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THE AUTOMOTOR

AND

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An Illustrated Monthly Journal.

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INDEX TO VOL. I.

ILLUSTRATIONS.

THE AUTOMOTOR

AND

HORSELESS VEHICLE JOURNAL

A RECORD AND REVIEW OF APPLIED AUTOMATIC LOCOMOTION.

Circulates amongst Makers and Users of Autocars, Cycles, etc., in the United Kingdom, the Colonies and the Continent.

VOL. I. No. 2. NOVEMBER 17TH, 1896. PRICE SIXPENCE.

CONTENTS.

THE NEW MOTOR-CAR REGULATIONS.

THE Local Government Board have issued the following Regulations to the county councils and certain other local authorities in England and Wales with respect to the use of light locomotives on highways, and their construction, and the conditions under which they may be used, and have directed that the same shall have effect on and after November 14th:—

ARTICLE I.

In this Order:—

The expression "carriage" includes a wagon, cart, or other vehicle.

The expression "horse" includes a mule or other beast of draught or burden, and the expression "cattle" includes sheep.

The expression "light locomotive" means a vehicle propelled by mechanical power which is under three tons in weight unladen, and is not used for the purpose of drawing more than one vehicle (such vehicle with its locomotive not exceeding in weight unladen four tons), and is so constructed that no smoke or visible vapour is emitted therefrom except from any temporary or accidental cause.

In calculating for the purposes of this Order the weight of a vehicle unladen, the weight of any water, fuel, or accumulators used for the purpose of propulsion shall not be included.

ARTICLE II.

No person shall cause or permit a light locomotive to be used on any highway, or shall drive or have charge of a light locomotive when so used, unless the conditions hereinafter set forth shall be satisfied, namely:—

(1.) The light locomotive, if it exceeds in weight unladen five hundredweight, shall be capable of being so worked that it may travel either forwards or backwards.

(2.) The light locomotive shall not exceed six and a half feet in width, such width to be measured between its extreme projecting points.

(3.) The tyre of each wheel of the light locomotive shall be smooth, and shall, where the same touches the ground, be flat and of the width following, namely:—

(*a*) If the weight of the light locomotive unladen exceeds fifteen hundredweight, but does not exceed one ton, not less than two and a half inches;

(*b*) If such weight exceeds one ton, but does not exceed two tons, not less than three inches;

(*c*) If such weight exceeds two tons, not less than four inches.

Provided that where a pneumatic tyre, or other tyre of a soft and elastic material is used, the tyre may be round or curved, and there may be upon the same projections or bosses rising above the surface of the tyre if such projections or bosses are of the same material as that of the tyre itself, or of some other soft and elastic material. The width of the tyre shall, for the purpose of this proviso, mean the extreme width of the soft and elastic material on the rim of the wheel when not subject to pressure.

(4.) The light locomotive shall have two independent brakes in good working order, and of such efficiency that the application of either to such locomotive shall cause two of its wheels on the same axle to be so held that the wheels shall be effectually prevented from revolving, or shall have the same effect in stopping the light locomotive as if such wheels were so held.

Provided that in the case of a bicycle this Regulation shall apply as if, instead of two wheels on the same axle, one wheel was therein referred to.

(5.) The light locomotive shall be so constructed as to admit of its being at all times under such control as not to cause undue interference with passenger or other traffic on any highway.

(6.) In the case of a light locomotive drawing or constructed to draw another vehicle or constructed or used for the carriage of goods, the name of the owner and the place of his abode or business, and in every such case and in the case of every light locomotive weighing unladen one ton and a half or upwards, the weight of the light locomotive unladen shall be painted in one or more straight lines upon some conspicuous part of the right or off side of the light locomotive in large legible letters in white upon black or black upon white, not less than one inch in height.

(7.) The light locomotive and all the fittings thereof shall be in such a condition as not to cause, or to be likely to cause, danger to any person on the light locomotive or on any highway.

(8.) There shall be in charge of the light locomotive when used on any highway a person competent to control and direct its use and movement.

(9.) The lamp to be carried attached to the light locomotive in pursuance of Section 2 of the Act shall be so constructed and placed as to exhibit, during the period between one hour after sunset and one hour before sunrise, a white light visible within a reasonable distance in the direction towards which the light locomotive is proceeding or is intended to proceed, and to exhibit a red light so visible in the reverse direction. The lamp shall be placed on the extreme right or off side of the light locomotive in such a position as to be free from all obstruction to the light.

Provided that this Regulation shall not extend to any bicycle, tricycle, or other machine to which Section 85 of the Local Government Act, 1888, applies.

Article III.

No person shall cause or permit a light locomotive to be used on any highway for the purpose of drawing any vehicle, or shall drive or have charge of a light locomotive when used for such purpose, unless the conditions hereinafter set forth shall be satisfied, namely :—

(1.) Regulations (2), (3), (5), and (7), of Article II of this Order shall apply as if the vehicle drawn by the light locomotive was therein referred to, instead of the light locomotive itself, and Regulation (6) of the Article shall apply as if such vehicle was a light locomotive constructed for the carriage of goods.

(2.) The vehicle drawn by the light locomotive, except where the light locomotive travels at a rate not exceeding four miles an hour, shall have a brake in good working order of such efficiency that its application to the vehicle shall cause two of the wheels of the vehicle on the same axle to be so held that the wheels shall be effectually prevented from revolving, or shall have the same effect in stopping the vehicle as if such wheels were so held.

(3.) The vehicle drawn by the light locomotive shall, when under the last preceding regulation a brake is required to be attached thereto, carry upon the vehicle a person competent to apply efficiently the brake: Provided that it shall not be necessary to comply with this Regulation if the brakes upon the light locomotive by which the vehicle is drawn are so constructed and arranged that neither of such brakes can be used without bringing into action simultaneously the brake attached to the vehicle drawn, or if the brake of the vehicle drawn can be applied from the light locomotive independently of the brakes of the latter.

Article IV.

Every person driving or in charge of a light locomotive when used on any highway shall comply with the Regulations hereinafter set forth, namely :—

(1.) He shall not drive the light locomotive at any speed greater than is reasonable and proper, having regard to the traffic on the highway, or so as to endanger the life or limb of any person, or to the common danger of passengers.

(2.) He shall not under any circumstances drive the light locomotive at a greater speed than 12 miles an hour. If the weight unladen of the light locomotive is one ton and a half and does not exceed two tons, he shall not drive the same at a greater speed than eight miles an hour, or if such weight exceeds two tons, at a greater speed than five miles an hour.

Provided that whatever may be the weight of the light locomotive, if it is used on any highway to draw any vehicle, he shall not, under any circumstances, drive it at a greater speed than six miles an hour.

Provided also that this Regulation shall only have effect during six months from the date of this Order, and thereafter until We otherwise direct.

(3.) He shall not cause the light locomotive to travel backwards for a greater distance or time than may be requisite for purposes of safety.

(4.) He shall not negligently or wilfully cause any hurt or damage to any person, carriage, horse, or cattle, or to any goods conveyed in any carriage on any highway, or, when on the light locomotive, be in such a position that he cannot have control over the same, or quit the light locomotive without having taken due precautions against its being started in his absence, or allow the light locomotive or a vehicle drawn thereby to stand on such highway so as to cause any unnecessary obstruction thereof.

(5.) He shall when meeting any carriage, horse, or cattle keep the light locomotive on the left or near side of the road, and when passing any carriage, horse, or cattle proceeding in the same direction keep the light locomotive on the right or off side of the same.

(6.) He shall not negligently or wilfully prevent, hinder, or interrupt the free passage of any person, carriage, horse, or cattle on any highway, and shall keep the light locomotive and any vehicle drawn thereby on the left or near side of the road for the purpose of allowing such passage.

(7.) He shall, whenever necessary, by sounding the bell or other instrument required by Section 3 of the Act, give audible and sufficient warning of the approach or position of the light locomotive.

(8.) He shall on the request of any police constable, or of any person having charge of a restive horse, or on any such constable or person putting up his hand as a signal for that purpose, cause the light locomotive to stop and to remain stationary so long as may be reasonably necessary.

Article V.

If the light locomotive is one to which Regulation (6) of Article II applies, and the particulars required by that Regulation are not duly painted thereon, or if the light locomotive is one to which that Regulation does not apply, the person driving or in charge thereof shall, on the request of any constable, or on the reasonable request of any other person, truly state his name and place of abode, and the name of the owner, and the place of his abode or business.

This Order may be cited as "The Light Locomotives on Highways Order, 1896."

In a letter addressed to the County Councils Sir Hugh Owen, the Secretary of the Local Government Board, draws attention to the provisions of the Locomotives on Highways Act, 1896. He refers to the exemption of light locomotives from certain enactments, and points out that the duties imposed by Section 4 of the Customs and Inland Revenue Act, 1888, will be payable for light locomotives which are carriages or hackney carriages as defined by the Act, and that such light locomotives will pay on and after January 1st next an additional excise duty at the following rate :—£2 2s. if the weight of the locomotive exceeds 1 ton but does not exceed 2 tons unladen, and £3 3s. if the weight exceeds 2 tons unladen. A summary of the above Order issued by the Local Government Board is given, and on the subject of speed Sir Hugh Owen states :—"Section 4 of the Act directs that no light locomotive shall travel along a public highway at a greater speed than 14 miles an hour, or than any less speed that may be prescribed by regulations of the Board. There is considerable difficulty in laying down definite rules as to the speed of light locomotives at the present time, as no experience has been obtained of their use in this country; but the Board have been strongly urged to make some general regulations on the subject, and they have dealt with it by Article IV of the Order."

The Carriage of Petroleum.

Sir Matthew White Ridley, the Home Secretary, in issuing the regulations as to petroleum for motor-cars, states:—

In promulgating the following regulations relating to the keeping, conveyance, and use of petroleum in connection with light locomotives, the Secretary of State for the Home Department desires to call public attention to the dangers that may arise from the careless use of those more volatile descriptions of petroleum to which these rules apply, being petroleum to which the Petroleum Act, 1871, applies, and commonly known as "mineral spirit."

Not only is the vapour therefrom, which is given off at ordinary temperature, capable of being easily ignited, but also, when mixed with air, of forming an explosive mixture. Hence the necessity for strict precautions in dealing with and handling the same, and for the employment of thoroughly sound and properly closed vessels to contain the same, the importance of avoiding the use of naked lights in dangerous proximity to the same or to any places where such petroleum may be kept, and generally of taking precautions to prevent contact of the highly inflammable vapour of this very volatile liquid with any form of artificial light.

Regulations.

1. Petroleum shall not be kept, used, or conveyed, except in tanks or cases of metal so made and closed that no leakage, whether of liquid or vapour, can take place therefrom, and so substantially constructed as not to be liable, except under circumstances of gross negligence or extraordinary accident to be broken or become defective or insecure in course of conveyance or use; and every air-inlet in any such tank or case shall be at all times, except when the valve, if any, is required to be removed for immediate use or repair, protected by securely affixed wire gauze, the openings in which shall not be less in number than 400 to the square inch.

2. Every such tank or case shall be clearly stamped or securely labelled with a legible metallic or enamelled label with the words "mineral spirit, highly inflammable, for use with light locomotives."

3. The amount of petroleum to be in any one such tank or case at one time shall not exceed 20 gallons.

4. There shall not be at the same time on or in any one light locomotive, more than two of such tanks as aforesaid.

5. Before repairs are done to any such tank or case, that tank or case shall, as far as practicable, be cleaned by the removal of all petroleum and of all dangerous vapours derived from the same.

6. When petroleum for use in, or in connection with any light locomotive is not being so used, it shall be kept either in accordance with the provisions of the Petroleum Acts, or in such tanks or cases as aforesaid; provided that the amount of petroleum which may be so kept in tanks or cases as aforesaid shall not exceed the amount of petroleum which may be kept on or in any one light locomotive at the same time, and that the tanks or cases shall be kept in the open air, or in some suitably ventilated place.

7. The filling or replenishing of a tank with petroleum shall not be carried on, nor shall the contents of any such tank be exposed by artificial light, except a light of such construction, position, or character as not to be liable to cause danger, and no artificial light shall be brought within dangerous proximity of the place where any tank containing petroleum is being kept.

8. In the case of all petroleum kept or conveyed for the purpose of or in connection with any light locomotive (*a*) all due precautions shall be taken for the prevention of accidents by fire or explosion, and for the prevention of unauthorised persons having access to any petroleum kept or conveyed, and to the vessels containing or intended to contain, or having actually contained the same; and (*b*) every person managing or employed on or in connection with any light locomotive shall abstain from every act whatever which tends to cause fire or explosion, and which is not reasonably necessary, and shall prevent any other person from committing such act.

9. These regulations shall come into operation on the 14th day of November, 1896, and be in force until further notice.

AGRICULTURISTS AND THE SPEED OF AUTOMOTORS.

The monthly meeting of the Council of the Central and Associated Chambers of Agriculture was held at the Society of Arts, Adelphi, London, on the 3rd inst., under the presidency of Mr. J. Lloyd Wharton, M.P. The delegates considered, as a matter of urgency, the rate of speed to be permitted by the regulations of the Local Government Board for light locomotives on the roads.

Mr. Muntz, of Warwickshire, moved: "That in the opinion of this Council the maximum rate of speed at which light locomotives should travel along public highways for 12 months at least should be fixed at not exceeding 10 miles per hour, and representations to this effect be forwarded to the Local Government Board." He drew attention to the fact that under the Act the speed was to be not exceeding 14 miles an hour. They thought that rate was excessive. The Act further asserted that the machines were to be pulled up within 50 feet. The stoppage within such a short distance from a high rate of speed would seriously damage the roads.

Mr. H. Williams, Monmouth, seconded, and thought that eight miles per hour was sufficient. Agriculturists ran a great risk from their horses being frightened by cyclists. Of this class "the scorchers" were the worst. He regretted they did not postpone their scorching till they got to the next world. (Laughter.)

Mr. A. D. Wells (Berks and Oxon) opposed the resolution, and Mr. Corbett mentioned that in Switzerland electric cars ran along the roads at a speed of over 14 miles an hour without to any extent inconveniencing the traffic.

Mr. Lipscomb said that in his district (the West Riding) a year or two since traction engines had, through using the roads in frosty weather, damaged them to the extent of £1,000 per mile. The rate of speed, he thought, should be moderated. They were in danger of being overridden. He dissented from the view taken by one of the speakers, that the proposal to moderate the speed of road locomotives was grandmotherly. Restrictions in this direction were as necessary now, in the light of experience, as ever they were.

The Chairman said the minimum distance for pulling up light locomotives was 50 feet, and this he thought was much too short a distance. With heavy engines he thought this would result in serious injury to the roads. Fast travelling was all very well in the fen district, where a driver could often see two miles or more in front of him, but in districts where the roads had sharp curves and high hedges, he regarded swift travelling as extremely dangerous. He should like to see the maximum rate of speed reduced.

The motion was adopted.

The Indestructible Ignition Tube Syndicate, of 100c, Queen Victoria Street, E.C., have made arrangements for repairing and storing autocars in Queen Victoria Street. They have their showrooms, 110 feet long by 25 feet wide, fitted with machine tools for repair work, and dynamos for electric charging.

TYPES OF HORSELESS VEHICLES.

The Thornycroft Steam Motor-Carriage.

Mr. Thornycroft, whose name is identified throughout the world with high class torpedo-boat machinery, has identified himself with the new self-propelled traffic, and designed a steam-carriage which will carry a load of one ton, and weighs about 35 cwt. when in full working order—including the weight of the coke used as fuel, the driver, and water necessary for a run of 20 miles.

Tho boiler is of the Thornycroft water-tube launch type with water fire-bars, steam being raised in about 15 minutes. The engine is double compound, the cylinders being respectively of 2 and 4 inches diameter, with a stroko of 3 inches. The engine speed is geared in the ratio of 9 to 1 to the road driving wheels. The condenser is placed on the roof, and is of sufficient cooling surface to condense all the steam at ordinary rates of working.

The van can climb an incline of 1 in 10 when fully loaded. The ordinary speed of working is about six or seven miles per hour, but a speed of nine miles per hour can easily be sustained on level roads. The floor space available for carrying goods is about 25 square feet.

Several trials have been made of this carriage with excellent results, while the name of Thornycroft is sufficient guarantee of the admirable quality of the workmanship and material which is used throughout. For developing this new branch of work an establishment has been founded under the title of the Steam Carriage and Wagon Company, Homefield, Chiswick Mall.

THE THORNYCROFT STEAM MOTOR-CARRIAGE.

An American Motor-Carriage.

From our representative in the United States we learn that a carriage capable of attaining a speed of from three to 18 miles an hour has been invented by a Springfield man, and an extensive factory will be erected for the manufacture of the vehicle. The promoter of the new carriage is Henry W. Clapp, and the inventor is Charles E. Duryea, both of Springfield, Ohio. A company is now being formed, and nearly one-half of the required capital of £60,000 has been secured. The new carriage has been given repeated tests, all of which have been successful. A trip was made to Hartford and return recently, insido of three hours. In appearance the machine resembles an ordinary side-bar four-wheel carriage. The wheels are rubber-tyred and run on ball bearings. Each of the front wheels instead of turning on a central bolt, as is the case with ordinary carriages, revolves on its own pivot located in the hub, thereby making each turn in a much smaller radius, and, consequently, being easier to operate in steering. The vehicle is easily manipulated by a lever located in front of the driver. A lateral motion of the lever turns the wheel while the vertical motion controls the speed. One of the advantages of the carriage is that by pressing a button connected with a brake drum the vehicle can be stopped almost instantly, thus lessening the danger of travelling in the streets. The motor is compactly located under the seat, and is stated to weigh about one cwt. for an output of four horse-power. Near this is a dynamo. To start the wagon a crank is revolved once on the side of the wagon. This turns the motor which starts the dynamo, which generates the necessary sparks to explode the oil-gas contained in the combustion end of the cylinder. Since the experimental machine has been completed it has been run over 1,000 miles, and is reported to have established its practicability on country as well as city roads.

Roots and Venables' Three-wheeled Carriage.

THIS vehicle, which we illustrate as manufactured by Messrs. Roots and Venables, of 100, Westminster Bridge Road, is built with a strong angle steel frame, carrying the oil motor of 2½ horse-power at the back, together with the exhaust box and small water-tank. The power is transmitted from the crank-shaft of the engine to a counter-shaft by means of belts working on various-sized pulleys, which counter-shaft again transmits the power to the axle of the carriage by a pinion and toothed wheel.

ROOTS AND VENABLES' THREE-WHEELED CARRIAGE.

This two-speed gear runs the carriage at ten or four miles an hour as desired. In the front of the carriage the larger water-tank is fixed out of sight beneath the feet of the riders. The carriage steers remarkably easy, and is fitted with two brakes, one on the front wheel and the other on a drum on the main axle. Sufficient oil is carried for a run of 27 miles in the tank, but more can be easily placed under the seat.

The tyres are of solid indiarubber dovetailed into steel rims.

The oil used is common American Tea Rose or Royal Daylight, price 5½*d.* per gallon.

The specific gravity of this oil is from ·8 upwards. Consequently it is quite safe to use, and must be distinguished from the gasoline or benzoline used by most other carriages, particularly those at present running in France.

The Benz Motor-Carriage.

A BRADFORD correspondent writing of this vehicle—which is the invention of Mr. Benz, of Mannheim, and is being introduced into this country by the Arnold Motor-Car Company, of East Peckham—gives an interesting account of a ride which he recently enjoyed. He states that "by the courtesy of the local agent, Mr. James E. Tuke, Aldermanbury, he was initiated into the mysteries of the horseless carriage, riding with Mr. Tuke in a small car of 1½ horse-power from Otley to Bradford, the time occupied being an hour and twenty minutes exactly. The day was very unsuitable owing to the heavy condition of the roads, and the success of the ride under such adverse circumstances showed how great the scope of the invention must be. At present the machine is hardly out of the experimental stage; but on the flat a good speed was attained. One fine feature of the machine is the ease with which the speed is regulated, without having recourse to the brake. Hollings Hill can be descended, either fast or slow, by simply setting the indicator, or, if economy be aimed at, the gearing may be shifted, and the wheels allowed to revolve down hill under the control of the brake. It appears that a car of 1½ horse-power is not quite equal to carrying two people up the Yorkshire hills in bad weather, but an addition of "½ horse-power" would probably be ample. The little carriage now in Mr. Tuke's possession is one of the smallest made, and its value is about £130. No particular mechanical knowledge is required to understand the working of the car, and when once charged with oil and electricity it will run for 150 miles. The sensation of travelling by this new and convenient method is precisely that of cycling, with the exception of the labour involved by the latter. All that is needed for motor-car riding is a hand for steering and a head to restrain one's natural inclination for racing on the public road. Of the utility and general merit of the horseless carriage there cannot be any doubt. For doctors the novelty appears to offer immediate advantages, but a general adoption of the vehicle by tradespeople and others will naturally be a work of time, and must depend upon the further development of the invention itself." These motors have found much favour in France and Germany, and will doubtless obtain a fair measure of success in this country.

THE BENZ MOTOR-CARRIAGE.

HINT TO INVENTORS.—In connection with the show of cycles which is to be held in Belgium in the new year, prizes of £40 are being offered: (1) For the best wrench which will not cut or disfigure the nut; (2) for a motor for machines, weight not to exceed 21 lbs., capable of giving one horse-power, and inexplosive. Smaller prizes are offered for the following: (1) A machine for transmission, whereby an even amount of power is obtained on both sides of the machine; (2) the best kind of frame, in which solidity and weight are carefully and advantageously combined.

A WELCOME reminder of the advent of Christmastide is to hand in the shape of a package of the marvellous cards and books issued by Messrs. Raphael Tuck and Co. The firm has so long held and deserved the highest reputation for artistic design and perfect printing, that it is almost impossible to write anything new in their favour. For the children there are wondrous books of fairy lore, of kindly goblins, and nursery rhymes illustrated with beautiful children and dolls, while whimsically-designed elfins and Puck-like creatures hover about the pages in such alluring ways that the little ones cannot fail to be attracted and amused by the apt illustrations and tasteful dialogue. For older folk the Christmas cards are designed in perfect taste; while such work as that shown in Raphael Tuck's series of platino panels has, perhaps, never been equalled by any other publisher. Perhaps next year they may give us an idealised automotor carriage, with appropriate occupants and motor (we apologise—motto).

THE LONDON COUNTY COUNCIL AND MOTORS.

THE Highways Committee of the Council presented a report to the Council on the 3rd inst. regarding the Locomotives on Highways Act, 1896, and motor-cars in London. The committee stated that they had considered a letter from the Local Government Board, forwarding a copy of general regulations which it is proposed to make under the Act. It appeared to the committee that, having regard to the crowded condition of many of the London thoroughfares, it is important that a regulation limiting the speed of such vehicles when travelling in London to a maximum of eight miles an hour instead of 14 should be made and issued before the Act comes into operation. There is little doubt, the committee stated, that if light locomotives were to be allowed to run at the rate of 14 miles an hour they would seriously interfere with the other traffic. The Board asked that observations upon the proposed general regulations might be submitted not later than October 31st, and the committee had accordingly, on behalf of the Council, made a representation to the Board of the necessity for such a regulation. The action of the committee was approved by the Council.

LIGHT RAILWAYS.

THE Commission appointed by the Act of Parliament last Session to give assistance to promoters of light railways throughout Great Britain has acquired temporary offices at 23, Great George Street, Westminster, where all plans of light railways must be considered before the end of December. Every application going before the Commissioners must be accompanied by a full statement of the proposed light railway, gauge, motive power, county and parish where proposed, advance of money requisition, and a certificate that a fee of £50 has been paid to the Board of Trade. The Commissioners are quite ready to advise applicants having the desire of constructing light railways in the procedure necessary. The Commissioners are the Earl of Jersey, Col. G. F. O. Boughey, R.E., and Mr. Gerald FitzGerald. Mr. Bret Ince is the secretary. A full account of the provisions of this important measure appeared in our last issue.

An interesting exhibition of light railway plant was recently shown at Newlay, near Leeds. It was all the more noteworthy by reason of the fact that the plant is intended for the first light railway which the Government of India has sanctioned. The Barsi light railway, for which the present equipment is intended, will be laid along the side of an ordinary country road, the gauge being 2 feet 6 inches. The rails weigh 30 lbs. per yard, and as there is no land to purchase, it is estimated that the cost of construction will not exceed £600 per mile of single track. The locomotives are of the eight-wheeled coupled type, capable of hauling 276 tons on a gradient of 1 in 100, and of 150 tons on a gradient of 1 in 57. Both the goods wagons and the passenger coaches are of the bogie type. The object of the demonstration was to show that heavy loads can be carried over a narrow-gauge line, and that the permanent way and plant in an average country district are simple and inexpensive.

THE SELF-PROPELLED TRAFFIC ASSOCIATION.

FORMATION OF A LIVERPOOL BRANCH.

The vice-president of the Liverpool branch of the Self-Propelled Traffic Association, Mr. Alfred L. Jones, on Monday, the 26th ult., gave a luncheon in the Exchange Station Hotel for the purpose of welcoming Sir David Salomons, Bart., president of the Association, on the occasion of his visit to that city to deliver an address before the members of the newly-formed local branch of the Self-Propelled Traffic Association. About 50 gentlemen assembled besides the principal guest, Sir David Salomons.

Invitations had been extended to the following :—The Earl of Derby, Prince Bhanuganger, of Siam ; Colonel A. H. Holme, Sir W. B. Forwood, Captain Wilson Wilson, Professor Hele-Shaw, Messrs. A. Bromley Holmes, A. J. Lyster, J. A. Brodie, A. Musker, G. F. Ransome, H. H. West, J. Wilson, J. F. Wood, E. Shrapnell Smith (local hon. sec.), G. H. Cox, M. Bannister, H. P. Boulnois (city engineer), C. M'Arthur, L. Jones, A. Sinclair, W. J. Davey, F. C. Danson (president), T. H. Barker (secretary Liverpool Chamber of Commerce), A. Cook, A. Elder, J. Dempster, Ellis Edwards, John Holt, J. Thorburn, E. Bindloss, W. J. Stewart, D. Jones, J. Pinnock, S. B. Cottrell, H. G. Clarke, &c. Public engagements prevented the Lord Mayor attending, and the Prince of Siam had left the city.

After luncheon, Mr. Jones, in his introductory remarks, said that much of the agitation and many of the facilities offered in improved road locomotion were due to Sir David Salomons's energy, foresight, and ability, both inside the House of Commons and out (hear, hear). He (the speaker) had attached himself to the society for the sole purpose of obtaining improved means of getting cargo to and from Liverpool and adjacent places. One of the most wicked expenditures of money had been the making of the Manchester Canal, which would not secure the object the Manchester people had in view—viz., taking steamships to Manchester, because the steamship of the future would be altogether unable to enter the canal.

Sir David Salomons acknowledged the cordial expressions of Mr. Jones concerning himself. Proceeding, he said if those who were going to start a system of transferring passengers or goods from one point to another could evade the purchase of land and the necessity of capital for the laying of the permanent way and its up-keep, they could do the work of transit very much cheaper than a railway company which started with those disadvantages at its back. Under the system he referred to they had the advantage of roads kept up and repaired by the ratepayers, and with it they ought to compete most favourably with the railways in the cost of conveying goods. A penny per ton per mile was an exceedingly reasonable figure to place on transit by road with any known form of locomotor. The chairman had a scheme before him of carrying goods at even a lower rate. The scheme was that of road trains not under the new Act, but under the old Act, to go at a speed not exceeding four miles an hour, carrying goods for less than a penny a mile between Liverpool and Manchester. It appeared to him if that scheme were going to be such an exceedingly profitable one—to say nothing of what the railways might do in consequence—they would have road trains innumerable between Liverpool and Manchester, sufficient almost to make the roads themselves impassable in a very short time. A question which arose was, would the county councils or other local authorities keep and repair the roads under those conditions without extra contributions from those who used them ? It would not be fair to ask the authorities to do so. There was a solution, however, for that. Those who benefited by that form of traction should, under the special clause of extra wear and tear, help the other unfortunate ratepayers in paying their rates (applause).

Mr. G. F. Ransome, a Liverpool engineer, believed the scheme mentioned by Mr. Jones to be thoroughly practicable. It was, he said, working in some parts of the country.

Sir David Salomons proposed the health of Mr. Jones, who, in responding, said his great object was to make Liverpool more successful than she had ever been.

The company then separated.

Address by Sir David Salomons on the Motor-Carriage Industry.

In the evening, Sir David Salomons delivered the inaugural address in connection with the Liverpool branch of the Self-Propelled Traffic Association, in the Royal Institution, Colquitt Street. In the unavoidable absence of the Lord Mayor, the president of the Liverpool centre of the Association, the chair was occupied by Mr. A. L. Jones, who was supported by a number of leading engineers, members of the Liverpool Chamber of Commerce, and others. It should be mentioned that the local vice-presidents are Mr. H. Percy Boulnois, Mr. Alfred Holt, and Mr. Alfred L. Jones. The Council consists of Mr. Maunsell Bannister, Mr. John A. Brodie, Mr. E. R. Calthrop, Mr. George H. Cox, Mr. A. Bromley Holmes, Mr. A. G. Lyster, Mr. Arthur Musker, Mr. G. F. Ransome, Mr. H. H. West, Mr. John Wilson, and Mr. J. T. Wood. Mr. E. Shrapnell Smith is the energetic honorary secretary of the centre. The number present exceeded 400, and amongst those who attended were :--Alfred Holt, H. Percy Boulnois (city engineer), F. C. Danson (president Liverpool Chamber of Commerce), W. J. Stewart (Stipendiary Magistrate), Professor H. S. Hele-Shaw (University College), E. Hallon Cookson, C.C., W. H. Williams, C.C., Thomas Menlove, C.C., Charles H. Giles, C.C., Louis S. Cohen, C.C., George H. Ball, C.C., W. J. Carmichael (Lancashire and Yorkshire Railway), J. Shaw (London and North-Western Railway), John Macaulay (Mersey Tunnel Railway), J. Audley F. Aspinall (chief engineer Lancashire and Yorkshire Railway, Horwich), M. C. Bannister, John A. Brodie, E. R. Calthrop, Geo. H. Cox, A. Bromley Holmes, Arthur Musker, G. Frederick Ransome, Henry H. West, John Wilson, C.C., J. T. Wood, C.C., Laurence Jones (solicitor to the local branch), T. H. Barker (secretary Liverpool Chamber of Commerce), Dr. Francis Melach, Dr. Proctor, Dr. Percy Marsh, Colonel Gamble, C.B., Colonel A. Hill Holme, J.P., Eustace Carey, Alexander Wall, Dr. J. W. Hayward, Dr. C. W. Hayward, A. R. Marshall, M. Zagury, Chas. H. Beloe, C.C., Major W. A. Pride, Dr. Henry O. Forbes, A. J. Pilkington, R. J. Glasgow, J.P., S. B. Cotterell (Liverpool Overhead Railway), C. H. Darbyshire, J.P., Geo. S. Hazelhurst, J.P., D. de Ybarrondo, Alex. Dalrymple, Percy Bateson, H. L. Higgins, R. E. Warren (Midland Railway), and E. Shrapnell Smith. Amongst the audience there were some 40 ladies.

The Chairman, at the outset, said he did not know any town in the country where the use of the self-propelled vehicle was likely to be more beneficial than Liverpool (hear, hear).

Sir David Salomons, who was very cordially received, after paying a graceful compliment to the energy and intelligence of the citizens of Liverpool, said :—The place I have occupied in regard to self-propelled traffic is so exceptional, that it is difficult for many to believe that I have not some ultimate interest in the movement. Business men cannot always appreciate the position of those who are devoted to the application of science, and whose pleasure it is to work and expend money in this direction, without the expectation or desire to receive interest in return. It is my good fortune that, by devotion to practical science, I can hope to influence others, for, with an engineer's training, and having studied the question to be dealt with to-night very closely for a number of years, I am able to speak freely, and without fear or favour. I should not refer to myself in such terms, but for the reason that I am anxious to assure my hearers that all I say is honestly what I believe ; and further, that it is not my desire to give offence in any direction. My object is simply to put the whole case fairly before you, without paying compliments to anyone.

The Doubtful Value of Patents.

One opinion from which I have never swerved upon this question is that no patent connected with self-propelled traffic is worth the paper it is written upon, whether the patents will bear the test of the Law Courts or not. All fresh capital required for the production of the new vehicles should be utilised by enlarging existing workshops, or for the erection of additional factories as well as for working capital. There is no reason for locking up large sums of money in patent rights except for the benefit of company promoters and their companies. Any industrial concern heavily loaded with unproductive capital, must necessarily either charge the public an undue profit on their goods or fail, and since there is no impediment in the way of producing the best possible self-propelled vehicle (the question of patents not arising, except in some cases to an inappreciable extent), it would be unjust that any attempt should be made to compel the English public to pay an unfair price for an article, only to benefit the few who are feathering their nests. It must not be supposed from these remarks that I grudge the inventor a portion of the profits which might arise from the article which he has devised or improved, but I object to the trading in patents by sale outright, which so often acts unfairly to the public as well as to the inventor himself. I have always contended that the equitable way of dealing with such property is for the patentee to accept deferred interest and, if required, a moderate sum paid down in money or shares according to the nature of the circumstances, the transaction being such that in the case of the manufacture (which all patents *must* be) the patentee, should his invention prove of value, would derive the benefit jointly with those who hold his rights, and *vice versâ*. As a natural consequence the patentee and the manufacturer, in regard to the article produced, would stand or fall together. Self-propelled traffic, although it has in recent years been hampered in this country, is so old, so well known, and has been worked out by such able men in the past, that every form of engine, and every type of gearing which has a value, is public property. Further, every patent of any value in connection with gas and oil engines has expired, so that to the Englishman the world is now open for the production of self-propelled vehicles without let or hindrance, whatever may be said by interested parties to the contrary.

Steam the Motive Power of the Future.

I have expressed myself very strongly, that steam and steam alone will be the future power of self-propelled traffic. You must not understand me to mean that there is absolutely no place for other forms of motors. This I fully recognise, yet I feel confident that within a short period, in nine out of every ten motor vehicles constructed, steam will assert its supremacy. You will see the point more forcibly when I deal with the subject in detail.

The Initiation of Recent Legislation.

The celebrated 1881 Appeal in the Court of Queen's Bench decided till November 14th, 1896, the fate of motor locomotion on the highways, for the decision placed every vehicle self-propelled within the narrow limitations of the Locomotives Acts, which were created to deal with heavy traction. The definition of a locomotive in one of these Acts is such that the lawyer's well-known "coach and four" could not drive through it. Although many gentlemen, including myself, have been given the credit of helping forward the new Act, it is only fair to point out that the first credit is always due to Mr. Shaw-Lefevre, who introduced a Bill in the final Session of the last Parliament, and that he did so without public agitation is a proof that he is a man ready to recognise the wants of modern society. His Bill, however, was faulty in regard to one point. Had this Bill become an Act without considerable amendment, the question would have been left in the hands of the local authorities, and once more there would have been an Act, which would probably have been unworkable, in consequence of different districts adopting dissimilar regulations. The manufacturer might have had to consult the requirements of a hundred or more local authorities, whose demands might have been constantly varied. The user of the carriage would also have been hampered quite as much as the manufacturer.

Advantages of the New Law.

The present Act is free from this blemish, and the high roads of England are made continuous under one system of regulations. The manufacturer, by the study of two sets of rules to be issued, one by the Local Government Board, and the other by the Home Office, will be able to conform to the requirements of the State. These rules will be framed in the interests of public safety, and therefore an advantage to all concerned.

The Paris-Marseilles Contest.

From time to time I have published pamphlets and articles dealing with the subject of horseless traffic. I will, therefore, not weary you with a recapitulation of all that can be said on the matter, but leave the past and go straight to my recent visit to Paris on the occasion of the Thousand Miles Race, and from its results draw deductions according to my own judgment. About 50 carriages were entered, but on the day of the start 32 only appeared. So few, out of the total entered, arriving at the starting point was due to many manufacturers having found that their vehicles were not sufficiently perfect, or could not be prepared in time. The fact that steam was only represented by two carriages, and that these failed to make any headway, will by many be taken as an argument against this agency. On one point the French differ from the English, in not being so practical. The Englishman would finish his carriage long before the day of the race, and experiment with it. Our neighbours, however, leave matters to the last moment, although there are, of course, exceptions to this rule. I saw the two steam carriages 48 hours before the start, and at that time the wheels were not completed! These carriages, so far as their build and system are concerned, were good, though heavy. The wheels, in consequence, formed an important element in the success of their running. My own opinion, from the first, was, that accidents apart, the race would lie between M. Levassor and M. Peugeot. The result was in accordance with my expectations. M. Levassor was successful in one class, and M. Peugeot in the other.

The Works of MM. Panhard et Levassor.

The first mentioned gentleman very recently showed me over his works, and I cannot do better than pay him the compliment that his factory is organised on the best English lines, with the most modern machinery. The whole of the engineering portion of his carriage is as well and accurately made as a piece of watchwork. The engine employed is a modified Daimler, called the Pygmé, and is a great improvement on the Daimler engine. M. Levassor did not use any special carriage in the race. He employed the benzine motor and gearing which he has for some time past adopted, and was consequently well prepared when the day arrived.

The Peugeot Motor.

A year ago M. Peugeot purchased his engines from MM. Panhard and Levassor. He then decided to make one of his own type, and after much experimenting, only reached a successful result a very short time before the race. Indeed, the carriages sent in from his manufactory only reached Paris a day or two before the start, and the "bodies" were in an unfinished condition. It is truly remarkable how well these carriages have run, seeing that there was no time to make the necessary experiments. In the Peugeot engine there are two cylinders, and they are horizontal instead of vertical, as in the Levassor type. The time was too short to make anything beyond a cursory examination of the Peugeot motor, but it appears to remove the objectionable points existing in the Daimler engine.

The Daimler Engine.

To describe briefly the construction of the Daimler engine, of which so much has been heard. It consists of three parts:—

1. A double-cylinder Otto gas-engine pure and simple, the patent of which has run out some years.

2. A cam arrangement for working the valves, which is similar to a method previously used in connection with gas and steam-engines.
3. A governing device which is an absolute copy of the Corliss trip gear.

This latter adaptation is the weak point of the engine. The Corliss gear is perfect for a steam-engine, but too delicate for these quick-running, small engines on account of the numerous springs necessary. Yet, although there is absolutely nothing novel in the Daimler engine, great credit is due to the designer for having made one of the first attempts to construct a very small, light, and quick-running oil motor suitable for a carriage or any other purpose. From what I observed in the Peugeot motor, the disadvantages of the "Daimler" have been overcome. The working parts are more accessible, and the multiplicity of springs has disappeared.

Sir David's Opinion of the Result.

The difference in running between the Levassor and Peugeot carriages in the race has been so small, that, when allowances are made—for in the case of M. Levassor he was ready long before anyone else, and M. Peugeot was only prepared on the eve of the race—it is evident there is not much to choose between the two. Knowing M. Levassor personally, I am quite prepared to believe that he will still further modify the governor to simplify his engine. Of the other carriages which competed, those of M. Delahaye ran well, but there is nothing very novel in them beyond the general assemblage of the parts. Carriages of the type of the Benz were run by the Maison Parissienne, but notwithstanding the French name of the Company it was curious to observe that the conductors spoke in German. M. Bollée entered a carriage and two of his tandem cycles, which have been so well advertised. These latter I regard as dangerous from every point of view. They are complicated, and first engineering principles are disregarded. The single driving wheel at the back gives an insufficient grip on the road, with a tendency to throw the man out in consequence of the back wheel "dancing."

The Time occupied in the Contest.

In consequence of the great storm which occurred the day after the start, and owing to various little accidents which happened, considerable delays were experienced, which brought down the average rate of running in the race. But there is one point I would call your attention to. It must not be imagined that because the whole distance was traversed in a given time, at the average rate of approximately 25·5 kilometres per hour, that if you purchased one of these carriages you could do anything approaching the same record. In the first place, endless quantities of duplicates were carried in case of need. Secondly, a perfect army of workmen, the best that France could produce in this trade, accompanied the carriages. Thirdly, the speed attained down the hills was tremendous, to make up for the slow speed uphill. It would be impossible for anyone to perform the distance in the race time if he complied with the law of France as to a maximum speed of 20 kilometres (14 miles) an hour, carried only a reasonable quantity of duplicate material, and travelled with one conductor, who would naturally be a mechanician, unless the owner was one himself. In this case the time occupied would be double or treble that taken in the race.

Increase of Power found to be Necessary.

Technically, in regard to the carriages which entered, there was absolutely nothing new of engineering interest, beyond the fact that makers have learnt that more careful work is required, and that the horse-power found to be necessary has been raised from three or four to six. This power is still insufficient for a hilly district such as is found in parts of Kent and elsewhere. Anything less than 8-horse power is not of much service for an average speed of 12 miles an hour, if the legal maximum is not at any time to be exceeded. The vibration produced when the carriages were standing has not been remedied, nor has any fresh arrangement been devised for stopping and starting the engines in the traffic.

The Steering of Motor-carriages.

Much surprise was caused by the recent appearance of an article on the self-propelled traffic question in one of our leading engineering papers, condemning both the steering properties of the present motor vehicles as well as the new Act. The writer of the article must either have been biassed or have been ignorant of the subject. A proposal is therein mentioned to attach ponies to motor-driven carriages to give the direction whilst employing the motor to do the work! Now, anyone who has the smallest experience of motor traffic knows perfectly well that it is far easier to guide such carriages than any horse, and I was able to prove this to the complete satisfaction of Major Tullock, C.B., who visited Paris officially at the instance of the Local Government Board.

Various Types of Motors—The Oil-engine.

I will now deal briefly with the various types of carriages, that you may judge of the advantages and disadvantages of each form. The ideal heavy oil motor for light work has not yet appeared on the market. To volatilize or to spray the oil, a special form of carburetter, or some equivalent, is necessary, less simple in form than that required with the lighter spirits like benzine. Besides this, the exhaust gases have a very disagreeable smell. Many attempts have been made to scent the oil, but the success met with is somewhat doubtful. That a suitable heavy oil motor will eventually be made, no reasonable man can doubt. Petroleum motors using mineral spirit such as benzine are the favourites at the present time. A large number of engines of this type are on the market. In every single instance they are ordinary gas-engines. The carburetters are very simple. Water is necessary to cool the cylinder, except in those cases where the power is small, and in these the heat is dissipated by means of metal webbs cast on the cylinder, or by making the cylinders exceedingly thin, so that no large mass of metal is required to be cooled. I do not consider that any engine of this type is satisfactory when the power exceeds ½ horse, unless water for cooling is used. Many engines of a larger size have been shown without a water jacket, but an expert would be very sceptical in regard to their performances if put to real work. Such engines may run round in a room or yard very well, but if placed on a hilly road on a hot day the chances are that they would come to grief, or give off very little power. Only those who have had considerable experience with a carriage driven by a benzine-engine can realise the little difficulties which arise. All the working parts are placed so closely together, that should any slight accident occur when on the road, and the engine pull up, it is, in most instances, impossible to remedy the defect, because all the working parts are so hot, that even with thick gloves, the hands cannot be inserted between the machinery. It is absolutely necessary to grind the valves periodically. Otherwise, in a comparatively short space of time the engine will give off little or no power. The grinding process is by no means easy, except for a mechanic. The best form of benzine motors have two or more cylinders, and the working parts generally are fairly complicated; consequently there are a large number of screws, nuts, bolts, stuffing boxes and connections, which the rattle of the road is liable to loosen. Should this occur, as it does pretty frequently, and tightening up is not at once resorted to, portions of the engine may be lost, and the occupants of the carriage landed high and dry miles away from home. It is absolutely essential that the owner, or his man, should be a mechanician, and anyone purchasing a carriage on an assurance to the contrary, will soon discover his error, though after many sad experiences, the owner or his man will, by force of circumstances, become a workman, unless totally devoid of mechanical sense. This experience will also have to be paid for, because, at the beginning, a practical man will have to be called in from time to time to put matters right. In regard to benzine, the difficulty of storage enters, which will always be a source of trouble in large towns. To sum up the foregoing remarks, I would never advise a friend to purchase a benzine-driven carriage, unless he was made well aware of the disadvantages.

Advantages of Oil.

The advantages may be summed up in the following manner:—If the vehicle is supplied with a powerful motor, is constructed by a good maker and the driver is a mechanician, he will be able to travel immense distances at a good average rate of speed—an advantage which is not possible with the horse. Further, in the winter, he need not fear slippery roads, and he could drive his carriage from within a glass canopy. When calling anywhere he would have no qualm as to keeping his horse standing. If he has a suitable arrangement, something like a condenser, for cooling the water, there is no reason why the carriage should not travel 24 hours and more at a stretch without taking in supplies of any kind.

Benzine Troubles.

To give an idea of one of the troubles least anticipated, which may arise with a benzine motor-carriage, I may mention that I was stopped last month on my road to Paris, in consequence of a tube leading from the reservoir to the engine becoming blocked up with deposit from the benzine. Accidents, similar in character, have been reported to me by friends. The consequence is that I am now changing the pipes for others of larger section, and so connected that they can be cleaned from end to end at a moment's notice. It has been supposed that the deposit in the tubes is due to the use of inferior benzine, but this is not the case. About 23 years ago a Company was formed to enrich coal gas by passing it through benzine. It was intended to place in every house a cistern of benzine, which liquid would be changed from time to time by the Company, an annual charge being made for this purpose. I declined to place the apparatus in my house, until I was convinced that the pipes could not become incrustated, and after making some experiments I soon discovered that a deposit was formed in the shape of crystals, in appearance like cotton wool, as well as a condensation. From these experiments and my recent experience, it is quite clear that all pipes employed for benzine should be large, and so arranged that they can be cleaned from time to time, quickly and with ease.

Igniting the Explosive.

Some makers use the well known gas-engine ignition tube, and others the electric spark, to ignite the gas in the cylinder. The lamps have the disadvantage of being troublesome in very windy weather. No doubt, in time, this will be remedied, though it is not so easy as anyone would be led to believe, in consequence of the large amount of air necessary to keep them burning. I have myself been stopped on one or two occasions, owing to the lamps blowing out, and great difficulty is experienced in re-lighting them, because the lights are generally extinguished at an exposed place, and they must be heated first before they will burn. When an electric spark is employed there is the risk of the accumulator or primary battery becoming exhausted when far away from any place where a fresh store can be taken on board. For a long journey a duplicate source of electric energy should be carried, and in a strange land, where renewal is impossible, lamps are preferable, because primary batteries are always troublesome, and, as a rule, are not fit for use until they have stood several hours after being charged.

The Dion-Bouton Tricycle.

There is one type of benzine carriage which is worthy of special attention. It is the De Dion and Bouton tricycle. This carries a little engine of about ½ horse-power. The ignition is electric, and the pedals are employed as an auxiliary force. Both muscular and engine power are necessary on hills, and on fairly level country there is no fault to be found with these tricycles, but in hilly districts they are tiring. The machines are good and well made. I have two of them myself, and they answer the purposes for which they are required in an admirable manner.

The Power required to Drive a Motor Vehicle.

It has often been asked, Why should the horse-power required to be carried by a carriage be greater than that necessary when the horse occupies his place in front? This is due to the position of the motive power. When it is placed without the carriage, as in the case of the horse-drawn vehicle, the wheels are lifted over the various impediments existing on the road. When the power comes from within, the tendency is to push the wheels into the ground when an obstruction is met with. This disadvantage may be partly overcome by the employment of very large wheels, but, no doubt, in course of time, our present notions of design in regard to these carriages will become modified. In theory, to obtain double the speed, four times the power is necessary, yet with the motor-propelled carriage, within the limits of the speed permitted on the highway, the increase of power for a given increase of speed is almost in an arithmetical instead of in a geometrical proportion. In other words, to obtain double the speed, instead of four times the power, very little over twice is needed. It must not be inferred that in practice the theory is upset. The reason is that at a greater speed the obstacles on the road are overcome in a different manner, and therefore offer less resistance to the advance of the vehicle, than when travelling at a slower rate.

Electric Carriages.

Carriages driven by electric energy have not yet come within practical range for general purposes. The weight of the accumulators and the necessity of charging stations are the stumbling blocks. The comparatively light accumulator, capable of being charged and discharged rapidly, must require frequent renewal, and this expense few are willing to face. Electrically-driven carriages may yet have a limited use.

The Serpollet Steam Motor.

My faith is more than ever pinned on steam, after seeing the recent carriage of M. Serpollet in Paris. When writing about his carriage, and of steam generally, I had pointed out that complete success could only be obtained when a good heavy oil burner appeared, and M. Serpollet accepting this view, set to work assiduously, and his labours have been crowned with success. The carriage I rode in is a light voiturette for two persons, with the boiler placed behind and out of sight. One large heavy oil petroleum burner serves for the fire. The engine of this little carriage can give off 10 horse-power with ease. The carriage is on three wheels, but I understand that four will be employed in the new ones. It runs up the steepest hills as if on level ground. The ride from Paris to Versailles is very hilly, and with my carriage I required an hour and twenty minutes to make the journey, but the little Serpollet carriage covered the distance in somewhat over half an hour, and on the long steep inclines it rushed in front of every other vehicle, whether motor or horse drawn. The only fuel necessary to be taken in upon a long journey is water, and this is required but every three hours. A sufficient store of heavy petroleum can be carried for a very long journey. In the new carriages, which will be made after the model of the experimental one, a condenser will be added capable of condensing a portion of the steam, and thus enabling a longer journey to be made before obtaining fresh water. The carriage requires a few minutes' preparation, say four or five, before it is ready to start. The time is occupied in the combustion of a small quantity of methylated spirit to warm up the burner that it can be lighted. The speed is regulated by a pedal, and the price is so reasonable, viz., £120, that this vehicle must have an enormous future. There is not the slightest doubt that the steam-carriage, as solved by M. Serpollet, is the coming one. The machinery is simplicity itself, and of a character known to almost every village smith—the ordinary steam-engine. The boiler is small, non-explosive, and self-cleansing.

The burner has nothing in it to get out of order, and the power given off is enormous compared with the size and weight of the vehicle. Larger types will be made on the same lines as soon as the numerous orders, which are pouring in, can be got off hand. The weight of the carriage described is between 8 and 9 cwt. It is unfortunate that the experimental carriage was not completed some months ago, instead of but one week before the race. Had this been the case steam would probably have competed successfully with benzine-driven carriages. I think it may be fair to point out that many boilers of this type are in existence; indeed the principle of only admitting sufficient water into the boiler to supply the steam needed is much older than M. Serpollet. The chief credit which attaches to this gentleman consists in the fact, that after experiments extending over many years, and after repeated failures, he has, by his persevering efforts, probably attained a better knowledge of this class of boiler than anyone living, and his advice, guided by his experience, therefore, has far greater value than his patents, whether they be good or bad. Three weeks ago M. Serpollet left Etretat at 8 a.m. in his experimental steam-carriage, and arrived in Paris at 6 p.m., thus covering the distance of 240 kils. in 10 hours, at an average rate of 24 kils. the hour, which speed is equivalent to nearly 16 English miles per hour. The actual rate of running must have been greater, but the times of the various stoppages are not given.

Steam v. *Petroleum.*

Those who have read what I have from time to time published on the Self-Propelled Traffic question may think that my views have somewhat changed, and that having been in favour of petroleum motors I now prefer those actuated by steam. This is by no means the case, because steam has always been my favourite, but I have simply discussed vehicles as they existed, and until recently the difficulties in the way of applying steam to this class of light traffic on highways had not been overcome. I still believe that motors employing light or heavy petroleum will have a considerable future, although eventually steam is likely to supersede them. For the moment electricity is out of the running, but it is quite possible that improvements will be forthcoming which will place this agency on an equality with steam, or even before it.

Trade the Ruling Factor in Great Britain.

In France, motor-carriages have been taken up as a kind of sport, and in general the class of men who purchase them care little whether they throw away £100 or not, but the great and immediate future of self-propelled traffic in England will undoubtedly be in connection with trade. The sporting element of society will never be induced to give up their horses, and the poorer gentry and small tradesmen cannot afford to purchase motor-carriages until they are assured that a really satisfactory vehicle can be obtained. There will undoubtedly soon be seen on the roads a very large number of motor delivery vans for railways, factories, shops, and other business houses, for the simple reason that they will not wait for the little refinements required in a private carriage, and the cost of replacing their vans at a later period will not be an important matter. The reason for this is that every motor-wagon or cart will be doing the work of from four to six horses per day at a far lower cost. The rent of stabling for horses will also be saved, and these economies will cover the cost of the van in a comparatively short time—say two or three years. The trader will not only reduce his expenses but add to his profits, because his circle of delivery will be much increased, since his vans will travel greater distances. Each van could accomplish a fifty mile run from the shop or warehouse in the course of an afternoon—a journey which no one would dream of attempting with horses. One other advantage, a motor-van can be left standing in an open yard, and at the end of a day's work may easily be sent to the outskirts of the town for shelter, where the rent is low. This point does not exist in the case of horse-drawn vehicles, since the horse cannot be left standing in the open and in all weathers. In winter especially, heavy traffic will be relieved of a great deal of the cruelty to horses which accompanies it at the present time, when on a slippery day we see horses losing their foothold in all directions.

Condition of the Roads.

England is possessed of splendid roads as compared with France, although it is true that in the latter country fine roads are to be found, but in village districts they are paved with stone in the roughest manner. Whatever our local authorities may say in regard to economy of expenditure in road-making, it is a benefit to a district that the roads should be good. Anything which will induce people to travel through a locality, must be an advantage, since it leads to more money being spent there; and even where this is not the case, good roads must lead to increased business and a general reduction in the rates and taxes.

A Forecast.

I can picture to myself that in the next ten or perhaps five years, the whole of the heavy traffic, as well as the public conveyances of this country will be propelled by motors, probably steam, instead of by living horse power. Tradesmen and country doctors will also have called in this method of locomotion to their aid, and those whose occupation requires them to go to daily business by rail, will be able to live at greater distances from a railway station, thus paying a lower rent, which will more than compensate the expense of the motor vehicle.

The Speed Question.

One of the most difficult points with which the Local Government Board will have to deal, is that of speed. My contention is that since "furious driving," and "driving to the public danger," apply to all light locomotives, whether bicycle, tricycle, carriage, or wagon, the police have complete power, in accordance with the Act, to control the traffic for the public safety. Consequently, when dealing with speed, only one other condition is required, which the new rules will probably, in some form, provide for. It is, that the speed of any vehicle, at any time, shall not be greater than that the brake may bring it to a standstill within a given distance, say 50 feet, which is about twice the length of a horse and carriage.

Conclusion.

I can only conclude by expressing the hope that all those engaged in trade will give motor traffic a fair chance—not by rushing into the subject as enthusiasts who spend money without regard to profits—but as business men who exercise their judgment, and prove by a true balance sheet, that motor traffic is the right thing in the interest of the community, adding not only to the prosperity of the manufacturing classes, but extending also a helping hand to the working population. (Loud applause.)

At the close of the address several questions were asked and answered, and a vote of thanks was passed to Sir David Salomons, on the motion of Mr. F. C. DANSON, seconded by Professor HELE-SHAW, and supported by Mr. W. J. STEWART.

On the following day Sir David Salomons left Liverpool for London. Prior to departing he paid a visit to the Town Hall, and was introduced to the Lord Mayor. The Earl of Derby expressed his regret that municipal engagements prevented his presence at the meeting of the Self-Propelled Traffic Association. Sir David Salomons afterwards visited the Overhead Railway and docks, and was accompanied by Colonel A. H. Holme, Professor Hele-Shaw, Messrs. S. B Cotterill, W. J. Stewart, and E. Shrapnell Smith. It may be mentioned that Mr. Lawrence Jones has been appointed solicitor to the Liverpool branch of the Association.

The proceedings throughout were most successful, and the reception accorded to Sir David Salomons was very cordial. Not content with the official luncheon, which we have reported.

some of the members entertained him to a quiet dinner at the Palatine Club, prior to the delivery of the address, and many necessary details of organisation were discussed and to some extent settled in this pleasant fashion.

The local branch intends to practically disseminate all the information it can amongst its members, and various papers will be read before them during the session of 1896-7. The first of these (illustrated by experiments) will be by Professor H. S. Hele-Shaw, M. Inst. C.E., &c., and will be delivered on Tuesday, December 1st.

All interested in Self-Propelled Traffic, who live within a convenient radius of Liverpool, should make it a point to join the branch, which bids fair to being a stalwart offspring of the parent Association.

NOTICE.

The Self-Propelled Traffic Association have decided that in future all communications to their members shall be conveyed to them through the columns of the Automotor and Horseless Vehicle Journal. *We have made arrangements to enable this to be carried out.*

MOTOR-CAR versus LIGHT RAILWAY.

At the annual general meeting of the Royal Scottish Society of Art held in Edinburgh, Professor Armstrong, who presided, referred to the passing of the Light Locomotive and Light Railways Acts. These in relation to the powers they respectively conferred could not well be otherwise than rivals in public estimation, and it would obviously depend upon the manner in which each was administered which of them would achieve the greatest popularity and success. The cars would do less damage to the roads than the present traffic, and, moreover, they would be able to run on the roads as they were. The motor-cars would be able to enter fields and farmyards, and run alongside the loading station and upon the quays, so that the farmer would be able, not only to deliver, but to receive his commodities direct and at first hand. He anticipated that in their day they were destined to witness a struggle for supremacy between the motor-car and the light railway, and whichever way the battle might turn, the outcome would be the same—the opening up of a new and extensive field for the exercise of that inborn mechanical genius and constructive skill which were the peculiar heritage of the British nation. (Applause.)

PROPOSED CYCLE SHOW FOR NOTTINGHAM.

It has now been decided by the members of the Nottingham Bicycle Club to hold a Cycle, Cycle Accessories, and Motor-Car Exhibition in Nottingham early in the new year, providing a suitable hall can be secured, a point which a sub-committee is at present investigating. The matter was thoroughly discussed at a meeting of the members of the N.B.C., several members connected with the trade expressing the opinion that the exhibition was bound to be a great success. An influential committee was appointed, with Mr. Ben Richards as hon. sec., and they are going into the scheme thoroughly. There is no doubt that the many local manufacturers who do not care to go to the expense of showing in London will warmly embrace the opportunity which the N.B.C. are placing before them, and that if a hall suitable for the purpose can be engaged the exhibition will be a great success.

MOTOR-CAR INSURANCE.

With business-like promptitude the National Cycle and Motor-Car Insurance Company has come forward to meet the danger which may arise from the use of motor vehicles, and is prepared to insure the owners against damage to person or property. The offices of the Company are situated at 33, King William Street, London, E.C., and, with the object of obtaining some information as to its work, we recently sought and obtained an interview with Mr. Edward Willson, its able secretary.

The task of organising an insurance company is an arduous one, involving, as it does, nearly as much work outside as it does in, and we were, therefore, not surprised to hear from Mr. Willson that he had recently visited the principal towns of England, Scotland, and Ireland, arranging branches of the

Mr. Edward Willson,
Secretary of the National Cycle and Motor-Car Insurance Company.

Company's business, inducting district officials, and interviewing agents, and contemplated a trip to Paris for the same purpose.

The difficulties in establishing a new insurance company are always very great, in consequence of the cost of initiating a successful opposition to the old-established and often conservative concerns which have the ear of the public; but the great possibilities which are in store for the automotor industry have been alluring to Mr. Willson from the first, and suggested to him that a Company established for the purpose of insuring this traffic on the lines upon which existing companies insured ordinary horsed traffic would, by making it a special feature, attract to itself a volume of business concurrently with the extended use of the new vehicles. The idea was not an easy one to carry out. There were those who derided the notion of the motor-car being for another decade anything more than a phantasm.

It became necessary, therefore, to expand the scheme so as to include all the ordinary branches of accident insurance. Hence the title of the Company, which was the ultimate outcome of his efforts, viz., the National Cycle and Motor-car Insurance Company. At this stage Mr. Willson entered into an alliance with Mr. James Jeffries, the *alter ego* of the undertaking, who occupies the position of the Company's manager. The title of the Company is certainly felicitous, but has a drawback in not sufficiently covering the various branches of the business, which also include insurance against personal accidents, sickness, ordinary traffic liabilities, employers' liability, burglary, plate glass, traction engines, sailing barges, and steam-tugs.

Naturally a new comer in the insurance world has difficulties to encounter, but the Company, by a judicious selection of its officials, has made great headway, assisted as they have been by a board of directors constituted as follows:—Colonel C. W. Wilson, D.L., J.P. (chairman, the Brewers and General Fire Insurance and Guarantee Corporation, Limited); Mr. Clement A. Ravenscroft (director, Birkbeck Bank); Mr. David F. Carmichael (director, the Madras Railway Company); Sir Edward Lee; Mr. C. H. Tindal, director, Walkers, Parker, and Co.; and Mr. Sidney Lee (editor *Cycle Trade Journal*, and director of the Dunlop-Truffeult Company).

The board is composed of business men, who, in dealing with claims, have adopted a broad and liberal policy which can alone ultimately succeed in insurance matters. They avoid legal quibbles, and construe their liabilities to their clients in a generous spirit.

The National Cycle and Motor-Car Insurance Company will exhibit, on the 20th instant, at the Stanley Show, at the Agricultural Hall, and on the 4th December, at the National Show at the Crystal Palace, their stand numbers being 6 and 117 respectively. It may be mentioned that they have secured a large amount of the insurance work amongst the exhibitors at both establishments.

BRISTOL ENGINEERS AND MOTOR-CARRIAGES.

THE first meeting this session of the Bristol Association of Engineers was held on Saturday evening, the 24th ult., at the Queen's Hotel, Clifton, the President, Mr. John M. McCurrich, in the chair. There were present: Messrs. J. R. Bennett, H. A. Chattock, F. J. De Soyres, C. Cooper, W. Fiddes, J. H. Fiddes, T. J. Moss Flower, R. Fenton, G. E. Ford, G. Garrard, D. L. Harris, J. W. J. Harvey, F. W. Hudson, H. J. Jacques, A. W. Metcalfe, T. Morgans, J. A. McPherson, P. Munro, A. Peckett, T. L. Perkins, H. C. Parkinson, E. M. Rees, J. Ryan, W. Stagg, D. Stuart, W. Thomson, N. Watts, T. H. Yabbicom; visitors, Messrs. Morgan and Brownlow.

The PRESIDENT having thanked the members of the Association for the honour they had done him in electing him their President, and the ordinary business of the meeting having been completed, he called upon

Dr. J. RYAN to read his paper upon "Motor-cars." Commencing with the early history of the subject, the speaker referred to the steam-carriages of Cugnot, of Symington, and of Trevethick. He dwelt upon the very considerable progress that was made with steam omnibuses and coaches in the early part of the century by James, Gurney, Dance, and Hancock, as well as Maceroni and Squire, Hill, and others. The era of the traction and agricultural engine was next dealt with. The modern aspect of the question and the recent developments in motor-cars were finally treated and illustrated with numerous views. The results and lessons of the various French competitions were discussed. Paris-Rouen, 1894; Paris-Bordeaux, 1895; Paris-Marseilles, 1896; and the Chicago competitions of 1895 were considered. The paper was illustrated throughout by interesting oxy-hydrogen views.

An interesting discussion took place on the conclusion of the paper, and the meeting was brought to a close by the President proposing a vote of thanks to Dr. Ryan for his interesting paper.

CORRESPONDENCE.

*** *We do not hold ourselves responsible for opinions expressed by our Correspondents.*

*** *The name and address of the writer (not necessarily for publication)* MUST *in all cases accompany letters intended for insertion, or containing queries.*

A MEMBER OF PARLIAMENT ON AUTOMOTORS.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

SIR,—The AUTOMOTOR has made a brilliant *début*. The editor, publisher, and everyone connected with it deserves the thanks and appreciation of the public for the very excellent publication they have so successfully started. The far reaching and enormous issues connected with, and incidental to, the introduction of horseless carriages, it is impossible to estimate. The historian of the future will look back upon November 14th, 1896, as an epoch to be marked for all time as one that effected one of the most revolutionary, yet at the same time useful, changes of a very changing century.

Foremost among the few who called the attention of our Parliament to the startling and novel mode of travelling, the Right Hon. Shaw-Lefevre takes first place. Sir David Salomons, outside Parliament, both here and in France, has done giant's work in popularising this most modern mode of moving from place to place. Perhaps you will kindly allow me to take an humble share with my worthy colleagues in my just claim to be the first person who in this present House of Commons had the honour of bringing the matter of motor-cars before the notice of the House, and directing Mr. Chaplin's attention to it, who at once gave it his most cordial support, and with the able assistance of his Under-Secretary, Mr. T. W. Russell, brought the Bill to a most triumphant issue, and pushed it through all its stages in the Commons and the Lords in a remarkably short time on August 14th last, when it had the Royal Assent. The general good sense of both Houses seemed to give an almost unanimous approval of the principle of the Bill, and sent forth this British-born bantling of foreign parentage, bred from an iron race of strong giants, to run on roads without rails—hither, thither, and everywhere—not merely from John o'Groats to Land's End, but, if necessary, from Chester to Calcutta, or Manchester to Moscow, when carried across the Channel.

The recent races held in France from Paris to Bordeaux, and Paris to Marseilles and back, the latter being held under most unexampled difficulties of storm and tempest, have uncontestably proved to a critical and yet appreciative public what enormous strides have been made in mechanical locomotion by these most modern discoveries of a century that first heard the screech of a railway whistle in our land, and gave birth to the wonders of electricity in motion, speed, sound, sight, and light, as instanced in the miracles of the electrophone, microphone, and kinetoscope, &c. When we think with what marvellous speed these wonders have been developed within the last few years, what great expectations may we not anticipate in the near future! Looking back but a very few years we compare Stephenson's "Rocket" with our latest 90 miles an hour express steam-engine—we compare the old "bone-shaker" of 20 or 30 years ago with the sylph-like "safety" of to-day. All this tends to indicate, but faintly, what great advancement the engineering instinct and inventive genius of our people is bound to achieve in a very short time from the present small and crude beginning of the best even of our present motor-cars. Go on, great giant of genius—go on your great career till this old century of cycles dies of old age to renew its youth in the ever-increasing progress of science through succeeding generations of centuries till "time is no more."

I am, Sir,
Your obedient servant and well-wisher,
Carlton Club, London. CUMMING MACDONA.

REPORTED ACCIDENT TO SIR DAVID SALOMONS.

To the Editor of The Automotor and Horseless Vehicle Journal.

Sir,—The following is a copy of a letter I have sent to a contemporary for publication. Will you oblige me by also inserting it in your columns?

"My attention has just been called to a note in a prominent part of your issue stating that there is a 'rumour' that I have met with an accident in a Serpollet steam-carriage. Since I have not one in my possession, it is clear that such a rumour is unfounded, and I take the opportunity to contradict it, because it might injure the prospects of what is probably one of the best and cheapest motor-carriages of the day."

I would point out that the editor of your contemporary is a director of the Daimler Motor Company, and therefore leave my readers to form their own conclusions as to the reason of inserting such a note, when it is remembered that he might have inquired of me by letter or telegram as to the truth of the report.

Yours very faithfully,
David Salomons.

Broomhill, Tunbridge Wells,
November 7th, 1896.

AUTOMOTOR FIRE ENGINES.

To the Editor of The Automotor and Horseless Vehicle Journal.

Sir,—The new Act should be of service in introducing a new method of propelling steam fire engines. Although few complaints can ever be made against the Fire Brigade for not being prompt at fire calls, yet there is a certain amount of delay in getting the horses from the stables, and then attaching them to the fire engines; and all this hindrance will be avoided if the engines are to be worked by the new motor power, for as soon as an alarm is given the engines can dash out of the station, and be at the scene of the fire in a very short time. The use of motor power instead of horse power to the engines will also be very advantageous in twisting in and out the traffic, and bringing the engines to a standstill much quicker than heretofore, and with very much less exertion, and it is perfectly clear that the expense will be materially reduced. It would be a happy idea if the Fire Brigade could manœuvre some scheme so as to do away with that shouting, or, perhaps more correct, yelling, when a fire engine is going to a fire. I should think that a steam whistle, a bell, or some kind of horn would be a more appropriate instrument for clearing the road. I suppose, however, we must await events.—I am, yours sincerely, Watling Street.

THE OPPOSITION TO MOTOR-CARS.

To the Editor of The Automotor and Horseless Vehicle Journal.

Sir,—The report of the meeting of the Warwickshire County Council and the speeches made by some of the members, if not very edifying, are at any rate somewhat amusing to read at the end of the nineteenth century, and would almost lead us to believe that we were living a couple of hundred years back, when, if anyone had been caught riding on a conveyance without any apparent motive power, he would probably have been burnt at the stake as being a magician. Alderman Flavel was very strong indeed in his denunciation of motor-cars, and gave it as his belief that they were "diabolical machines." Lord Willoughby de Broke, of course, was also very energetic in his wrath at the introduction of "these things" into an agricultural district, where no one has any right to be considered but landlords and farmers. It is an extraordinary thing that these people cannot see the necessity that exists for advancing with the times, and taking advantage of every new scientific discovery which tends to benefit the people generally.—I am, &c., Go Ahead.

OLD-TIME STEAM COACHES.

To the Editor of The Automotor and Horseless Vehicle Journal.

Sir,—By the enclosed extract you will see that in the year 1832 an attempt was made to introduce steam vehicles for the roads, and the first trip was to Birmingham. I hope that now the idea has been started again of introducing "motor-cars," it may be successful, and may be productive of good. Surely, omnibus and tram drivers and conductors, together with horses, will hail the day with joy when those who now go to church, chapel, Sunday lectures, and for pleasure, in public conveyances, will have their own vehicles, and leave the overworked a Sunday free from labour.—I am, &c., Antiquary.

[Extract from *Ladies' Magazine*, November, 1832.]

"Steam Coaches.—From Liverpool we learn that the steam coach of Messrs. Ogle and Summers, which has lately been making a trip to Birmingham, entered the former town on Monday, amidst the acclamations of a crowded populace. Among the party brought by her were the Messrs. Brotherton, the late extensive coach proprietors between that place and Manchester. Thus has been accomplished by steam power, on our common roads, a journey from Southampton, through Oxford and Birmingham, to Liverpool, over as irregular a surface of country as perhaps could have been selected for the purpose of the experiment. The objects sought, and of which there is a proof of accomplishment by these gentlemen, are, in the first place, a safe method of generating steam, in convenient space, in sufficient quantity to enable them at all times to propel vehicles on common roads, at any desired speed, and with such command of power as will overcome increased resistance from occasional obstacles, fresh gravelled, soft, or hilly roads. Secondly, the safe application of this power to vehicles of such construction, as will ensure action and progress on any description of ground, and, nevertheless, be under the immediate control and certain guidance of the conductor."

MOTOR-CAR SPEEDS.

To the Editor of The Automotor and Horseless Vehicle Journal.

Sir,—It seems to me that the authorities would be unwise in going outside the Government regulations to place a limit on the speed of automobiles. By so doing there is, on the one hand, the risk of giving the reckless an excuse for too fast driving, inasmuch as they would urge that they were not exceeding the authorised speed; on the other hand, there might and would occur, on roads where there was plenty of room and but little traffic, the absurdity of fast-driven horses passing an automobile which was proceeding at the reduced rate laid down by the local authority. In any case, an automobile is easier and more speedily controlled and stopped than a horse. Surely the wiser plan would be to leave automobile drivers to accommodate their speed to that of other traffic, and to proceed under the same responsibilities and risks as the drivers of all other vehicles, whether they be in charge of cycles, vans, carriages, omnibuses, &c.—Faithfully yours, Miles.

November 4th, 1896.

"What shall we call our motor-cars when we get them?" asks a correspondent. "We call our bicycles 'bikes.' On the same principle we might call our motor-cars 'mokes.' Imagine the delight of being requested by a charming young lady to 'stop that moke' for her. Mocar is not bad, but it sounds too much like 'Go-car.' I have a final suggestion to make, and I offer it to 'The Great Horseless Carriage Company, Limited,' free, gratis, and for nothing. Why should they not alter the name of their Company into the London General Pluribus Company, Limited? Their conveyance could be called a plus to distinguish it from bus."

REVIEWS OF BOOKS.

"Motor Carriages: The Vehicles of the Future." By "VAGABOND," the Cycling Editor of the *Newcastle Daily Chronicle*. (London: Messrs. Walter Scott, Limited.) Price 6*d*.

THIS is a reprint of a series of well written and carefully compiled articles which appeared in our Northern contemporary at the end of last year. The author, who wields a graceful pen, has put together some old facts in a manner which renders them easy of refereuce, and the little book is in every way worthy of perusal by all iuterested in the subject. Doubtless in view of the great impetus which the events of the past few months have given to automotor work, the publishers will make it the basis of a more ambitious volume in the near future.

"The Principles of the Transformer." By FREDERICK BEDELL, Ph.D. (London: Macmillan and Co., Limited.)

THE author of this work, from his position as assistant professor of physics at Cornell University, aud his deservedly high reputation in the mathematical field of electric science, is entitled to speak with authority on the abstruse and somewhat complicated problems involved in the construction of transformers. The growth of this particular branch of electrical research has been rapid. Ten years ago, the idea of generating a current of high tension and low quantity, and then transforming it into a current of comparatively low voltage and high ampèreage had hardly been thought of, but in the bare decade which has elapsed, the dream of the student has become the commonplace of the manufacturer. Only those who are intimately acquainted with the subject cau attempt to estimate the great practical economies in distribution of current which have been rendered possible by the transformer, aud the most expert cannot venture to prophesy as to its future value in electric lighting and the transmission of power. In the time which has elapsed since the initiation of the subject to the present day much valuable information and literary matter has been contributed in a scattered way to the learned societies and to technical papers. To gather all this into oue book, and to formulate a definite and intelligible scheme out of the multifarious and often contradictory material at hand, was not an easy task, but the author has entirely succeeded. To the student and to the practical maker of transformers the work will be invaluable.

"The Inventor's Adviser on Patents, Designs, aud Trade Marks." By REGINALD HADDAN. (London: Harrison and Sons.) Price 3*s*. 6*d*.

ALL who desire a reliable, concise, and cheap guide to the patent laws and customs of the world, should obtain this book. It is alike useful to the inventor, the manufacturer, and the commercial man who desires to invest in patents. The favour with which it has been received ou all hands is testified to by the issue of this—the third edition. The author treats in comprehensive and clear language of the English patent laws and rules, cases being cited to enforce the points laid down; while, in the latter portion of the book, the laws aud customs of all foreign countries are given, great care having been bestowed in making necessary alterations up to date. Another valuable feature of the work is contained in the chapters devoted to the commercial valuation of a patent; under this comprehensive heading, the questions connected with the sale, purchase, and licensing of a patent are fully discussed, and a basis is laid down which cannot fail to be of use to those who wish to deal in patents, but are too often prevented from doing so by the wide diversity which usually prevails between two interested parties in their attempts to establish the present value of a share in a probably untried patent. The work is well got up, and, with 440 pages of technical matter of this description, it is marvellously cheap.

"Notes on Motor Carriages." By J. H. KNIGHT. (London: Messrs. Hazell, Watson, and Viney.)

THE author of this little book is well kuown for the lengthened interest which he has taken in motor carriages on common roads. He is, therefore, fully competent to write a handbook which may be of service to those who take up the matter for the first time, while some of his hints will be useful to users of these vehicles. He discourses pleasantly aud correctly enough upou the historical portion of his subject. The chapter on oil and other engines—while purely elementary—will be a means of introducing the subject to those who approach it for the first time. The weakest chapter in the book is that devoted to electricity. It is so fragmentary in its character as to be useless iu its present form. Should another edition be issued, it would be better to omit it altogether, unless it is re-written in a much more comprehensive manner. The chapters relating to the French and American motor-car contests will be found useful for reference, as will also a brief but reliable list of books and articles, which may be consulted by those who wish to go deeper iuto the matter. The illustrations are sufficient for the purposes of the text, and the work may be safely recommended to the amateur.

THE *Leisure Hour* for October has a very readable article, with a reproduction of a quaint old print, on Mr. Goldsworth Gurney's steam carriage.

WE are in receipt of the report of the Institute of British Carriage Manufacturers, edited by Mr. Andrew Barr; it contains much interesting matter on carriages, and may be consulted with advantage by all interested in the allied automobile industry.

THE *Cosmopolitan* for October gives an illustrated account of the result of the competition for motor-cars which they recently organised, the prizes which they offered being 3,000 dollars. It is worthy of note that the prizes were awarded on the following points, the maximum being 100:—

Speed	35
Simplicity of construction and durability	30
Ease iu operating and safety	25
Cost	10

These, without being by any means ideal conditions, are considerably more satisfactory than any mere speed test.

THE *Referee* has devoted much space to the automotor question. The inimitable "Dagonet" has discoursed in his pleasant fashion of the dangers and changes which will follow in the wake of the new vehicle. Now the writer of "Our Handbook" has taken the matter in hand, and with that all-round mechanical and scientific knowledge which enables him to write sound aud intelligible matter upon almost any conceivable subject, has imparted much good advice to the makers and users of the new carriages. Whatever other fate may await the automobile world, the public Press of this country are determined that it shall not die of neglect.

MESSRS. REEVES and TURNER, of Chancery Lane, will publish immediately a book on the "Law of the Motor-Car," by Mr. E. Grimwood Mears, Barrister-at-Law. The work contains an introductory chapter giving *inter alia* an account of the motor-cycle invented in 1881 by Sir Thomas Parkyns, and the subsequent litigation. A full text of the Act is given with explanatory notes, and the Petroleum Acts and the general law relating to carriages are therein embodied, together with the partially repealed enactments. There is an important chapter on Negligence and Contributory Negligence, in which the rights and liabilities of persons in collision cases are carefully defined. Space is devoted to Employers' Liability, to Nuisance Obstruction, and kindred topics. A review will appear in our next issue.

LUTZMANN MOTOR-CARRIAGES.

We have the pleasure of giving an illustration of the Lutzmann Patent Motor-Van which has been imported by Messrs. Julius Harvey and Co., of 11, Queen Victoria Street, E.C., for Messrs. Lever Brothers, Limited, of

Sunlight Soap fame. We have ourselves inspected this van and find the motor is very powerful and strongly made, in fact the van throughout is a first-class piece of workmanship, and is likely to prove a most serviceable vehicle for all trade purposes. Messrs. Harvey have wisely had the final painting and lettering done in London by Messrs. Mulliner, of 28, Brook Street, W., who have a high reputation for carriages of every description, and

Messrs. Harvey's van is certainly one of the best finished motor vehicles we have yet seen. In addition to the van, Messrs. Harvey were able to show us a Lutzmann motor-carriage, which is extremely elegant in design and well got up in every respect. We also illustrate this carriage, which, with the van, took part in the run from London to Brighton.

BUSINESS NOTES.

We have received from Messrs. Julius Harvey and Co., of 11, Queen Victoria Street, London, an extremely well got up catalogue of motor-carriages—some of the best types of Continental makes being illustrated. A reprint of the Locomotives on Highways Act, 1896, is added for the convenience of users. The motto of the firm is very apt, Shakespeare, as is usual in all difficult cases, being the source of the quotation, which runs: "And here an engine fit for my proceeding." Messrs. Harvey and Co. are to be congratulated on their enterprise, as one of the first pioneers in this new field.

Mr. J. H. Paterson has been appointed manager of the Caledonian Motor-Car and Cycle Company, Limited, his business address being 265, Union Street, Aberdeen.

Messrs. T. B. Barker and Co., of Schofield Street, Birmingham, write to a local paper which stated that it was unable to ascertain that any motor-carriages were being made in the district, as follows:—"Allow us to say that the motor-car, of which we send a large photograph for your inspection, was made on our premises here, and that it has, during the last three months, travelled some hundreds of miles through the streets and suburbs of this city, carrying from one to seven passengers; its normal complement, as you will see by the photograph, being five passengers. We thought it would be of interest to you to know that Birmingham is, as usual, abreast of, if not ahead of, other centres in this new industry. The motor is a petroleum engine with electrical ignition."

The silver medal of the Highland and Agricultural Society has been awarded to the Daimler Motor Company for their exhibit at Perth.

PRIZES FOR MOTOR-CAR DESIGNS.

The expectation of the motor-car is obviously abroad in the land, for the Worshipful Company of Coachmakers and Coach-harness Makers of London is offering, in its next series of prizes, a competition, open to British subjects generally, for designs of a self-propelled light-motor pleasure carriage, to convey two or more persons. The first prize will be the Company's silver medal and £20, and the second the Company's bronze medal and £10, given by its Master (Colonel John William Lee); while the copyright of any new design for which a prize is awarded will remain the property of the winner. The other competitions are restricted to British subjects engaged in the trade of coach-making, and resident in the United Kingdom, and they embrace working drawings for a single brougham, a single-horse Stanhope phaeton, and other kinds of carriages; these having to be delivered before April 30th of next year. Previous competitions of the kind have resulted in some original designs, and much, therefore, is hoped from the present one.

A scheme of considerable magnitude is in contemplation, having for its object the connection of Southport and Lytham by means of an electric tramway. It involves the formation of an entirely new carriage drive 30 feet in width, which will run parallel with the tram lines. Ultimately it is desired to continue the tramway to Blackpool.

THE BOLLÉE TRICYCLE.

Fig. 1.

Herewith we give three illustrations of this machine, which, since its performance in the Paris-Mantes contest, has been a theme of much discussion in automotor circles.

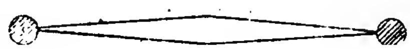
Fig. 1 is a photograph of the actual tricycle.

Fig. 2.—A front elevation, partly in section.

Fig. 3.—A plan of steering details.

Owing to the great pressure on our space we reserve a detailed description of the various parts, but the drawings will doubtless give all the requisite information. The owners of the patents in this country are the British Motor Company (Limited).

Fig. 3.



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NOTICES.

Contributions and articles likely to prove of interest to our readers will receive due attention, but in all cases the name and address of the writer must be given, not necessarily for publication.

All matter intended for publication should reach us not later than the 10th of each month. Stamped envelope must be sent if the manuscript is required to be returned.

All Advertisements should be sent to the Advertising Department. F. KING AND CO., LIMITED, 62, *St. Martin's Lane, London, W.C., where Advertising Rates may be had on application.*

The Annual Subscription is 7s., including prepaid postage to any part of the world.

Cheques and Post Office Orders should be made payable to F. KING AND CO., LIMITED, *and crossed London and County Bank; otherwise no responsibility will be accepted.*

THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL *can be obtained through* MESSRS. W. H. SMITH AND SON, *at* WILLING AND CO.'s *bookstalls, and wholesale of* MESSRS. HORACE MARSHALL AND SONS, *Temple House, Temple Avenue, London.*

When any difficulty is experienced in procuring the Journal from local newsvendors, intending subscribers can obtain each issue direct from the Publishing Office, by filling up and forwarding, with remittance, the Subscription Form accompanying the Paper.

The Automotor and Horseless Vehicle Journal.

A RECORD AND REVIEW OF APPLIED AUTOMATIC LOCOMOTION.

NOVEMBER 17TH, 1896.

THE NEW REGULATIONS AS TO MOTOR-CARRIAGES.

IN drafting the regulations under the Locomotives on Highways Act, 1896, we have to thank the Local Government Board for having tried to do its best in the interests of the new-comer on the streets. In the original circular which they sent out to the Local Authorities they shadowed out the following as the chief points to be insisted upon :—

A motor-carriage to come within the protection of the Act of last Session must not weigh more than 3 tons unladen; and must not be used for the purpose of drawing more than one other vehicle, such vehicle and locomotive not to exceed an unladen weight of 4 tons.

A motor-carriage must be constructed in such a manner that no smoke or visible vapour is emitted, except under temporary or exceptional circumstances.

If a motor-carriage exceeds 336 lbs. in weight unladen, it shall be capable of working either backwards or forwards.

No motor-carriage must exceed a width of 7½ feet between its extreme projecting points. (*Now amended to 6½ feet.*)

The tyres must be proportioned as follows :—

Between ¾ ton and 1 ton,	not less than 2½	inches wide.
„ 1 ton „ 2 tons,	„ 3	„
„ 2 tons „ 3 tons,	„ 4	„

No bosses or projections will be allowed, except in the case of pneumatic tyres, when the projections must be of the same material as the tyres.

Every motor-carriage must be provided with two independent brakes of such a power that when the carriage is travelling at the rate of 14 miles an hour, the carriage can be stopped within a distance of 50 feet.

The name and address of the owner must be painted on the side of the vehicle.

The driver must be competent.

Lamps must be carried at night.

The driver must give notice of his position to the public by sounding a bell or by other sufficient signal.

The vehicle must be brought to a standstill at the request of the driver of a restive horse or at the demand of any police constable. The putting up of a hand shall be a sufficient signal to bring this order into operation.

The maximum speed allowed is 14 miles per hour. (*Amended.*)

The various County Councils have mainly fallen foul of the speed allowed, altogether forgetting that it would have been a maximum rate, and was safeguarded by the brake power insisted upon, while both drivers and owners are, of course, subject to the Common Law of the land. The consequence has been that a minimum of 12 miles an hour for the lightest vehicles, diminishing down to six miles for the heaviest types, has been insisted upon. This will doubtless satisfy the critics who imagined that a three-ton vehicle, driven by an incompetent amateur, who had never before seen a piece of mechanism, would be permitted to run amuck in a crowded thoroughfare at the greatest legal speed permitted originally by the Act. The regulation as drawn is almost prohibitive to motor omnibuses, and will doubtless be amended at the earliest opportunity.

The chief point, however, is that the Local Government Board have done wisely in restricting the new rules to an operative period of six months. No great harm can be done in the interregnum by the small difficulties which have been thrown in the path of the owners and makers of the vehicles by the deviations which have been made from the original intentions of the Central Board. In the meantime, the drivers must show, by their consideration for the public interest, that restrictions are not justified. What is reckless and unlawful on the part of the owner of a vehicle drawn by a horse should be the test applied to the conduct of the driver of a motor-carriage, and if an owner employs bad workmen or purchases inferior vehicles as propelling power, the punishment which will ensue will soon act as the most effectual deterrent.

We have dealt at length only with the question of speed, because we believe that the experiences of the next few months will demonstrate more fully the inutility of the present regulations than reams of argument could at the present moment. One final remark and we have done. The regulations provide a scheme for the compulsory display of lamps by the horseless vehicles, and the sooner this is applied to the whole of the carriage traffic the safer will our streets become.

LIVERPOOL TO THE FORE.

FOLLOWING the admirable example set by Glasgow, a local branch of the Self-Propelled Traffic Association has been instituted in the great seaport which may be said to be the connecting link between Great Britain and the United States. The Western city, which has commenced so well with a president of the standing of Lord Derby, and with such an influential backing of celebrities as those which assembled to listen to and applaud the interesting address delivered to them by Sir David Salomons, cannot fail to help to mould the future of the great industry which dates its new birth from the 14th of the month.

In the course of his remarks, Sir David said much that was of invaluable use at the present stage of matters—he has had unique opportunities of testing the vehicles which our French friends have constructed, and from his independent and fortunate position can freely express his opinions. His views on the present position of the various motive powers will therefore be read with the keen interest which they deserve—for he has the courage of his convictions, and an adequate technical training and knowledge to back up his opinions when they are questioned.

One item in his address strikes us as capable of much modification. He is doubtless correct when he states that the main principles of explosive engines are well known; but we cannot follow him in his seeming depreciation of the value of patents in automotor work. Doubtless many of the so-called inventions which have been introduced are valueless; but before a motor-carriage free from vibration and using an engine propelled by a safe and heavy oil has been perfected, much inventive skill will be necessary—especially if other essential points, such as ease of management and economy, are to be secured. In such a case the labourer will be worthy of his hire, and will receive it ungrudgingly from all interested in the subject.

This, however, is only incidental to the congratulations which may be addressed to the new branch. By adopting the principle of an extended course of lectures on all subjects of interest to the users of automotors, the Liverpool Society is doing well—for discussion and a liberal interchange of enlightened views must benefit the users and makers of the new carriages.

WANTED—A WORD.

In a considerable portion of the bulky correspondence which has come to hand as a consequence of the first issue of this Journal, complaint has, *inter alia*, been made that none of the terms hitherto employed neatly describe the vehicles which come within the provisions of the Locomotives on Highways Act, 1896. On one point at least all our friends are united, viz., that the Parliamentary phraseology is not worth imitation, while in the many suggestions which have been made we have not yet received, at least in our opinion, a better word than Automotor. It is convenient to remember, does not outrageously violate scientific principles, and does not jar on a sensitive ear as does the word "bike," which we hear so often in a kindred trade.

The fact is that we want a coined phrase which must be apt and yet not too flippant—"horseless vehicle" and "self-propelled carriage" are too lengthy and not distinctive or exact enough—so, for the moment at least, we must be content to accept a compromise between those who would frame a word built on German chemistry lines, having some forty letters in it describing in brief all the complex operations which are required to propel a carriage by power, and the Ishmaels of philology who would be simply content to dub the new carriages as "mo-cars."

We have, as we have stated, received many views on this interesting subject, but as they occur, in the main, in the course of private congratulory letters to the Editor, we have not published them, not caring to do so without the express permission of the writers. The matter, however, is well worthy of ventilation, and we invite correspondence upon it. We can hardly offer a prize for the best title, because the public will ultimately judge what word shall be the survival of the fittest; but the correspondent who succeeds in hitting upon the term which the "man in the street" will adopt, will have at least the satisfaction of adding another word to the thousands which haunt our end-of-the-century dictionaries.

"ENGINEERING" AND AUTOMOTORS.

We have received several letters from correspondents complaining of the apparently hostile attitude taken up by *Engineering* against the self-propelled vehicle. Most of these communications are of a private nature, while those sent for publication did not—either through inexperience in the use of the pen for journalistic purposes, or in consequence of the writer's wrath—treat our able contemporary with the courtesy which is due to its high standing as a trade journal.

We think that *Engineering* has altogether failed to grasp the position taken up by those who are seeking to introduce the new industry into the country. No one—least of all the owners and makers of the machinery—wishes to place vehicles of from one to three tons in charge of incompetent men to drive through crowded streets at the rate of some 14 miles an hour, with the certain result of dealing out death and destruction all round. This is the fear which seems to haunt our usually level-headed contemporary; but every interest is opposed to the adoption of any such idiotic and suicidal tactics. The keynote of the advice given by all concerned in automotor work is to go slowly at first; to avoid the slightest suspicion of fear at any cost; and to win public support by accomplished facts of safety and convenience. If we attempted to traverse some of the comments of

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Engineering our remarks might be discounted, as emanating from a newspaper identified with this particular industry, so we prefer to quote from an article which appears in an independent journal—the *County Council Times*—some remarks with which we cordially agree. They are as follows:—

"The motor-car is not to be made as useful as it should be just yet, for there are evidently still many old and foolish prejudices to be broken down. There is an idea in some quarters that the object of the inventors of motor-cars has been solely to produce a machine which shall personate the 'raging lion' on every road in the country, and shall seek not only whom, but what it may devour. The motor-car is not a dangerous machine, any more than an ordinary carriage and pair is dangerous; and on country roads, where it will be most frequently met with, it will be far less dangerous than a horse-drawn vehicle, which travels faster there than in a city. The motor-car, from the fact of its being machine-driven, is better under the control of its driver than a horse-drawn vehicle can possibly be, and both the steering and the brake-power are so much more perfect that danger is greatly reduced by them. Nevertheless, although the man with the red flag will cease to be necessary at the end of next week, the speed at which motor-cars are to be allowed to travel is being ridiculously restricted. The Local Government Board thinks that 10 miles an hour is a more suitable speed than 14 miles; and some people prefer 8 miles to 10. But, since 10 miles an hour will probably be the limit imposed, let us consider what that means. The mail-coaches which still leave London at night for Guildford and Brighton travel, when they get out of the suburbs, quite 14 miles an hour. The coaches which run during the season are not much slower. An ordinary carriage and pair travels more than 10 miles an hour; and a cyclist is never 'hauled up' for furious riding unless he is going at a rate of 15 or 16 miles per hour. In Warwickshire the Council has declined to sanction a higher speed than 10 miles an hour for what one member, Mr. Flavel, calls these 'diabolical' machines. But even in Warwickshire opinions are divided, for another member, Mr. Vero, means to try a motor-car and 'go as hard as ever he can'; so perhaps we shall have an agitation for greater freedom when the cars become better knowo."

In all friendliness we would ask the editor of *Engineering* to look a little more kindly towards the new industry, the legal birth of which only dates from the 14th of the present month.

Forthcoming Exhibition.—One of the special attractions next year to mark the sixtieth year of her Majesty's reign will be an electrical and engineering exhibition to be held at Newcastle on-Tyne. There being no permanent building in that city adapted for showing heavy machinery and machinery in motion, a site on Pandon Dene has been secured, on which special temporary buildings will be erected, and will be so arranged as to meet the requirements of the exhibits referred to. It is intended to be strictly an exhibition, and in no way an organisation for the sale of goods. Exhibitors, however, will be allowed to book or take orders for the various specialities. What are known as bazaar goods will be absolutely excluded from the exhibition. The importance of Newcastle as an electrical and general engineering centre will naturally create special interest in an exhibition of the articles described. It is intended to make a special feature of cars and cycles propelled by electric or other motor power. Exhibitors in these lines will find it to their advantage to be adequately represented at the exhibition. Mr. H. Engel has the matter in hand, and intends making substantial provision out of the proceeds for the Royal Infirmary, which will take the form of "a donation from the exhibition to the new building fund."

THE BRITANNIA COMPANY'S ELECTRIC SYSTEM.

We herewith illustrate a couple of carriages fitted with motors on the well-known Britannia electric system, the rights of which in this country have been purchased by the British Motor Syndicate. One great feature of this motor is the ease with which it can be adapted to existing carriages in case the owner desires to substitute motive power for the horse. The photograph of a Victoria is taken from a carriage which was taken out of the ordinary stock of a coachbuilder, and converted into a motor-carriage by the addition of a box under the seat to hold the battery, the Britannia motor and axle being substituted for the ordinary axle box, and these, with the addition of a simple and effective form of steering gear, being all that was required for the conversion. The dog-cart was altered in an equally simple manner, the battery in this case being placed at the driver's feet. The carriages are extremely smooth and easy in running, and are very fast; the amount of power provided and the general efficiency of the motor renders them capable of attaining a good speed on gradients. Mr. J. Vaughan-Sherrin is the inventor of the motor. Both of these vehicles took part in the procession to Brighton.

THE MOTOR-CAR IN THE LORD MAYOR'S SHOW.

PERHAPS the most striking feature in the Lord Mayor's Show, on the 9th, was the appearance of the motor-car. It was certainly the item which was received with the greatest amount of cheering in such crowded thoroughfares as Moorgate Street, Cheapside, Fleet Street, and the Strand. The past and the present were admirably and pictorially contrasted. Immediately preceding the horseless carriage, moving with grace and freedom, and adapting itself, under the alternate steering of Mr. Henry J. Lawson and Mr. Charles McRobie Turrell, to all the exigencies of the narrow lane through the closely-packed and swaying crowds in the thoroughfares, and to the frequent halts and irregular pace of the snake-like procession, was the ancient stage coach, with passengers in the picturesque costumes of the last century, and the quaint guard, armed against highwaymen with a huge blunderbus. The motor-car was dubbed "New Times," and there could be no question of its "up-to-date" type. The property of Mr. Henry J. Lawson, its dexterous driver, the "New Times" (which we illustrate herewith) is to outward appearance an elegantly-modelled enlarged landau, capable of holding four inside (which is beautifully upholstered in dark-green cloth and leather) and two in front. On the right of the front seat is the steering-wheel, more easily manipulated than horses' reins, to which the car is more instantly obedient than ever horses could be under the guidance of the most expert whip. The driving power is petroleum, and the propelling engine, the Daimler motor, which is stowed away behind and beneath the body of the car, so as to be hardly noticeable. Vibration has been reduced to a minimum, and the rattle and whirr of the gearing has been obviated by the employment of leather belting, instead of cogs, on the driving wheels. All the wheels are also furnished with rubber tyres. The car, which, by the way, had as an inside passenger a representative of the *Daily Telegraph*, moved with great ease and silence, and the success of this official introduction of the "New Times" carriage to the streets of the Metropolis was beyond question.

"NEW TIMES" MOTOR-CAR.

LONDON TRAMWAYS PURCHASE.

Electric or Mechanical Haulage Considered.

NOTHING has been heard for some time of the scheme for the transfer of the Metropolitan tramway systems to the County Council. When the question was last discussed by the Council, the offer of a syndicate to lease from the Council, after that body had purchased them, the undertakings of the North Metropolitan and the London Street Tramways Companies was rejected. Since then the Highways Committee have had several schemes under consideration, and the result of their investigations is contained in a voluminous report. The committee have come to the conclusion that an arrangement should be made with the companies mentioned for the purchase by the Council of their lines and depôts, and for leasing them to the North Metropolitan Company for a comparatively short time.

The proposal is that the companies shall sell their tramways to the Council at £10,000 per mile for double and £5,000 per mile for single lines. Without entering into details of the two systems, it may be stated that, at this rate, the purchase-money for $43\frac{1}{2}$ miles of double lines—single lines included as half the length of double—will amount to about £437,000. To this sum, however, must be added £101,798 paid for about five miles of the London Street Company's undertaking already purchased by the Council and leased to that company. This brings the total capital expenditure up to about £540,000. The Council will receive £45,000 fixed rent, which is equal to $8\frac{1}{2}$ per cent. per annum on the capital outlay, and which will be further augmented by the rent of freehold and leasehold buildings, and 5 per cent. of the increase of the gross receipts over those of 1895. This, moreover, leaves out of account any profit that may be made from new extensions or connections. At the expiration of the lease to the company, in 1910, the Council will, it is estimated, have received by way of fixed rent and percentage of receipts a sum of £903,630, of which £187,854 will have been applied to the reduction of debt, £251,869 to payment of interest on loan, and £463,907 in relief of rates. The relief to rates during the first year will be £25,875, after payment of £32,295 for interest and repayment of capital, which the committee consider "an exceedingly good return on the capital invested by the Council."

In addition to preparing this scheme for the transfer of the tramway systems, the Highways Committee have discussed the advisability of adopting some system of electrical or other mechanical haulage in substitution for horse traction; and have arranged with the company that, if at any time during the continuance of the lease, the Council should consider it desirable that some form of traction, other than horses, should be adopted, the leasing company will be prepared either to carry out the necessary works on terms to be arranged, or, should the Council execute the works, to pay a fixed rent and a share of the extra profits which may accrue in this way. If future developments in the system of traction by electricity or otherwise should promise a very largely increased return, by reason of saving in working expenses and increase in number of passengers carried, the bulk of such profit should, the committee state, accrue to the Council and the ratepayers rather than to any private corporation. The ultimate decision as to the proposals of the Committee has been adjourned pending further negociations on the subject.

NORTH COUNTRY FARMERS AND MOTOR-CARS.

A meeting of the members of the Newcastle-on-Tyne Farmers' Club was held on the 7th inst. in the Club Rooms, Town Hall Buildings, Newcastle, Mr. E. J. Browell occupying the chair.

Mr. John Morrison, F.C.S., read a lengthy paper on "English Roads and Road Transit of the Present and the Future, from an Agricultural Point of View"; and in his introduction said his statements and conclusions must be regarded as those of a critic rather than an expert. There could be no question, the writer proceeded, that cheap transit is the true key to the whole position as regards foreign competition in agricultural produce, and only by fighting it could British agriculture keep its head above water. There was the unfortunate peculiarity about agriculture, that its operations for a given volume of results are diffused over an enormous area The quantities per acre to be moved in one direction or another were comparatively small. He went on to point out that road haulage by means of horses had long been regarded as a comparatively extravagant method, and reviewed at considerable length the history of the movement of mechanical cars on roads, and the difficulties placed in the way of their development. Having touched upon the various restraints put by Act of Parliament upon road locomotion by steam, Mr. Morrison said the new Locomotives on Highways Act inaugurates an entirely new *régime*. After commenting adversely as to the great speed allowed, Mr. Morrison said the probabilities were that no such speed would be required for commercial purposes, and regretted that the framers of the new Act seemed to have been influenced in the interest of vehicles of a non-commercial class. He then discussed the merits and demerits of the various kinds of motive power, and said that one of the weak points in the new Act was that—owing to its 3-ton weight limit—it gave very little fairplay to steam, which presented more possibilities of usefulness than oil, and was the only source of road motor power which up to the present possessed the slightest economical importance, while a really successful and practical oil road-engine had not yet been exhibited. He then proceeded to deal at length with the Light Railways Act of last Session, and stated that his own experience was that what agriculture really wanted was a four or five ton locomotive, capable of hauling five to 10 tons load at a six or eight mile speed, with but a man and a boy in attendance.

In the course of the discussion which followed the reading of the paper, Mr. W. Trotter said good roads were undoubtedly necessary. He was of opinion that the cost of repairing should be divided, as in Scotland, between the occupier and the owner of the land. He complained of the imperfect way in which roads were made.

Mr. Forster Coull thought the roads should be maintained by the nation.

Mr. John Philipson, speaking as a carriage manufacturer, said he believed the vehicle of the future would be the steam-carriage. He did not think the petroleum-carriage, with all its complications, would ever be reliable, at any rate for the agriculturist. The electric-carriage would be the carriage of the future, however, so far as regarded large towns, where they could have storage stations. He did not think there was yet one reliable vehicle in the market. There was still wonderful scope for development, and he looked forward to the English engineer giving that attention to the subject, which would surmount the difficulties that had shown themselves both in Paris and America, and to their producing a vehicle superior to any of them. Englishmen had been handicapped by legal restrictions, but these having been removed to a very great extent, a stimulus was given to the younger generation of engineers to produce a vehicle suited not only to carrying purposes, but also to the conveyance of passengers. These new carriages should be protected back and front with lights. He was inclined to think that something like eight or ten miles an hour would be the average speed. With good roads and proper vehicles to bring agricultural produce to the centres of population, they would constitute one of the greatest boons, and at the same time do much to alleviate agricultural depression.

Mr. Knox-Lyal said light railways would not do agriculturists as much good as one of those steam-cars, which could go from one place to another to collect the produce. He believed the speed ought to be restricted.

The Secretary said the committee of the club were in communication with a company in London who were desirous of obtaining information with a view to the construction of light railways in various parts of the country. If particulars could be laid before them to show that such a railway was desirable and would pay in some particular locality, they were prepared to send someone down. He (the secretary) would be glad to hear from any member of the club on the subject.

The Chairman agreed with Mr. Knox-Lyal that light railways did not promise so much for a part of the country like theirs as a carriage to travel independently over the existing roads. He also was of opinion that very stringent regulations were necessary in connection with the management of the new vehicles in order that pedestrian and horse traffic might be protected.

On the motion of Mr. Potts, a vote of thanks was accorded to Mr. Morrison for his paper.

Dr. Seelig, of 11, Ludgate Hill, who is well known as an organiser of Continental trips, is arranging a series of Motor-Carriage Journeys at home and abroad.

A Sign of the Times.—Messrs. Chadwick and Sons, the old-established and well-known auctioneers, of St. Martin's Lane, are, we believe, the first firm of repute to announce their special facilities for dealing with the new automotor vehicles, whether by auction or valuation. The firm's reputation and experience should secure them a goodly portion of the business likely to come forward with the introduction of this new and important industry.

In our last issue a couple of mistakes occurred, for which the difficulties incidental to the production of a first number can only be offered as an excuse. In thanking our contemporary, the *Kent and Sussex Courier*, for the courtesy extended to us, we inadvertently described that paper as the *Kent and Sussex Chronicle*; while the heading to Mr. C. Harrington Moore's letter *re* the "Motor-Car *Run* to Brighton" was interpreted by the printers as a "Motor-Car *Race* to Brighton." The context of the letter sufficiently explained what was really intended; but we presume our friends, the printers, were too sportsman-like to imagine that the rival vehicles could be sent on their way without an effort being made to determine which could cover the distance in the shortest time

DOINGS OF PUBLIC COMPANIES.

The Aberdeen Motor-Car and Cycle Company.

The shares of this new Motor-Car and Cycle Company are reported to have been practically all taken up. Originally it had been intended that the Company should be a private one, but now it has been decided to make it public. When all preliminaries have been adjusted, the Company propose to at once proceed to organise a factory for the manufacture and sale of the machines specified in their prospectus. The premises No. 414, Union Street, Aberdeen, vacated by Messrs. Gifford and Son, have been secured for this purpose, the shop being by situation specially adapted for show purposes. The Company propose manufacturing a special cycle of their own, and will likewise hold agencies for a number of leading firms in the south. They will also be agents for a new motor which has been devised for the propelling of any cycle. Also they will hold an agency for the Great Horseless Carriage Company. In order to spread the business, agencies on behalf of the Company will be established throughout the north. The manager appointed by the Company is Mr. J. H. Paterson, and it is expected that the business will be under way by Christmas.

Midland Cycle and Motor-Car Exhibition.

The statutory meeting of shareholders of this Company was held at the Grand Hotel, Birmingham, on the 11th instant. Mr. J. B. Burman presided, and there was a large attendance of shareholders.

The Chairman explained that the Company had now been duly registered, and the capital considerably over applied for. The allotments had been made, and the preliminary arrangements decided upon for the holding of the exhibition at Bingley Hall from January 22nd to 30th inclusive. A number of applications for space had already been received, and everything was progressing in the most satisfactory manner.

The election of the Board of Directors was then proceeded with, and resulted as follows:—J. B. Burman (chairman), W. Calcott (Coventry), R. F. Hall (Birmingham), F. H. Parkin (Wolverhampton), F. Westwood (Birmingham), J. H. Price (Birmingham), J. Urry (*Bicycling News*), and C. Wheelwright (*Bicycling News*). The registered offices of the Company are at 174, Corporation Street. Mr. C. Wheelwright, of Lucifer House, Lionel Street, Birmingham, was elected secretary.

A vote of thanks to the chairman closed the proceedings.

New Companies.

The number of new companies registered at Somerset House during October was 382, with capital amounting to £23,665,740, as against 280 in September, with an aggregate capital of £15,695,774. The following are more particularly related to horseless vehicles:—

	Capital.
British Electric Traction Company (Limited)	£600,000
British Pure Acetylene Gas Syndicate (Limited)	50,000
Beeston Wheel Company (Limited)	10,000
Coventry Wheel Company (Limited)	12,000
Coventry Motor Company (Limited)	10,000
King and Rool's Starting Gear Syndicate (Limited)	3,000
Midland Cycle and Motor-Car Exhibition Company (Limited)	1,000
Rosser Cycle and Vehicle Brake Company (Limited)	50,000
Starley Bros. and Westwood Manufacturing Company (Limited)	110,000
Savage's Engineering Works (Limited)	120,000
Steam Carriage and Wagon Company (Limited)	1,500

Ramsay's Horse, Carriage, Cycle, and Autocar Repository (Limited).

This is a new Company, formed with a share capital of £60,000, for the purpose of erecting an extensive repository in the Hammersmith main road, for auction sales, &c. The directors are Sir Edward Lee, Messrs. Charles Fox, Robert Johnson, and W. D. Ramsay, and the offices 223, Hammersmith Road, W. A dividend of 10 per cent. per annum is anticipated; and provided the proposals of the Company are efficiently carried out, there is no reason why the shareholders should not receive all the advantages the directors foreshadow.

New Issue.

With a capital of £150,000, in £1 shares, the London Electrical Cab Company (Limited) has been formed to place on the streets of London electrically-propelled cabs (British Motor Syndicate patents), to supersede the present hansoms and four-wheeled cabs. The cabs will ply for hire in London in the same manner as the present hansoms, and at the same rates. Two sets of accumulators will be supplied to every cab, each set, it is claimed, being capable of propelling the vehicle 40 miles with one charging. It is intended to open depôts in different parts of London, so that the driver will be able to change accumulators without always having to return to his own station. The Company will acquire for the price of 50,000 shares, or cash in lieu thereof, the license from the British Motor Syndicate (Limited), subject also to the payment of a royalty of £4 per cab per annum. The said price has been fixed by the Traffic Syndicate (Limited), who are the vendors to the Company. The whole of the shares are offered for subscription, £100,000 being for use as working capital.

Walter C. Bersey, A.I.E.E., M.I.C. and M.E., the engineer to the Company, also represents the following kindred organisations:—The Great Horseless Carriage Company (Limited), the British Motor Company (Limited), the Motor-Car Club.

Mr. Bersey's two carriages in Saturday's procession were pronounced a success. The large landau was driven by Mr. Bersey himself. This gentleman has constructed several carriages—omnibus, vans, cabs, phaeton, and landaus—which have run an aggregate of considerably over 10,000 miles during the last four years. These vehicles are covered by several patents, which are now owned by the British Motor Company (Limited); and the Great Horseless and London Electrical Cab Companies are working under licenses from the British Motor Company.

A practical demonstration of the capabilities of the new cabs was made on Monday in the presence of a large number of people, when one started from the Royal Hotel, Blackfriars, at 12.30 for the City. In the carriage were the Earl of Fingall, Mr. Frank Gardner, Mr. Davison Dalziel, Mr. H. Mulliner, while Mr. Bersey was on the box. The carriage was driven down Queen Victoria Street, past the Mansion House, and round the Bank, into Throgmorton Street, the ease and facility with which it was guided through the crowded streets and the entire absence of any vibration proving that the introducers of this new form of locomotion for the public are justified in their anticipation of a successful future.

Capital of Cycle Companies.—The popularity of bicycling is demonstrated in some measure by the fact that since the first of the year over £11,000,000 has been invested in new cycle companies. Up to the end of last year the capital of the cycle companies was less than £6,000,000. It has thus been nearly trebled since January. This figure does not include capital invested in the numerous private concerns in different parts of the country. Nearly 2,000 patents for inventions connected with bicycles or accessories were applied for during 1895. The value of the bicycles made in a year in Great Britain, at the present rate of production, is £12,000,000.

NOTES OF THE MONTH.

An agitation has been set on foot in Manchester with the object of compelling the owners of omnibuses and tramway cars to provide covers for outside seats to protect them from rain in wet weather. The movement deserves to succeed. "If you don't like to sit on a wet seat, walk," is not good policy for either the public or the omnibus and tram proprietors.

An electric tramway is proposed to be constructed at Bray; the agents for the promoters are Messrs. Molloy and Molloy, 18, Eustace Street, Bray. The company which they represent is called the Electric Pioneering Company, with a capital of £100,000, and they propose to expend from £30,000 to £40,000 on the scheme. At the annual meeting of the Bray Township Commissioners held recently the matter was very favourably received.

The Dublin United Tramways Company intend to promote an Order in Council to authorise their making considerable extensions in the city and townships.

Penny rides on tramcars are popular, but when a passenger is compelled to take three separate tickets and pay for them in the three instalments at different stages of the journey, the process is apt to be somewhat irritating. In Leeds, on the Corporation tramways, tickets are only issued of one value, viz., one penny, and when a rider has exhausted the potentiality of one ticket, he has to take another, and so on to the end of the journey. It is little wonder, therefore, that we learn, on the authority of the *Leeds Mercury*, that the system is causing a good deal of dissatisfaction. Tickets of various values should be at once adopted; it is easy for an intelligent conductor to prevent any attempted fraud on the part of those who would ride a long journey with a short-distance ticket.

The men employed on the Manchester Tramways have been dissatisfied with their hours of work, and at one time a strike was imminent. This has been obviated by an arrangement, commencing on the 1st of this month, by which the hours of the drivers and conductors are reduced to 11 per day, and the wages of the horse-keepers are increased.

Either the local opinion of Bradford is not favourable to electricity, or the terms offered by the tenderers were not considered satisfactory, as we find that last month the offer of the Simplex Electric Tramway Conduit Syndicate to work the proposed tramway line to Great Horton was declined by the Bradford Town Council.

In Nottingham there has recently been a battle—not of gauges—but of the particular power to be applied to the tramway systems of the Corporation. For the moment the advocates of cable lines seem to be in the ascendant, but probably those interested in other methods will make their views heard. In Nottingham the cost of running the cable system, when in full working order, is estimated at about 6*d*. per car mile.

The Swansea Improvement and Tramway Company have agreed to sell their tramways to the Swansea Corporation for a nominal purchase price of £32,000, but as this amount is contingent upon certain conditions it is subject to modification. The Company in return get a 21 years' lease of the line at a rental which will fluctuate between £5,000 and £6,000 per annum. The Corporation intend to substitute electric traction for horse power, and this they will do in connection with an extensive scheme of electric lighting which they have in contemplation.

A cycle which "can easily be driven at the rate of 35 miles an hour," is one of the wonders promised us by the chairman of the Company owning the patents. The surprise one feels at the announcement is certainly not lessened when we are told that the word "'easily' means that only one-tenth of the power required to drive an ordinary cycle will be needed for getting the enormous speed out of the new machine." This is all delightfully vague, and is not rendered any clearer by the chairman's explanation that the cycle is to be "driven neither by chain, gearing rods, nor mechanical contrivance, but by a wonderful adaptation of an old principle in use in our chief public buildings to-day." The Belfast *Northern Whig*, which appears to be in the secret, prophesies that the power is hydraulic.

The Blackburn Corporation have applied through their town clerk, Mr. R. E. Fox, for power to raise a loan, £10,000 of which is to be devoted to electric traction, and £18,000 to the extension of the very successful electric lighting plant which has already been laid down, but which is not equal to all the demands made upon it. The price to be paid by the Tramway Company for electric power has been fixed at 3*d*. per car mile, and both the Corporation and the Company are stated to be satisfied with the agreement. As no opposition has been made to the loan, there is no doubt that the Local Government Board will sanction it.

A large scheme for the extension of the tramway system of Liverpool has been prepared, and is now under the consideration of the Health Committee.

It is proposed to apply for powers to construct an electric tramway next year from Laxey to Ramsey, Isle of Man.

A Company is shortly to put 24 motor-omnibuses on the road between Birmingham and Warwick, which will convey passengers the whole distance at a return fare of 1*s*. 6*d*., or half the third-class railway fare. To give another example of the cheapness of the new traction, a motor-car containing four passengers was lately run for 80 miles in Warwickshire at an expenditure in oil of 3*s*., or 9*d*. a head. It would be curious indeed if the railways at the end of the century were to find themselves once more face to face with their earliest competitor, traction by road.

The Clontarf and Hill of Howth Tramways Company, Limited, have presented a memorial to the Lord Lieutenant, praying for an Order in Council to authorise the construction of a tramway between Clontarf and the Hill of Howth.

IN Tokio electric tramways are only to be permitted as a municipal concern, and progress has been retarded by a recent refusal of the City Council to allow the utilisation of the head-waters of the Tamagawa for the generation of the necessary motive power on the plea that the town water supply, which is drawn from a lower reach of that river, might suffer contamination.

BIRMINGHAM being so much interested, there is no doubt that a representative exhibition of cycles and motor-cars held in that city would prove to be of great benefit to the two industries concerned, and we are therefore not surprised to learn that a Company is being formed for the purpose of making a demonstration of this kind. The proposed Company, which is to be called the Midland Cycle and Motor-Car Company, Limited, has received so much support that more than the total capital required has been promised. The exhibition, which is to be held in Birmingham early in January, should act as a great stimulus to the cycle and motor-car industries. The promoters hope and believe that the Right Hon. Mr. J. Chamberlain, M.P., will consent to open the exhibition.

MR. H. W. STANER, of Coventry, in a letter to the *Western Morning News*, takes to task some correspondents in that journal who have attempted to somewhat belittle the results which have been attained in the recent contests. As he truly observes, our Continental friends have been the modern pioneers in this matter, and the greatest credit is justly due to them for what they have achieved. He concludes an interesting communication as follows:—"As a matter of fact, the reason for abstention of the Anglo-French vehicles was found in the fact that the English-made carriages were not ready, and it is to be hoped that when the great British contest takes place next year the home-made productions will have passed the experimental stages, and be in a condition to compete in a hard and protracted trial under the eyes of mechanical experts, with proper regulations and tests, to ascertain power, fuel consumed, weight, and all-round efficiency. Finally, I would like to emphasise the fact that every autocar contest which has been held up to now has provided all intelligent autocar designers and builders with many invaluable object-lessons and useful hints, the practical results of which can be seen in numerous improvements, both in design and construction, of the later pattern of horseless vehicles."

THE directors of the Dublin Bread Company (Limited) deserve notice as perhaps the first public concern in this country to advertise for tenders for a motor-van. We trust that these requirements have been met; if not, their consulting engineer, Mr. F. J. Warden-Stevens, 34, Victoria Street, Westminster, may doubtless be pleased to hear from those who can meet his requirements.

HERE is "A Sign of the Times." Mr. Jas. Cooper, the well-known auctioneer of Newcastle-on-Tyne, recently sold at his Crown and Thistle Mart, in that city, a number of heavy draught horses and carts and chain gears. His instructions were from Messrs. Nimmo and Sons, brewers, of Castle Eden, and the reason assigned for the sale is "owing to their having purchased a traction-engine."

THE municipality of Buenos Ayres must do pretty well out of the local tramways. It levies a tax of 6 per cent. on their gross receipts, and the amount collected by this means last year was £91,113.

EVIDENCE of the wide disparity which would have prevailed in various districts had the various local authorities been empowered to fix the speed at which motor-cars could travel in different parts of the country, has been amply given during the last few weeks. Members of a large number of County Councils, under the erroneous impression that with them, and not the Local Government Board, rested the fixing of the maximum speed, gave notices of motion to deal with the subject, but were, of course, ruled out of order. The speed actually proposed to be allowed varied between four miles per hour and the actual maximum of 14. The first-named retrograde step was proposed in Scotland, while the Midlands and the South were generally in favour of a liberal welcome to the new comer on the roads. The mean average of the various proposals made worked out at 9½ miles per hour. We have, indeed, reason to be thankful that we have only one body to deal with in this matter, otherwise the resulting chaos would have been terrible.

BIRMINGHAM, always a model Corporation, is about to effect some very great improvements in its at present very excellent tramway service, and an interesting report on the subject may be expected at an early date. At present the tramway system extends 14½ miles outside the city, and these connections will, in all probability, be taken even further.

IN West Hartlepool the electric tramway system has, after a six months' trial, been found to give general satisfaction to the inhabitants. Although overhead wires are used, they are not regarded locally as unsightly, while the smoothness of running leaves little to be desired. The members of the Middlesborough Town Council have recently inspected the line, and will report at an early date whether they recommend the example to be followed in Ironopolis. In the course of a speech made after a luncheon at Hartlepool, Alderman Bulmer, responding for the Middlesborough Corporation, said he and his colleagues were well pleased with what they had seen.

THE Tonge Parish Council have decided in favour of electric tramways, and intend to use their influence with the Bolton authorities to get them constructed.

THE Bolton Corporation have succeeded in persuading the Horwich Urban District Council to adopt electric tramways. The cost of laying the line is estimated at about £4,000 a mile, or a total of £12,000; the electric equipment will cost £2,000 per mile, bringing the total cost of the rolling plant and line up to about £19,000. If the Horwich Council generated its own current, a further capital expenditure of some £15,000 would be necessary, but this is to be obviated by the Corporation furnishing the supply from their own station at a rent to be agreed. Powers to carry out the scheme are to be applied for at once.

STIRLING tramways are to be extended by the Bridge of Allan Tramways Company (Limited).

A NEW Company has taken over the Highgate Hill Tramways, London, and are busy with necessary repairs to plant and roadway.

MR. J. H. WILKINSON, of Chancery Lane, London, presided over a meeting held in the Hoghton Chambers, Hoghton Street, Southport, on the 22nd ult., when a provisional committee was appointed for the purpose of putting into due form, prior to the formation of a limited company, the scheme of Mr. Stewart Speddy, Southport, for constructing a roadway and electric tramway from Southport to Lytham. The estimated cost was put at from £450,000 to £500,000.

THE Dundalk Town Commissioners have resolved to apply for a Provisional Order enabling them to light the streets of the town by electricity, and to run their trams by the same power.

A DAIMLER motor-carriage was recently on view at Ashford, and caused considerable interest in the vicinity of the "Saracen's Head," the headquarters of its driver. It had travelled from Margate to Ashford in about three hours—leisurely progress being made on a Sunday afternoon under the old Act. The weight of the carriage was about 28 cwt.

WE understand the Gorleston and Southtown Tramway Company are seeking Corporate sanction to extend their line from Pier Walk to the vicinity of the South Pier, and to apply electricity as a motive power.

THE Manchester City Council have discussed the speed of motor vehicles under the new Act, and have recommended the Local Government Board to restrict the maximum to six miles per hour within a given radius of the Manchester Town Hall.

THE Gloucestershire County Council have contented themselves with suggesting that there should be two new bye-laws, the first providing that any motor exceeding one ton in weight should not exceed the rate of four miles an hour in crossing any bridge exceeding a 12-foot span, and a second forbidding two motors crossing any bridge at the same time.

THE Coventry Electric Tramways Company propose to apply for Parliamentary powers to extend their present system by about six miles and a half.

THE opposition which magisterial minds can bring to bear on suggested improvements was voiced by Mr. Hopkins, the stipendiary magistrate at Lambeth Police Court, who recently fined a cyclist 10s. and costs for furious riding, and then went out of his way to remark: "It's a horrible thing to think that in another fortnight we shall have the auto-cars doing the same kind of thing. What will then happen I don't know." To presuppose that the owners of the new vehicles intend to break the law is neither impartial nor judicial.

THE Warwickshire County Council, in considering the proposals of the Local Government Board with regard to the regulation of motor-carriages, ultimately adopted the report of a committee recommending that the speed should be 10 miles an hour, instead of 14, and the maximum width of a vehicle $6\frac{1}{2}$ feet, instead of $7\frac{1}{2}$ feet. This was carried by 33 votes to 24, but not before Lord Willoughby de Broke had made an earnest effort to get the speed reduced to eight miles. He held that, as the representatives of an agricultural district, they should encourage horse-breeding, and put all the obstacles they could in the path of what another worthy member described as "diabolical machines." His Lordship and his supporters are at least half a century behind the times.

THE London cabby has assuredly fallen on evil days. Threatened by the rivalry of the motor-car in the future. and railway monopoly in the present, he may well be at his grumpiest and surliest. Everything has gone wrong with him. Embarked by his union on a strike which everyone realised from the first must end in disaster, he fails to comprehend even now that he is beaten. His union, too, landed him still deeper in the mire. Their proposal to carry the war into the enemy's camp by boycotting the railway stations, and putting down passengers with their bag and baggage outside, was certainly one of the most audacious suggestions ever entertained, but they alienated any little public sympathy with their cause which might have been felt. Besides, it placed the drivers absolutely at the mercy of their fares, who were, of course, quite justified in refusing to pay should the men refuse to drive them to their destination. That such a proposal should ever have been entertained shows to what desperate straits the men were brought; but, thanks to the vigorous utterances of at least two of the London magistrates, the boycott was as short in its duration as the sentences upon the drivers would have been long had the mad scheme been persisted with.

MR. WOLFE BARRY's inaugural address as the President for the year of the Institution of Civil Engineers, on the 3rd inst., largely took the form of a review of the progress made in engineering science during the 60 years of the Queen's reign. Perhaps the most attractive part of Mr. Barry's address was that in which he dealt with the appearance of the automotor as a factor in our everyday life. In his opinion we are now on the eve of a development in automotor carriages and wagons which will be as remarkable and far-reaching as that of the bicycle. He thinks it will probably prove that the automotor will accommodate much of the traffic to be served by light railways, and render to a large extent nugatory the legislation of last Session on this subject, more especially if provision is not made in the construction of such lines against the evils of break of gauge.

A DECIDED novelty was seen in the course of the November municipal elections at Coventry. Voters were conveyed to poll in motor-cars. This is the first time the new vehicles have been brought into such use in England. The motor-cars are the earliest to be made in this country, having just been produced at the Coventry works.

As a contribution towards solving the problem of locomotion in London, Mr. J. Allen Baker, a member of the County Council, has prepared an elaborate memorandum dealing with the question in various aspects, and discussing incidentally the scheme now under consideration for the purchase of the two metropolitan tramway systems. He has drawn up a statement based upon information collected by himself at Blackpool, Huddersfield, Leeds, Glasgow, Edinburgh, and other cities where mechanical traction or the municipal working of tramways is in vogue. The result of his inquiries is summed up in the statement that he is "more than ever confident that the Council will not obtain full value for their property, either in the sense of giving an efficient service to the travelling public of London or an adequate profit to the ratepayers, until they adopt a suitable system of electric traction and have the full benefit of the very great advantages that are to be derived therefrom." Experience, he adds, is universally in favour of municipal as against company working of tramways, and he opposes the scheme now before the Council on the ground that it would delay municipalisation for a period of 14 years.

It is announced that there is to be an auto-car race on the Riviera early next year. It is being organised at Nice by a number of amateurs, but it will be open to makers as well as amateurs. The race will probably be from Nice to Marseilles and back, a distance of 450 kilomètres. It will most likely take place in February.

It is stated that, in view of the electric omnibuses which will be placed on the London streets, the London United Tramways Company contemplates a second attempt to obtain Parliamentary powers for the substitution of electric for horse traction on its lines from Hammersmith to Kew and Richmond, and from Uxbridge Road Station to Acton.

The automotor drivers of Hamburg have established a strike record. Five-sixths of them went out, leaving the public without the indispensable horseless carriage, and in one day the terms of the men were conceded, and the Hamburg citizens again enjoy their usual facilities of locomotion.

Motors for horseless sleighs are among the latest novelties. They are light, powerful affairs, and can be run by an amateur as easily as those attached to horseless carriages. The sleighs are designed to be run either on snow or ice.

The City of Belfast has, by a majority of 24 to 9, resolved to adopt the overhead system of electric tramways.

London is charged £75 per horse per annum for the hire of 137 horses for Fire Brigade work. Any practical proposal, therefore, which would have for its object the reducing of this big item of £10,275 is sure to receive careful attention at the hands of the authorities. America, as usual, is leading the way in such matters. A big self-propelling steam fire-engine is already in use at Hartford, and Fire Commissioner Russel, of Boston, is about to order two of the same kind for his city.

A correspondent suggests that while the County Council is asking the Local Government Board to reduce the speed of motor-cars it might also devote some attention to the size and weight of traction engines. His house, he says, which is in one of the nearer London suburbs, suffered a veritable earthquake from the passage of one of these gigantic machines past its doors. The whole house seemed to sway, and small articles of crockery and furniture clattered as if there had been a genuine earthquake.

Hull seems likely to be amongst the leaders of the automobile movement. A motor-carriage belonging to Messrs. Thornton, Varley, and Co., a well-known firm of drapers in Prospect Street, Hull, has been perambulating the streets for a month past; now comes the news that a local Company for manufacturing automotors will be launched shortly, and that already there is a large demand for the shares.

The Lancashire County Council have adopted a stupid recommendation of their Main Roads Committee, to the effect that the speed of the new motors should not exceed six miles per hour. This decision was come to after a vigorous protest from the Chairman of the Board, who pointed out that it was expected, and no doubt would be the case, that half the motor-carriages would be really private carriages, which would not be more liable to injure the bridges than any other ~~private~~ carriage which went over them now. In France a light kind of motor-carriage was much in use on the roads, and it was to be remembered that if a bicycle had motor power it would come under the rule. He suggested that the proposed rate of six miles an hour should only refer to heavy traffic. To apply it to light vehicles would be, in his opinion, objectionable. He did not think the Council should do anything to limit the use of the new carriage when it came into operation, and on that ground he appealed to them to reconsider their recommendation. The Board, however, would not listen to reason, and, as a body, rendered themselves ridiculous by their resolution.

The North Riding County Council were not much better, as they resolved to recommend that the rate of speed at which light locomotives shall travel on public highways shall be, for 12 months at least, not more than 10 miles an hour.

The Works Committee of the Acton District Council have instructed the clerk to the Council to write to the secretary of one of the motor-car companies, asking for an estimate of the cost of a scavenger's cart fitted with motors. It has not yet been decided to dispense with the horses now in use, but it is thought that motor scavenging carts will be a more economical means of road-cleaning.

From far-distant Rangoon we hear that the ladies have taken the automotor under their protection and made it popular—as a practical protest against the cruel manner in which horses are treated there. The engineer drivers are smartly dressed in a sort of Spanish costume of dark blue velvet, and the "turn-outs" are reported to present an extremely taking appearance.

FIG. 1.

FIG. 2.

FIG. 3.

FIG. 6.

For description of the above vehicles see page 73.

FIG. 8.

FIG. 11.

FIG. 9.

FIG. 12.

For description of the above vehicles see page 73.

EMANCIPATION DAY.

(*See Pages 64, 65, and 66 for Illustrations.*)

On Saturday last, the long looked for and much discussed date on which motor-carriages could be legally driven through our streets without absurd restrictions arrived. Those of us who have in the past indulged in stolen rides in out of the way places, undertaken with a due fear of the police ever present to the mind, naturally took the earliest opportunity of making use of our new-found liberty. Without incurring the expense of a Continental trip, we were on the stroke of that midnight which ushered in a dismal 14th of November, at liberty to career at will through the streets of London, hampered only by thoughts of Local Government Board regulations, which will doubtless be modified at the end of the six months for which they have been officially promulgated.

Personally, we celebrated the occasion by taking a phaeton out of its quarters at about ten minutes to twelve, being duly guarded by a policeman, who exercised solemn care that we did not start a moment before the "grim clutches of the law" were released by statute. Once the clock had really chimed the man in blue had lost his terrors, and with a vigorous cheer from the crowd which had gathered round, we started on our way through the traffic, encountering in our progress the good-humoured chaff and comments of the omnibus and cab drivers, who were conveying belated theatre-goers and diners-out to their homes. About an hour or so of this on a bad November night, with the prospect of a heavy day before us, was enough for amusement, and after comparing notes with a few others who had similarly celebrated the occasion, we gladly adopted Pepys's phrase of "then to bed."

Fig. 13.

Fig. 14.

The early morning—say between eight or nine—might have pleased a Mark Tapley, but with the prospect of a run to Brighton on vehicles which had never before been legally tried in England, the outlook was about as bad as it could well be. A drenching rain had fallen heavily for hours, the roads were soft and muddy, while a mist—heavy enough to be almost described as a London fog—hung about the streets in the vicinity of the river with a chilling depression which might have well checked any enthusiasm on the part of those who might otherwise have been expected to be interested in the new vehicles. The inhabitants of the Metropolis and the surrounding suburbs soon showed, however, that climatic conditions would hardly prove to be any check at all upon their curiosity to see the new carriages, and to celebrate the day on which they might be used in their streets. The procession to Brighton, which had been organised by Mr. H. J. Lawson and his *confreres* of the Motor-Car Club, was in the mouths of the multitude; fabulous sums were on offer for a seat in one of the carriages; crowds of more or less known people vied with each other for the possession of tickets to the Hotel Métropole to view the start in comfort, while outside the great British public took possession of every available inch of Northumberland Avenue, its adjacent streets, and the roomy Thames Embankment.

Writing with an intimate knowledge of the crowds which have been seen in the streets on great occasions, we unhesitatingly assert that never before have so many thousands of people been gathered in a given space as those which congregated in the immediate vicinity of the Hotel Métropole to see the start of the motor-carriages. The throng came at last not in hundreds but thousands, and in the end the streets were absolutely impassable. The first carriages to take up their position in the vicinity of the Whitehall entrance of the hotel arrived at about 9 o'clock, and from thence onward until the start at 10.30, the police force, both on foot and on horseback, waged one continual war with the crowd to get the vehicles into position, and to make such arrangements as would enable them to get a fair chance of starting when the time arrived.

While all this was going on outside of the hotel, the interior presented a very animated appearance as the numerous guests invited to an inaugural breakfast by the Motor-Car Club put in an appearance. In addition to the representatives of most of the important newspapers in the kingdom, and the members of the Club, many notable persons were present at the repast, which was presided over by the Earl of Winchilsea, among his supporters being Lord Fingall, Lord Cardross, Lord Trimlestown, Lord H. Fitzgerald, Col. Sir V. Majendie, Col. Fitzgeorge, Sir J. Ewart, Mr. B. Barnato, Mr. H. J. Lawson, Mr. Jerome K. Jerome, and many others equally well known. Mr. Chas. McRobie Turrell and the Secretary of the Club, Mr. Harrington Moore, were here and everywhere throughout the day, indefatigable in their efforts to ensure the comfort of the guests. The Chairman, in the course of some well-chosen remarks, pleaded for consideration on behalf of the drivers who had undertaken that day to pilot down to Brighton carriages with which they had but little acquaintance under circumstances of unusual difficulty, their task being rendered the harder by the crowds which they would meet, and the weather which was to be faced. To this would have to be added the fact that many of the carriages starting were comparatively old types of Continental makes, which had covered considerable distances and had sustained much wear and hard usage, so that they could not fairly be taken as being at all representative of the motor-carriages which may be reasonably expected to be ultimately produced by the English companies and firms engaged in this industry. The noble Chairman's remarks were well received, and at the conclusion of the breakfast a dramatic "drop curtain" was effected when the Earl of Winchilsea tore into tatters one of the red flags which have hitherto been compulsorily carried in front of traction-engine and motor-bicycle alike, and thus symbolically emphasised the fact that the day of freedom in this matter had at length arrived. All those who were not bound for Reigate and Brighton by train to watch the arrival of the carriages at those places then repaired to the windows of the hotel to witness the start, and amongst the crowd of special sightseers who occupied prominent positions in the principal rooms we noticed the Duke of Teck and the Saxe-Weimar family.

Punctually to time the vehicles were ready to start, the official programme and order being as follows:—

1. Panhard dog phaeton.
2. Mr. Lawson's private landau.
3. Panhard and Levassor, the winning carriage at the "Paris-Marseilles" race.
4. The Hon. Evelyn Ellis's private carriage, Daimler type.
5. Daimler phaeton.
6. Daimler phaeton.
7. Daimler carriage, second in "Paris-Marseilles" race.
8. Panhard and Levassor wagonette.

9 and 10. Daimler dog cart.

11. Panhard and Levassor omnibus.
12. Daimler dog-cart, Mulliner's limited body
13. Daimler's two-seat carriage.
14. Peugeot Frères omnibus.
15. Bersey landau, electrical.
16. Bersey phaeton, electrical.
17. Bersey hansom, electrical.
18. Britannia Victoria, electrical.

19 and 20. Britannia dog-cart, electrical.

21. Britannia Victoria, electrical.
22. Britannia Bath chair, electrical.

23, 24, 25, and 26. Anglo-French phaeton.

27, 28, and 29. Arnold sociable, Bentz motor.

30. Arnold Sunlight Soap van, Bentz motor.
31. Arnold Victoria, Bentz motor.
32. Pennington tandem.
33. Pennington tricycle.
34. Pennington cycle safety.

35, 36, 37, and 38. Bollée motor-cycle, Bollée motor-car.

39. De Dion tricycle.
40. De Dion racing tricycle.
41. Barrie Bersey, private carriage.
42. Lutzmann phaeton.

43 and 44. Duryea carriage, American.

45 and 46. Rüb tricycle.

47. Three-wheel dog-cart, New and Mayne, oil.
48. Hunt's Panhard and Levassor omnibus.
49. Bucknall private carriage.
50. L'Hollier tricycle.
51. Lormont Paris steam bicycle.
52. Lutzmann van, Sunlight Soap.
53. Petter's oil motor-carriage.
54. Messrs. Penn's steam-carriage.

The route taken was by way of the Victoria Embankment, Westminster Bridge, Lambeth Palace Road, Albert Embankment, Harleyford Road, Kennington Oval, Brixton, Streatham, Thornton Heath, Croydon, Purley, Merstham, Reigate, Crawley, Hand Cross, Bolney, Albourne, Pyecombe, Patcham, and Preston Park.

The carriages with their drivers had been in readiness for more than an hour before Mr. H. J. Lawson, as pilot, gave the signal to start; but when progress had to be made then came the troubles of the police. A solid wall of people in front and an all too narrow lane at the sides of the drivers seemed to arrest all attempts to proceed. However, by a judicious admixture of force and persuasion, coupled with the good humour of the crowd, a commencement was at length made, the onlookers being vigorous with their cheers and ready with their comments. The feelings of the "man in the street" towards the newcomer are somewhat difficult to ascertain. We told off one of our representatives to specially advise us on this point, but he failed to give us much help. His testimony was to the effect that the trade unionists had somehow got it into their heads that the whole procession was an organised opposition to the cabdrivers on strike; while the mothers were of opinion that from henceforth the streets would not be safe for women or children; and the City men thought that "no fellow would ride behind a 'bus horse while he could glide along like that." All were unanimous, however, on one point—that the show was the most novel which London has seen for years. Perhaps when our contributor has had time to analyse the result of his investigations, he will see that the public—like all of us—cannot yet attempt to fathom what will be the ultimate result of the new method of transport which has been introduced into our midst.

Coming to the actual start of the procession, such inspection as could be obtained from even the most advantageous stand in the hotel, was an imperfect and obscure one, but it could be seen that in the forefront of the procession was the pilot car, displaying the violet and gold banner of the Motor-Car Club, the President of which, in yachting costume and wearing an armlet of blue and crimson, steered the machine—a dog-cart with a hood—which was propelled by a Panhard motor. Next to it in the order of starting—which, however, was soon disarranged by the vicissitudes of the journey—was the Daimler "Present Times" closed landau—the same which took part in the Lord Mayor's Show. Then came the winner of the Paris-Marseilles race, having two places in front, with a protecting hood, and two places behind, the passengers being seated back to back. Colonel Sir Vivian Majendie was on this car. Next in order was the Daimler private carriage, owned and driven by the Hon. Evelyn Ellis—a vehicle which has already travelled 2,000 miles. It holds four people, dog-cart fashion. All these were provided with petroleum motors. Three tricycles, tandems, constructed on the Bollée system—cumbrous-looking machines, with huge rubber tyres, but having powerful 1¼ horse-power oil-motors — followed, together with a Kane-Pennington bicycle. In their rear was a phaeton giving room for four travellers, who were assured of some protection from inclement weather by a roof and a glass screen. An advertising delivery van (Messrs. Peter Robinson's) preceded another of the yellow-wheeled cars which appeared in the Paris-Marseilles race, in which it actually proved the fastest. Mr. Turrell was in charge, and his sole companion held aloft a red, white, and blue flag, intended to commingle the French and English colours, with a tattered and besmirched red traction-engine flag also attached to the pole. After this, in order of starting, was another of the French automobiles, the winner of the second prize. It was a wagonette, with room for a driver and three passengers, the Earl of Winchilsea taking the box seat. Other vehicles, also driven by Panhard and other motors, built according to patents owned by the British Motor Syndicate, followed, one of them being a neat bus (Harrod's), with accommodation for four inside, and another being the Panhard-Mulliner dog-cart.

It was altogether a matter of hazard on the part of those who started for Brighton by motor-car whether they would ever reach their destination. A Press representative who was fortunate in having the opportunity of travelling by a car which completed the journey satisfactorily supplies the following record of the run:—

Our car was No. 15. It was the one which actually came in first in the Paris-Marseilles race, but was placed second in order of merit. M. Merckel, who steered it on that occasion, and whose portrait appears in Fig. 4 of this number, was our driver, and his coolness and discretion, with daring and nerve at ticklish moments, were much to be admired. Lord Winchilsea sat on the box of this conveyance, which carried four persons in all, two in front and two in wagonette seats, facing each other, behind. The six horse-power motor, built by Panhard, an improved Daimler, was driven by petroleum, and it made 690 revolutions per minute, the gearing permitting four rates of speed—the fastest, I understood, being 25 miles an hour. Reversing gear enabled us to go backwards or forwards at will, and, instead of bands and rubber pulleys, which, if too soft, are liable to lengthen and burn, creating an horrible odour, the power from the motor was transmitted from the shafting by a chain travelling over a cogged wheel attached to the axle. Two brakes were fitted, and the machine was under splendid control, as the incidents of the trip will show.

We had to forge our own way through the huge crowd which filled the Thames Embankment, the temporary stoppage of a parcel van in front of us having led the spectators to close up their ranks, but following in the wake of Mr. Turrell's "flier" —its record speed is 32 miles an hour—we presently crossed Westminster Bridge, cheered by tens of thousands. The pavements, the housetops, the range of hospital buildings belonging to St. Thomas's, the river craft, and every inch of foothold on the ground, or high above it, were black with people. From Vauxhall—where the first car fell out—we steered through the crowd there assembled, and through Kennington to Brixton the concourse of spectators was immense. The red parcel van again indulged in vagaries, but before the police could deal with it as an obstruction it again went merrily onwards. Not so a motor-cycle, whose owner I saw despondently wheeling it back along the edge of the crowd, until, as I afterwards learned, he could find a hansom to carry off the disabled machine. Cabmen were just a little incredulous, and 'bus drivers were sarcastic as to the capabilities of the new machines. "I don't think much on 'em," said one; but the tram drivers—who have been accustomed to the cable trams on Brixton Hill—were more tolerant.

This long but gentle rise, followed by Streatham Hill, attaining to a height of 184 feet, did, indeed, tax the climbing powers of the weaker machines, and, as was subsequently reported, many of them got no further; but given a good car, we soon left the laggards behind. It was at the Crown and Sceptre, where the pilot car took refuge for a while, that we started in good earnest, travelling through thick lanes of men and women and children, pursued by a flight of cyclists, and running side by side with trotting mares in tandem, on one of which was impudently perched a dog, maintaining his equilibrium wonderfully. To this point we had been an hour on the journey for the six miles covered; but in spite of the rising ground, which did not trouble us much, except to put into play the gearing for reduced speed, with increased climbing power, we got to Streatham Library at 11.40, ten minutes after leaving the Crown and Sceptre; and four minutes later we were passing the common, and left behind us the Excelsior coach, which had been obliged to stop to water its horses. But we needed nothing for many a mile yet. Onward we sped, a welcome warmth diffused about our feet, and a trail of steam behind us, which was reminiscent of the atmosphere of "washing-day," but otherwise there was no discomfort due to the vehicle itself. It is true we were bespattered with mud, but this was thrown up from the tyres of some too attentive cyclists who, realising that the car was a good pace-maker, rode closely in our rear, trusting to us for a signal to check a collision, as they were without brakes. Out-distancing an Irish jaunting-car tandem, down we went to Norbury, made light of the ascending road through Thornton Heath, and so on to West Croydon, and into its main street, as the hands of the clock of the Town Hall pointed to the hour of noon—just 10 miles in one hour and a half. The Croydon townspeople to a man had turned out of doors, business came to a standstill, and domestic servants and errand boys rejoiced in a brief respite. Away we went through the High Street of the suburban borough, past the coaching-houses, once the pride of the old town and the hope of the future, now that the glories of the road are to be revived, and so into the open country, with the rice thrown by a well-wisher still in our ears and working down our backs, just as though we were a runaway pair returning from Gretna Green, and were welcomed by friends who had aided in bringing about the elopement.

At Purley Corner, a point from which the bicycle records are made, we began at 12.10 p.m. a run of 10½ miles to Reigate, for the road led us through Redhill. But we had a long climb before us, having to ascend from 220 feet to 434 feet—the highest altitude of the chalk ridge just before reaching Merstham. The fog had now lifted, and the genial weather had tempted carriage folk from miles around to line the roadside, and holiday had been permitted to the boys and girls of the Reedham Orphan Asylum, who gave us a hearty cheer.

Down the hill into Merstham, having caught here and there a view of the special train from Victoria on its way to Reigate, we plunged. For the first time we felt the exhilaration of travelling at 25 miles an hour in a motor-car. Not a thought of danger, not a thought of what might happen if the smaller car in front of us suddenly broke down, and we were unable to avoid a collision; but full of confidence in our driver, down we went, descending over 200 feet in the couple of miles which separates the picturesque village of Merstham—one of the old coaching places of call—from Redhill. This is the modern part of the ancient borough of Reigate, and it owed its creation entirely to the reluctance of the Reigatonians of those days to allow the Brighton Railway to pass through their town—an error of judgment which has ever since been regretted. Into

Redhill, avoiding the shorter route *viâ* Gatton Corner, we go, leaving its Marble Hall and quaint Town Hall—a relic of the days when Gatton was a pocket borough—behind us as in a flash, for it is nine minutes only since we quitted Merstham. At Redhill two roads are open to us, either we may take the "classic" coach road through Horley, Balcombe, and Cuckfield, places whose inns figure so frequently in old prints—or we may diverge through the rapidly extending residential town much patronised by stockbrokers and City magnates, into Reigate. It was at Reigate that luncheon awaited us, and our appetities were sharpened by the fresh air. So thither we proceeded, a little more cautiously, perhaps, as the throngs of bystanders were great. We pulled up in the market-place, close to its quaint isolated Town Hall, at 1 o'clock, having completed the 10½ miles from Purley Corner in 50 minutes, and the whole distance from London, 22½ miles, in two hours and a half, in spite of all obstacles of crowded streets, and unfavourable conditions of the roads.

"Reigate welcomes Progress." Such was the inscription prominent amidst the flags and bunting. The market-place was jammed with vehicles and cyclists. Never in its history, not excepting the memorable occasion when, in 1880, 40 cyclists essayed and 20 only succeeded in ascending Reigate Hill by the help of the stone tram line, has the retired coaching town been so busy. Its hostelries were overflowing, and mine host of the White Hart, what with coach parties to provide for, cyclists and others, was obliged to have recourse to the Public Hall as a supplementary luncheon place, where many of the motor-car visitors, most of whom had arrived by train, could be served with a substantial meal. For us it was a meal taken in a hurry. We were anxious to make the most of the daylight, and we were free to start as soon as ready. During the 50 minutes we stayed in the town there were a few opportunities of comparing notes. We learned that certain Bollée tricycles had gone ahead, and that the first car to enter Reigate 20 minutes before us was the Duryea—an American invention, which explodes the charge in the motors by an electric spark. It had joined the procession on the road. The Duryea pressed onwards, and the first prize winner in the Paris race was the only car visible when we drew up alongside it; but in a few minutes we were joined by the pilot car, driven by Mr. H. J. Lawson, which had waited a little on the road, and at a quarter to two the Paris car, driven by Mr. Turrell, came to hand, with a grievous tale of disaster; for, after water leak had been put right, the gearing went amiss, and the brake broke. What became of this unfortunate car, in the end, I am unable to say. We saw, too, the roofed phaeton come in, and subsequently heard of the parcel vans, after some misadventures, and the Anglo-French conveyance putting in their respective appearances. But time was up, and off we started independently at ten minutes to 2 o'clock for a run of 30 miles to Brighton.

A fairly level road between Reigate and Crawley, passing through Hoothwood and Lowfield Heath, suggested to Lord Winchilsea some timing. Accordingly, he discovered that the first mile was covered in 4½ minutes, the second in 3 minutes 20 seconds, the third in 4½ minutes, the fourth in 4 minutes, the fifth in 4 minutes 40 seconds, and the sixth in 4 minutes. Of a dozen cyclists who had started from Reigate with us quite fresh, eight now remained, and we passed the phaeton which had gone ahead of us. Cottagers waved us welcome as we sped by, and peasants stared at us in amazement. Crawley we found in festive array—with a great banner in blue and white strung across the road, between its open-timbered or tiled-fronted houses, to bid "Success to the Motor-car." The George Hotel, with its curious dragon signboard swinging from a beam athwart the high road, was the centre of local activity. Away we went, over the level crossing, near which a train was kept in waiting, and through the town, the inhabitants giving us a pretty wide berth. They had grown cautious already; for, as we afterwards heard, an accident had, a short time before our arrival, happened. The first car to pass through the old-world town had knocked down a little girl named Dyer, the daughter of a publican at Three Bridges. She had been struck on the head whilst leaning forward, and a cyclist who was following fell on her with his machine. She was removed to the inn, and the latest reports were that she was not injured seriously. Our time to Crawley for the last three miles had been 13½ minutes; and, as one after the other the milestones were passed, we completed 9¾ miles in 45 minutes. It was a delightful piece of woodland road which took us in the direction of Handcross. Brown oak leaves, the ruddy foliage of copper beeches, and the green Scotch pines, made together a picture of late autumnal beauty, but the trees, charming as they were, and the carpet of dead leaves, caused the road to be very damp, and at this period of our journey it took us fully 11½ minutes to complete one mile, and in this the cyclists gained upon us, as they always did when we were laboriously, but steadily, ascending declines.

"This hill is dangerous for cyclists." Whether M. Merckel saw the placard or not, or whether he chose to disregard it, I cannot say; he certainly approached the notorious descent of Handcross Hill with apparent indifference. To rush through the air at the speed of a torpedo-boat destroyer, down a narrow, curving road, enclosed with hedges, and without being able to see what was to the front of us, was a novel and thrilling experience. The gradient is very steep. One minute we were 500 feet above the sea level, and the next 300 feet only. We had accomplished this rapid descent of 200 feet in a few seconds of breathless suspense, when the slightest error of steering would have landed us into one bank or the other, or plunged us into the midst of cyclists who were waiting at the bottom of the hill to see how we should take this admittedly awkward piece of country. We did it magnificently, without a swerve. And all the while our motor was actively impelling us onward, adding to the velocity which had been already imparted to the vehicle by the momentum. It was a grand sensation, and the danger of the feat was not lessened by a rearing horse attached to a cart which we narrowly shaved at the foot of the hill, and which we had calculated would involve us all in utter wreck and discomfiture.

After this incident things appeared somewhat tame, and it scarcely stimulated our pulses to hear that we had covered two miles in five minutes. But the cyclists deserved attention. One by one they had found the pace too killing or had met with mishaps. The gruesome, mud-bespattered group, one or two with blood running from their lips, into which they had pressed their teeth, their haggard faces covered with splashes of clay, held on manfully as long as they could. One man incautiously followed too closely in our rear, and when we suddenly slowed he could not avoid a collision. Frantically he grasped the back of the car, and away he was dragged from the saddle of his machine, whilst his friends cried out, "Let go, let go!" as he was borne off at 10 miles an hour, until, releasing his hold, he fell in the road, picked himself up, rejoined his cycle, and was seen no more. Another tumbled from his machine, and rolled neatly to one side just in time to avoid a second motor-car which was catching us up. A third man held on to our car for miles, but in spite of the lift, and the circumstance that the roads were getting less greasy, owing to the rain, he could not go the pace, and he, too, dropped off—the last of the disheartened men of the wheel who had failed to beat the motor-car. The driving rain tended to make the last stage of the journey one of discomfort. At Bolney (3.6 p.m.) we rejoiced the heart of an ostler by proving to him that our motor could drink up two large pails of water, and a liberal tip was forthcoming for it. At Albourne Green, four miles farther on, happily, we did not need to patronise the facetious blacksmith, who placarded his forge with a notification that motor-cars could be repaired "while you wait." Some other car did, however, break down hereabouts. Having left Bolney at 3.22, we arrived at Piecombe at 3.53, and thence, with a descending gradient, passing on the road foxhounds, coaches, carriages, cyclists, and spectators of all sorts and conditions, who had defied the weather. We ran past Patcham, where another breakdown subsequently happened, and so to Preston Park, where we were welcomed with the flattering inscription: "Centuries look down upon this, your immortal ride." We had allowed Colonel Sir Vivian Majendie's car to get ahead of us, so that on arrival we found ourselves second in the order of the procession which the Mayor of Brighton was waiting to conduct to the Hotel Métropole, so soon as the pilot car should arrive, which it presently did. We pulled up in line at 4.15 p.m., and thus we had been 5 hours 45 minutes on the road, or, less the time spent at Reigate and Bolney, 4 hours 40 minutes for the 50 miles.

It was blowing half a gale and was very wet when, having safely traversed the crowded thoroughfares of Brighton and the Front, we reached the hospitable quarters of the Hotel Métropole, and at this destination other cars arrived one after the other; but it was impossible to tell which had survived the extremely hard test to which the motors had been subjected. Telegrams posted up in the hotel announced to the visitors that 60 vehicles would start from Charing Cross, but "they will not all reach you." And this was true. But the actual number could only be conjectured. A thinning-out process went on all day. At Brixton the numbers declined; at Streatham, 28 had passed at 12.39 p.m.; at Thornton Heath, 26 at 1.45 p.m.; at South End, Croydon, 22 motors were counted by 1.48 p.m.; at Reigate, at 2.2 p.m., 9 cars had arrived; at Crawley the first car passed at 1.20 p.m., and 4 others at 1.30 p.m.; at Hurstpierpoint, on the Cuckfield Road, one car went by at 2.11 p.m. At Brighton, at 6.30 p.m., Mr. Harrington Moore stated that 15 had arrived, and amongst the minor accidents notified was a punctured tyre, which, however, did not prevent the Kane-Pennington bicycle from arriving all right.

The following is the official list of the cars which reached Brighton in the course of the afternoon and evening up to 6 o'clock, when the timekeepers (Messrs. J. Dring and R. Coleman, who officiate for the National Cyclist Union) retired:—

Description of car.	Time of arrival at Brighton. h.	m.	s.
Bollée car	2	30	25
Bollée car	2	45	20
Panhard omnibus	3	46	10
Mr. H. J. Lawson's car	4	52	30
Panhard and Levassor	4	53	15
Britannia bath-chair	4	57	10
Daimler phaeton	4	57	25
Pennington tricycle	5	2	0
Bersey landau	5	4	40
Panhard wagonette	5	7	13
Anglo-French phaeton	5	14	45
Daimler dog-cart	5	27	13
Bersey hansom	5	41	30

Some adverse comments having been made in the Press as to the comparatively small number of motor-cars which arrived at Brighton compared with those which paraded outside the Hotel Métropole, it may be as well to explain that more than half of the owners never intended to go all the way to Brighton, it being arranged that they should simply take part in the inaugural start. The reason for adopting this course was in order that the public safety might be ensured, because with comparatively inexperienced drivers the task of negotiating a new vehicle through the immense crowd which thronged the streets would have been fraught with great danger. The police authorities would not give any facilities for practice before the Act of Parliament actually came into force, as shown by their successful prosecution of one driver who ventured out at 10 o'clock on Friday night and also by their unsuccessful application for a summons against Mr. H. J. Lawson for driving a motor in the Lord Mayor's Show. Then, too, after a few miles had been traversed, the unfavourable state of the roads and weather doubtless deterred many of those who would otherwise have gone the whole of the journey.

With reference to this point the Motor-Car Club yesterday issued an official report on the run from London to Brighton on Saturday. The committee state that it was at first decided that only cars officially tested and passed should enter for the ride, but this was overruled, and an open event decided upon. Instead, therefore, of 20 efficient cars entering as pre-arranged, all kinds of experimental machines took part in the demonstration. The committee go on to explain the manner in which the cars arrived, and state that no accident of any kind happened to those belonging to the club. After the banquet the committee examined 20 cars, and beyond the lower half of each vehicle being smothered with mud, they were in perfect condition, and ready to take the road again immediately. Eighteen of these cars were lent by members of the British Motor Syndicate. The committee award gold medals to the first eight motor-cars which arrived in the town. Considering the head wind, the beating rain, heavy roads, and congested traffic, and considering the fact that 20 motors out of 22 which left Brixton arrived at Brighton during the evening without accident, they add that a feat has been accomplished far exceeding their most sanguine expectations.

DINNER AT THE MÉTROPOLE.

The dinner given in the evening at the Hotel Métropole, Brighton, by Mr. Harry J. Lawson, "in celebration of the passing of the Locomotives on Highways Act, 1896, the Magna Charta of Motor-Cars," took place in the Clarence Rooms, and was a brilliant success. The company numbered some 200. Lord Winchilsea (President of the Club and Chairman of the Great Horseless Carriage Company) presided, having, on his right, Mr. Harry J. Lawson, the genial host of the evening, and on his left the Mayor of Brighton (Alderman J. G. Blaker, J.P.). Those present also included:—

The Marquis of Queensbury, Sir Somers Vine, Sir Joseph Ewart, M.D., J.P., the Mayor of Reigate. Mr. J. T. Allbutt (Humber and Co.), Councillor Broadbridge, Mr. J. Bradford, Mr. J. B. Baxter, Mr. C. N. Baker, M. Bollée (inventor of the Bollée car), Mr. W. C. Bersey (Great Horseless Carriage Company), Mr. J. J. Clark, J.P., Mr. C. W. C. Crandon (Great Horseless Carriage Company), Mrs. Crandon, Mr. Childs, Alderman Davey, J.P., Mr. Devine, Mr. Dalziel, M. Daimler (inventor of the famous motor), Mr. Duncan, Mr. C. McR. Turrell (Deputy Secretary British Motor Syndicate), Mr. H. Fenney, Mr. Roger Fuller, Mr. S. Gorton (New Beeston Cycle Company), Rev. Prebendary Hannah (Vicar of Brighton), Mr. D. Sherwin Holt (Daimler Motor Company), Mr. Rowland Hill (New Beeston Cycle Company), Mr. Innes (Beeston Tyre Company), Dr. Iliffe (New Beeston Cycle Company), Mr. Henry Jelley and Mr. James Jelley (Beeston Tyre Company), Mrs. Harry J. Lawson and the Misses Lawson, Mr. J. H. Mace (Daimler Motor Company), Mr. W. Olliver, Mrs. Olliver, Mr. C. Osborn (Secretary Great Horseless Carriage Company), Mr. W. Phillips (Humber and Co.), Mr. E. F. Pierson (British Motor Syndicate), Alderman Sendall, J.P., Councillor Stafford, J.P., Mr. Frank Shorland (Raleigh Cycle Company), Mr. C. N. Stewart (Great Horseless Carriage Company), Mrs. Stewart, Mr. J. Tonks, and Mr. Van Praagh.

The loyal toast having been honoured, the Mayor of Brighton proposed "The Motor-Car Club," remarking that although, in accordance with the request he had received, his remarks would be few, they would be none the less sincere and cordial. He was sure they would agree with him that that would be a red-letter day in the history of the country, and certainly in the history of the town of Brighton (applause), because they took it as a compliment that on that, the first day on which the Act came in force, the Motor-Car Club should have chosen their town as the one to come down and visit. (Applause.) He had the pleasure of riding down from Preston Park on the foremost car, and he was bound to say it was one of the most pleasant rides he had had in his life. It was true that the elements were not altogether favourable to the ride, but he would venture to call their attention to the fact that it was a big christening, and that they very often found water at these christenings. (Laughter.) As they were aware, the reason that they were that day, for the first time allowed to pass along the Queen's highway, was the removal of a flaw in the law, and it was largely through the influence of the Motor-Car Club that the law had been so altered as to allow the public to make use of this—in his opinion—greatly improved means of locomotion. In honour of the eveut the Brighton and Sussex Goldsmiths' Association had presented him with some of their registered designs, with the arms of Brighton suitably engraved, and he would ask their Chairman whether he would accept, as a small memento of the occasion, one of those medals. (Applause.) It was characteristic of the town that people coming there to live never left the town. By some singular accident twenty years ago Mr. Lawson did leave Brighton, but he had returned to it in his triumphal car, and they might depend upon it that if he weut away it was because he had that car, and could so easily come down again from London to Brighton. (Laughter and applause.) He had great pleasure in submitting to them the toast of "The Motor-Car Club," coupled with the name of Mr. Lawson. (Applause.)

Mr. Harry J. Lawson, in responding, said that remarkable occasion was the first meet of the Motor-Car Club on the great day of the emancipation of his very much-beloved motor; it was the day of the great deliverance of our roads and highways from the reign of quadrupeds and the rule of, well—other animals. (Laughter.) For 16 long years the lovers of science had been waiting for this day with the full knowledge that machinery and science were equal, nay, vastly superior, to any animal power. (Hear, hear.) That day was a victory. (Hear, hear.) He did not know how many there were at the start—but he himself counted 32 cars. At the start the procession was broken in halves by a great rush of people, and he had heard that a part of them never started at all. (Laughter.) It was utterly impossible to get through the people; the enormous crowd was greater than that at the Lord Mayor's Show on the previous Monday. (Hear, hear, and applause.) The 11 cars which were particularly his detachment were his Syndicate's cars, and they were supposed to be the latest improved patterns. (Hear, hear.) He was very pleased to be able to announce to them that every one of those cars was in Brighton that night. (Applause.) With the exception that a bolt fell out of the cylinder of the car on which he rode, involving half an hour's delay, he had had the most pleasant ride the weather would allow. (Laughter.) It was lovely until they got just beyond Crawley, and then it did rain very hard. (Laughter.) He thought the rain was helping them, because had the weather been fine people would have said they would not have brought out their cars had it been heavy weather. In spite of the weather, however, in spite of many inexperienced drivers, and in spite of the very hilly nature of the roads, he had a telegram to say that no fewer than 22 cars had arrived in Brighton—or were still on the road. (Laughter and applause.) The most remarkable performance of the day was undoubtedly that of M. Bollée, the great French inventor, who was there that evening. He left Brixton at half-past 11 and arrived in Brighton at 25 minutes past 2. (Applause.) Mr. Lawson then gave the names of others who were among the earliest to arrive, and said the question was, What did all this mean? It meant that they were able to deliver goods by road from London to Brighton; and they had done so that day. (Applause.) Now they would be able to start a carriers' wagon at 5 in the morning, arrive in Brighton and return again to London by 1 o'clock, and once more return and make a second delivery in Brighton in the afternoon by 5 o'clock, returning to London again by 9 o'clock in the evening. Proceeding, he said he believed the coach which accompanied them that day arranged for five changes of horses to keep up with them. That was 20 horses for the one journey. Of course, there were some trotting mares on the road which simply went by his car, but he pointed out that there was very good reason for not keeping up with them, because the law forbade him to travel more than 12 miles an hour, though trotting horses, cyclists, and butchers' boys might travel at any rate they liked. (Laughter.) He went on to say that that was the inaugural day, the birth, of one of the greatest industries the world had ever seen (hear, hear), because it would branch off in all directions. Their forefathers made great fortunes by the introduction of machinery, and he hoped that men of the present day would do the same. (Hear, hear.) According to the Press of that week, the safety bicycle trade, of which he was, as they knew, the acknowledged founder, had already reached an annual sale of no less than £12,000,000. And if that had been done with regard to cycles, what, indeed, would motors do? He believed that almost every kind of domestic life was going to be affected by it (laughter), and that the value of property and land would also be affected. The Brighton builders gave season tickets to connect their houses with London. They would not do that in the future. They would put up a handsome little coach-house, and put a handsome little motor in it, and by that very motor they would connect it with the town. Land 10 miles outside the town would become almost as valuable, if there were good roads, as land in the interior. Now, that was an enormous item, but it was bound to come; there was nothing to prevent it. He did not believe it would stop even there. He believed the houses themselves would take to moving. (Laughter.) Why should they all stick together in one place? Why should they not be able to say in London, "We have had enough of London; we'll be off to Brighton"—then put a little oil into the motor and away you go! The houses moved in America, and houses were going to move here. They would naturally like to know what kind of system was employed in propelling the cars that day. In nearly every case oil was used, but he pointed out that the benzoline, which was meant by the word "oil," only escaped by half-drips, and that the atmosphere had an important part to play in supplying the motive power. When electricity was used the only trouble was in "charging up," but wherever the electric light was there they could get it charged. They simply had to take out one set of batteries and leave them to be charged while they used another lot already charged. Motor-cars were not fully developed yet. It seemed to him that if oil could give all this immense power at present, it was only for them to wait a few months and Great Britain would produce, he hoped, a car really perfect—that was to say, with much less noise than at present. Numbers of the cars that came that day were English as well as French, German, and American, and every one of them was a little better than the other. They kept on improving. He did not know a single accident that had happened that day—except two. (Laughter.) One of them he saw himself. A horse (it pained him to say) and trap knocked down a cyclist and ran over him. He was sorry to say, also, that he saw a motor-car knock down, he believed it was a child, at Crawley, but he was pleased to say it was not one of their cars. He believed, however, it was not at all the driver's fault, for it seemed the police had just cleared a pathway, and then the child dashed right across in front of the motor. Such an accident would happen to anyone, horse or motor. (Hear, hear.) People who saw his carriage in the Lord Mayor's procession on the previous Monday confidently informed him that it was driven by electricity. One man shouted out to him, "What about the 'osses, sir?" He said, What about them? He saw that the "whip makers of Walsall" had been holding meetings and writing to the papers carefully signing themselves anonymously as "friends of the horse" (laughter and applause)—the poor animal with a "leg at each corner" which stood so much flogging from them. Oh, the irony of it! Friends of the horse! After they had broken his heart, broken his spirit, "broken him in," as they called it, they put a great load behind him, and because he tried to run away from it and run away from them, because he could but drag the load with him in his vain attempts to get free, they said, "Behold the friend of man!" He was afraid if they gave the horse a chance he would not show such friendship. He had a painful recollection of giving a horse a chance in Richmond Park the other day. He suddenly put his steering wheels round where his head was, while he himself went straight on! And when he woke up among the dead leaves he found the "friend of man" had gone home. But not so the motor: like a fair angel of science it now stood holding out to them and to all Britain its dainty levers, saying, "Take me; I am your willing slave. I will work incessantly from early morning till late at night—all night, too, if it is only your will ; and, as your most humble and obedient servant and slave, I will earn the everlasting gratitude of mankind, the triumph of science, and bring wealth and prosperity to the whole nation at large."

Mr. Van Praagh, in proposing "The Industry of Motor-Cars," said the day was not far off when it would be as difficult to think of the world without motor-cars as it was now to think of the world without railways. Only a year ago, when Mr. Lawson told him he was going to buy the Daimler motor, he could scarcely imagine a man speaking in that way, and he ventured to say there were very few in that room who knew a year ago about motor-cars. Mr. Lawson, in forming the British Motor-Car Syndicate, had brought into it three important factors—himself, his money, and his influence. (Applause.) By his influence he brought in some of the most important men who directed the industries of the present day, and the Syndicate set about buying all the patents of any value, making the industry what it should be, to place England side by side with Germany, and France, and America, and other nations of the world. Mr. Lawson was the pioneer of this industry, and by his exertions, directly or indirectly, he had brought about the alteration in the law without which the event of that day could not have occurred. The British Motor-Car Syndicate had now given birth to a great and important Company, the Great Horseless Carriage Company, which would give English engineers and inventors an opportunity of competing with the world in designing and making motor-cars. The Daimler Company had also been formed, and now they were on the eve of a new departure—an electrical cab company for London, which, he understood, would be launched almost at once. In conclusion, he eulogised the services of Lord Winchilsea in connection with the movement, remarking that they might be proud and grateful to have such a leader. (Applause.)

Lord Winchilsea, in responding, said he had been asking himself whether they were that day taking part only in an interesting scientific experiment, or whether they had been founding a great national industry. He was bound to say that that afternoon he had felt they were making an industry very fast, when he found by his watch that they were working on at something like 24 miles an hour. (Laughter.) The impression that they had arrived at a very practical point in this industry was put in his mind as they flew over the intervening 50 miles between London and Brighton. He must say that, bar weather, he had never had a more delightful ride in his life. (Applause.) He was delighted to find there was a complete absence of smell and a complete absence of vibration, and that the carriage was under perfect control, while horses had such little regard for their impending doom that they took no notice whatever of the car as it passed. (Applause.) He was struck with the attitude of the crowds which lined the roads everywhere. It seemed to him that they too felt that something more than an experiment was being carried out, and that a practical step forward had been taken to increase the facilities and enjoyment of their lives. Of course the legal restrictions which only came to an end that day had been a very serious barrier indeed to the prosecution of the motor-car industry in this country—so much so, indeed, that practical engineers had scarcely turned their attention to the subject. At the same time, he believed that when their engineers did turn their attention to the matter England would not long remain behind other nations in this respect. Such companies as the Great Horseless Carriage Company had great responsibilities in placing before the public really serviceable articles, and he hoped the public would be patient with them for a few months while they were perfecting their types, and that when they were placed in the hands of the public a certain amount of responsibility would rest with their owners, and that they would be treated with the forbearance due to an instrument, of whose powers those who used it had an imperfect knowledge. He believed motor-cars would be of the utmost use in collecting and distributing agricultural produce. (Applause.) He had long felt they would be infinitely superior to light railways, and the Chairmen of more than one of the great railways, with whom he had had an opportunity of discussing the matter, shared that opinion ; and looked forward to the time when they could be supplied with motor parcels vans to send out to agricultural districts as feeders of their main lines. He was very glad to think the use of motors would be by no means confined to private individuals. He believed the Government would make large use of them to expedite and improve the parcels post. (Applause.) The industry would give employment to numbers of people, and afford an outlet for a great deal of capital at present locked up. He must point out, on behalf of those responsible for the industry, that the motors already introduced might, even in the opinion of their inventors, be immensely improved, and that probably the motors of a few years hence would be very much more perfect than the motors of to-day ; but with that reservation he was convinced that they had arrived at a period at which these motors were, if not perfect, yet applicable for practical purposes. (Applause.)

Sir Somers Vine, in proposing the next toast, said those who were interested in this motor-car industry should acknowledge the hearty co-operation they had received from the representatives of the local governing authorities. The authorities might well be expected to be among the first to practically apply this industry within their respective areas, and certain it was that in the exercise of their judicial and administrative functions they would have an influence on the industry which might be most conducive to its prosperity. These authorities were represented there that night by the Mayors of Brighton and Reigate, and he asked them to drink to their healths.

The Mayor of Reigate having briefly replied, saying he was extremely pleased with the proceedings and speeches,

Alderman J. G. Blaker (Mayor of Brighton) said he was a little more doubtful than the previous speaker about the proceedings and speeches. He was quite prepared to hear from Mr. Lawson great things, but he was not prepared to hear him say that houses were likely to go about like motors. (Laughter.) If that was the case he was quite sure they would be found to be missing when the collector of rates went round (renewed laughter), and if that were so they would not find such fine roads as they did when they entered Brighton that day, or that electric light which had so brilliantly lighted the thoroughfares. In the name of the Corporation and inhabitants of Brighton he must cordially welcome them to the town. (Applause.)

Alderman Davey then proposed "The Press," saying he was proud of the independence it displayed, and glad that England had a Press second to none in the whole world. The toast having been acknowledged,

Mr. Lawson presented M. Daimler with the handsome silver trophy which was won in the Paris-Marseilles race by Messrs. Panhard and Levassor, who desired that it should be handed to M. Daimler, because he was the inventor who, ten years ago, made the first successful oil motor.

M. Daimler briefly replied, and the company then dispersed.

Yesterday morning, at Brighton, there was a parade of motor-cars. Thirteen vehicles assembled at the Hotel Métropole, including heavy vans, cycles, and phaetons, and went along the front to the eastern boundary and back to the hotel, where the procession dispersed. Subsequently the cars were to be seen in various parts of the town, especially on the King's Road, where great crowds of people had assembled. Numerous photographers were at work, and several cars and groups of cars were taken. With few exceptions the horses at Brighton have shown no alarm at the motor-cars. One horse attached to a private carriage became alarmed when the procession returned to the hotel, and jumped the railings in front of the building. It alighted safely on the pathway, but the shafts were broken, and the vehicle was otherwise damaged. The cars returned to London this (Tuesday) morning, parading at the Hotel Métropole at half-past ten.

Some idea of the large number of persons who witnessed the run to Brighton may be gathered from an experience of our own. We published a cheap souvenir number of The Automotor and Horseless Vehicle Journal, containing a programme, some information, and a few pictures of the carriages. The issue was, perhaps, one of the largest ever made by a technical or trade journal; but it was exhausted in the London streets in less than one hour; while from the orders which rained in from the agents at least another 25,000 could have been absorbed in the metropolis alone—to say nothing of the principal towns on the line of route, Brighton alone asking for a further supply of 5,000.

With the object of inspecting the carriages which the British Motor-Car Company (Limited) and Mr. H. J. Lawson intended to send on the journey to Brighton, we recently visited the exhibit at Wembley Park. Armed with a permit signed by Mr. Chas. McRobie Turrell, Mr. Lawson's able private secretary, we examined the remarkably interesting collection of motor-vehicles which has been collected there. They show at a glance the progress which has been made on the Continent in the manufacture of these carriages; and one is enabled to trace almost instantly the evolution of the automotor of to-day—from the original Daimler motor, constructed some 12 or 15 years ago, to the actual winners of the Paris-Marseilles race—purchased by the English Company and then finding a resting place at Wembley pending the tour to Brighton. In Mr. J. Thompson Smith the Company has an able and obliging representative, who kindly placed the whole of his exhibit at our disposal, and enabled us to test the smooth working and excellence of the motors of the various manufacturers which are represented. Perhaps one of the most interesting items of a long series of trials was a run on the Panhard et Levassor carriage, which took the second prize in the Paris-Marseilles contest, with the driver "up" who successfully steered it throughout the 10 days of the French run.

What skill and an amplitude of brake-power can accomplish when accompanied with pluck was well shown by him. Driving his carriage at a rate of more than 23 miles an hour down a hill, he steered it round ponds and obstructions with an ease which rendered one oblivious of the danger which would otherwise have been too apparent. The certainty with which this master of the new art could manipulate his mechanism was shown by the fact that, running at full speed down hill, he could stop at a signal within five yards of operating the brakes. All who wish to see what can be done now, and who would desire to form an opinion of the future possibilities of motor-carriages should visit Wembley and see the most concrete exhibition of varied applications of motive power to road vehicles which at the moment of writing can be found in the country.

We photographed some of the most interesting exhibits; all, with the exception of the first, being among those which took part in the procession to Brighton. They are reproduced on pages 64, 65, and 66, and the following particulars briefly describes them; but we shall doubtless deal with some of them more fully in an early issue, when we have more space at our disposal:—

Fig. 1.—The original Daimler motor, constructed by M. Daimler, and in connection with which all his original experiments were made. It is of historical interest, and its owner would not allow it to be sent to this country until a bond of something like £1,000 had been entered into to secure it safe return. The material used throughout is of the crudest description, the seat being a piece of sheet iron bent over. It is well worthy of inspection by all interested in automotor work.

Fig. 2.—Daimler quadricycle, a much more recent machine, but still an intermediate vehicle in the stage of development.

Figs. 3, 4, and 5.—These represent the three winning Panhard et Levassor carriages in the Paris-Marseilles contest. In Fig. 4, the driver photographed is the same who was in charge of the vehicle throughout the French race.

Fig. 6.—The Dion tricycle, which has hitherto proved the most successful oil-motor for light work on the Continent. Its splendid racing performances were set out in our last issue.

Fig. 7.—Daimler *vis à-vis;* about three and a half horse-power, with four speeds of four, seven, 11, and 14 miles an hour.

Fig. 8.—Daimler omnibus, with six places; five I.H.P., reversible at all four speeds to which it is geared; the maximum rate of progress being 16 miles an hour.

Fig. 9.—Roger Victoria; about three and a half I.H.P., with two speeds and two independent brakes; maximum speed 10 miles per hour.

Fig. 10.—Serpollet steam carriage, with six seats; fitted with two independent brakes; speed about eight miles per hour.

Fig. 11.—Bath chair, electrically propelled on the Britannia Company's principle.

Fig. 12.—Daimler phaeton; reversible on all speeds—of which there are four up to 18 miles; I.H.P., about four.

Fig. 13.—Daimler omnibus; four places; for railway station work.

Fig. 14.—Daimler Victoria (French type); reversible; four speeds, maximum 16 miles per hour; about three I.H.P.*

FRENCH CONTESTS FOR 1897.

The directors of the Automobile Club have decided to institute a series of trials for heavy vehicles to be held early next year. These trials will last about ten days, and will be divided into three classes of vehicles with fifteen and thirty seats and goods delivery vans. The programme of these trials will be published in about a fortnight's time. The directors have also made arrangements for the apprenticeship of auto-car repairers, who will be trained in the factories of the principal makers, and thus be fully qualified and competent to carry out in different parts of the country any repairs required by the auto-car owner.

Journalism on the Rampage.—The *Evening Standard*, in its desire to be picturesque, is becoming inaccurate. In the course of a description of the Lord Mayor's Show it stated, with reference to the motor-carriage which took part, that "the stench of the petroleum it emitted was strong enough to excite a good deal of hostile comment along the whole line of route. If this is the case with an ordinary carriage of the brougham class, what is to be expected now that omnibuses, cabs, wagons, and carts are all to be driven by machinery? Cologne, one of the foulest-smelling towns in Europe, will be as Arabi the blest by the side of London. It is to be hoped that someone will invent a respirator for the nose and mouth, containing a drug to neutralise the odour of petroleum." We have never contended that perfection has been reached in our infant *protégé*, but a description such as this could only have been written by a student of romance, or by a correspondent who, not being present, took the "Show" for granted.

* The photographs for these illustrations and of the other carriages appearing in this paper, which took part in the Brighton trip, were specially taken for the Automotor and Horseless Vehicle Journal by Mr. H. W. H. Palmer, Springvale, St. Germain's Road, Forest Hill, S.E.

ANSWERS TO CORRESPONDENTS.

W. H. ANDREWS (Colchester).—An engraving, showing the details of the motor in question, has been prepared and will appear in an early issue, probably the next. We are utterly unable to advise you as to "exact results on a prolonged run"; you had better apply to the inventor for permission to make a trial.

K. C. CARMICHAEL (Leith).—Your better course is to consult a reliable patent agent; in our own opinion, the combination specifically as claimed would be good subject-matter, but any re-shuffling of the parts would put you out of court.

NEMO.—Write to Chapman and Hall's for a copy of their catalogue; if they have nothing to exactly suit you, Spon's may supply you with an American work.

G. MOORE (Newcastle-on-Tyne).—We have already arranged; but thank you, and shall always be pleased to obtain particulars of the forthcoming novelties which you mention.

G. S. (Liverpool).—A gradient of one in ten can easily be surmounted by a Levassor carriage. For particulars as to prices in England, write the Great Horseless Carriage Company (Limited), 40, Holborn Viaduct, London, E.C.

EDWARD C. (Southport).—Whether you hold your shares or sell them must depend to a large extent upon your financial position. If you can afford to lock them up and wait, keep them, but if you want money sell them, they are unquestionably speculative.

F. C. WHITTON (Essex).—We do not care to give you the information for which you ask. We can supply you with a list of the directors of the companies you mention, but it would not be fair to furnish the names of their confidential *employés*. If you wish to apply for a situation do so in the usual manner.

G. F. (Maidstone).—Emphatically no; we have not any axe of our own to grind.

ECCLES (Maida Vale).—Write to Mr. Andrew Bait, at 32, Moorgate Street. He will send you full particulars of the objects of the Self-Propelled Traffic Association.

A. VESEY.—Communicate directly with MM. Panhard et Levassor, 19, Avenue d'Ivry, Paris, or to the British Motor Company (Limited), and they will give you particulars of some vehicles which will meet your requirements.

G. EDWARDS (Brixton).—Your better plan would be to finish the experimental motor before advertising for a partner, as you state that you have the means to enable you to do that. You will then get far better terms—if your expectations as to the results are realised. We return your drawing; the weak point is that you have not adequately provided for compression.

NOVICE (Manchester).—You may take it as positively certain that the cylinder of an engine of that power would have to be water-jacketted for any lengthened run.

NOVELTY (Bristol).—An ether engine is very alluring, but you under-estimate the practical difficulties.

INFORMATION WANTED.—Read our description in this issue, and then pay a visit to Wembley Park.

WE have just received from Messrs. Whittaker and Co. two works on motor-carriages, viz., "Carriages Without Horses Shall Go," ably written by Mr. A. R. Sennett and splendidly illustrated. It is published at 2*s*., and is wonderfully cheap. The other book is "Autocars," a translation from the French of M. D. Farman. As these have come to hand on the eve of publication, we hold over detailed notices till next issue.

LAW REPORTS.

Alleged Infringement of a Patent.

THE patent action Magee *v.* Tangyes (Limited), was decided in the Scotch Court of Sessions on the 4th instant. The plaintiff appeared in person; the defendants were represented by Mr. Ure and Mr. Wilson, who were instructed by Messrs. Davidson and Syme.

After hearing evidence, Lord Pearson disposed of a note of suspension and interdict presented by John Magee, engineer, 36, Pembroke Street, Glasgow, against Tangyes (Limited), hydraulic and general engineers, Cornwall Works, Birmingham, and carrying on business there and at 96 and 98, Hope Street, Glasgow. The complainer averred that he was the true and first inventor of improvements in gas motor engines, patented by him in 1892, which were of great commercial value, and that the respondents in the course of their business had infringed his patent by manufacturing and selling gas motor engines embodying a material part of his invention. He applied for interdict against the infringement. The respondents pleaded that they had not infringed the letters patent founded on, or otherwise that the letters patent were invalid on several technical grounds, and also for the reason that the complainer was not the true and first inventor; or that the invention was not new at the date of the patent; that the alleged invention did not constitute proper subject-matter as a ground of letters patent, and that the invention was not useful.

Lord Pearson decided that the respondents had not infringed the complainer's patent, and that the patent was invalid. He therefore refused the note, with expenses.

A Motor-Car Purchase.

IN the Court of Queen's Bench, on Monday, the case of Koosen *v.* Rose was heard.

In this Mr. John Adolphus Koosen, a gentleman residing at Southsea, sued Mr. S. Rose, a bicycle manufacturer, carrying on business at Southsea, to recover £150, the price of a motor-car. Defendant denied liability.

Mr. Wheeler, Q.C., and Mr. W. H. Nash appeared for the plaintiff, while Mr. Willis, Q.C., represented the defendant.

It appeared that last summer plaintiff was the owner of a Lutzmann patent motor-car, constructed to carry two, which had been exhibited both at the Imperial Institute and the Hurlingham Show. In August plaintiff and defendant met, and plaintiff said that, after having had a trial of the car on Southsea Common, the defendant, on August 22nd, agreed to purchase it for £150—£100 down and £50 in three months. A receipt was drawn up and signed, but plaintiff said it was not handed over, as defendant had not a cheque for £100 with him. The defendant took the car to the carnival which was held later in the day on Southsea Common, and on the following Monday he refused to pay any portion of the purchase-money or to take the car, which had been placed in the plaintiff's stable after the carnival. Plaintiff further said that the car was capable of going up gradients.

The defendant contended that the contract to purchase was conditional on the car working satisfactorily during the carnival, and that as the car broke down he was under no obligation to complete the purchase.

Mr. Justice Wright, at the conclusion of the evidence, said that plaintiff's story as to the sale was borne out by the receipt which had been put in, and on which the defendant made an endorsement. He therefore gave judgment for the plaintiff for the amount claimed.

AN important patent action is in progress in the Chancery Division of the High Court, before Mr. Justice Romer, viz., the Pneumatic Tyre Company (Limited) *v.* the East London Rubber Company, Limited. A talented array of counsel is engaged on both sides, and the decision on the alleged infringement will be awaited with great interest. As only the pleadings have been opened, we withhold a report until our next issue. The next case in the list before the same Judge is the Pneumatic Tyre Company (Limited) *v.* Friswell.

MESSRS. NEW & MAYNE (LIMITED).

A COLLECTION of interesting objects was recently collected at the Royal Aquarium under the title of the Craftsmen's and Industrial Exhibition. There was little to specially interest our readers, with the exception of the stand of Messrs. New and Mayne, of Palace Chambers, Westminster. This enterprising firm, besides a varied collection of electric-light fittings and sundries, showed a Woolf-Muller bicycle operated by a petroleum motor, the oil used being a safe form of benzoline. Although there are many points in connection with this machine which need perfecting—indeed, we believe that a new type will be shortly placed on the market—it is an interesting object. At the meeting of the Manchester Wheelers it is credited with a run at the rate of 30 miles in an hour, and it has covered a mile at Catford in $2\frac{1}{5}$ minutes. It has been run comfortably from Woking to Devizes, and was frequently seen in various parts of Surrey until the police interfered. Another object which is well worth inspection is the well-known New-Mayne patent electric rudder-motor. To those who are in search of an ingenious and efficient power for the propulsion of small motor boats, we can cordially recommend this as worthy of investigation and trial. We herewith illustrate an automotor laundry van just completed by Messrs. New and Mayne. This vehicle took part in the tour to Brighton on Saturday last.

HA hirdetök irják kérunk a "THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL" gondolni.

ACETYLENE MOTOR-CARS.—The *Journal of Gas Lighting* states that a firm of Italian engineers has recently built some miniature motor-cars for which acetylene serves as the motive power. The charge consists of acetylene diluted with 15 times its volume of air; and with this mixture it has been found unnecessary to use water for cooling the cylinder. The method of igniting the charge has not been divulged. According to the "Gastechniker," the motors maintain a speed of 600 revolutions throughout a working period of 15 hours. The weight is only about 20 lbs.; and 0·8 brake horse-power is developed. The cost of working is said to be about 0·6*d.* per hour.

MOTOR-CAR CONTESTS IN AMERICA.

IN our last issue we gave brief particulars of the results of the horseless-carriage races held at the Rhode Island State Fair. Now that our American exchanges are to hand we are able to give fuller particulars, and the *Horseless Age* supplies us with the following particulars:—

Out of the twelve original entries only eight started. These were the Duryea Motor-Wagon Company, J. Frank Duryea, George Henry Hewitt, Fiske Warren, George H. Morrill, jun., William M. Ashley and Son, Riker Electric Motor Company, and the Electric Carriage and Wagon Company. The last two were electric vehicles, the first being an entirely new one and the second the "Electrobat," which received the gold medal at Chicago last autumn. All the remaining wagons were of the Duryea model, one being entered by the Duryea Company and the rest by private purchasers.

On Monday, September 7th, about 5.30 p.m., the carriages were called upon the track, and numbers were assigned to them, as is customary in horse racing.

Each carriage being required to carry a weight of at least 165 pounds in addition to the driver, all preferred to take this in the form of an extra passenger, who was either an *employé*, or friend of the owner, or some well-known student of the subject.

All the contestants were sent back some distance behind the post for the start, and came up in good order. At the word the electric-carriages shot ahead, followed by the entry of the Duryea Motor-Wagon Company. The other Duryea wagons were road-wagons not geared for high speed, and they fell back from the start. Throughout the five miles dash the electric-carriages gradually increased their lead, finishing close together, the Riker carriage first.

The first Duryea wagon was about three-quarters of a mile behind the winners.

A very strong wind was blowing, and the track, while fast for horses, was too rough and lumpy in parts for motor-carriages. The time of the four leading vehicles for the first heat was as follows:—

Riker Electric Motor Company	15 m. 1 s.
Electric Carriage and Wagon Company	15 m. 14 s.
Duryea Motor Wagon Company	18 m. 47 s.
William Ashley and Son	20 m. 59 s.

As this was the first heat ever run on a track between motor-vehicles, it is reasonable to suppose that the contestants felt new and strange, and could not do themselves full justice. On the second day, however, they gained courage, and determined to improve on the time of the previous day.

At the word the Riker vehicle took the lead, as on the first day, maintaining it to the finish, closely followed by the Duryea wagon and the wagon of the Electric Carriage and Wagon Company.

This heat was closely contested by the three leaders, and evoked great enthusiasm from the spectators. The time was a considerable improvement over that of the preceding day.

Riker Electric Motor Company	13 m. 6 s.
Duryea Motor Wagon Company	13 m. 13 s.
Electric Carriage and Wagon Company	14 m. 33 s.
William Ashley and Son	16 m. 31 s.

On Wednesday and Thursday a violent north-easterly storm prevailed throughout that section of New England. Rain fell in torrents, and the wind played havoc with the shows and with the plans of the management, and, therefore, all races were declared off on these two days.

On Friday the weather cleared, and by the afternoon the track was in good condition.

The electric carriages dashed off at a two-minute pace, closely followed by the Duryea wagon. A little beyond the half-mile the Duryea wagon was pulling up with the two electrics when a tyre punctured, and the wagon gradually lost headway. The Riker carriage maintained its lead until the home stretch was reached, when the other electric spurted ahead and crossed the line a second ahead of its rival. Much better time was made by all the entries in the third heat, scarcely one falling below the 15 miles an hour limit. The times of the four winners were as follows:—

Electric Carriage and Wagon Company	11 m. 27 s.
Riker Electric Motor Company	11 m. 28 s.
Duryea Motor Wagon Company	11 m. 59 s.
William Ashley and Son	15 m. 47 s.

The race was conducted by the Association under the general rules applied to trotting races, and the awards were made upon this basis. The conditions called for a 20-mile race of five heats of five miles each, one on each of the five successive days of the fair, but as unfavourable weather prevented the completion of more than three heats, three-fifths of the purse only was divided in the following proportions:—First money, to the Riker Electric Motor Company, of Brooklyn, N.Y., 900 dollars; second, to the Electric Carriage and Wagon Company, Philadelphia, Pa., 450 dollars; third, to the Duryea Motor-Wagon Company, 270 dollars; fourth, to William Ashley and Son, Springfield, Mass., 180 dollars.

Public interest in the motor races in Providence and vicinity was very keen, and quite a number of students of the new method of locomotion came from distant points to witness the trial of speed.

The electric carriages weighed from 2,200 to 2,500 lbs. in racing trim, including passengers, the heavier of the two being that of the Electric Carriage and Wagon Company. The leading Duryea wagon weighed about 1,200 lbs. all on.

The fastest mile was covered by the Riker electric carriage, the time being 2 minutes 13 seconds.

It was quite generally commented on by the audience that the electric vehicles made as much or more noise than the gasoline at high speed.

Professor W. H. Pickering, of Harvard University, acted as Chairman of the Board of Judges.

From the Chairman of the Judges.

Cambridge, Mass.,
September 20th, 1896.

Now that the Providence races are over, and we have had an opportunity to examine and weigh the results, I think we must conclude that some very valuable information has been obtained. Unlike the Chicago and New York competitions, this was a speed contest pure and simple. Only eight vehicles were entered for competition, and, therefore, according to the published rules governing the races, no other points were considered by the judges. The comparison between the electric and gasoline carriages was particularly interesting, and the results were quite different from those obtained at Chicago. No electric carriages were entered in the New York contest. While at Chicago the electric carriages were badly beaten, at Providence both of those entered came out with flying colours, distinctly in advance of the best gasoline engine.

The reasons for this difference are obvious. In Chicago the race lasted several hours, and the course lay over a rough and very difficult track. In Providence, on the other hand, the race lasted but a few minutes, and the course lay over a hard and perfectly level road. Both vehicles, doubtless, have been much improved since the Chicago race; but were it to be tried over again to-morrow, we cannot doubt that the result would be the same.

QUIPS AND CRANKS.

Not a Novelty.—"A fine idea these new horseless carriages are, and what a novelty!"

"Novelty? Not a bit of it. I travelled in one more than thirty years ago, when I was a little child."

"Nonsense! Where?"

"At Margate. It was in a railway train."

The *Westminster* cartoon for the month of October, by Mr. E. Blomfield, quaintly represents some woe-begotten quadrupeds looking over a fence at automotors and motor-driven bicycles careering gaily by. Above their heads is a board with the inscription:—"Horses for sale, very cheap; no reserve. Reduction made if bought by the dozen. Premises to be used for motor-car sheds." The prophetic newspaper quotation at the foot of the picture is as under:—"[The establishment of so many autocar and motor-car companies in Victoria Street is causing grave concern to the equine interest, who foresee with sorrow that their services may soon be at a discount.—*Vide* Daily Press.]."

The *Entr'acte* expects that the motor-carriage will bring about the destruction of a good number of old horses, in which case we may expect to find some of our beef-essences quoted at lower prices than those which now obtain.

Our contemporary *Answers* recently published an amusing article on the future of horseless carriages, the illustrations accompanying it showing a run with the hounds on a motor "bike"; a cricket match, England *v.* Australia, played on wheels; the Derby of 1906, ridden on wooden horses propelled by motors; a convenient suburban residence being removed on wheels by a tractor to the seaside; and an excited crowd at the Zoo inspecting a "very rare animal"—the horse—described as the "Equs Cabullus; born in the menagerie."

The motor is not to have it all its own way. Someone in Perthshire is advertising for a "steady, respectable man as Postboy."

Our contemporary the *Referee* recently celebrated its thousandth number by a special and exceedingly interesting issue. "Dagonet," in the course of an amusing attempt to forecast the contents of the two thousandth number, gives the following as an extract from it:—"The Zoological Society have been fortunate in securing a splendid specimen of that now almost extinct animal, the horse. It will no doubt be an object of great interest to the thousands of young people who have heard their parents speak of this once-popular beast of burden, but have never seen one themselves." *Verb. sap.*

The *Daily Mail* celebrated the 14th inst. with a humorous forecast of the automotor carriage in 1921. One picture, representing the petroleum-driven sportsmen of the future stalking wild horses, was very funny.

A Cycle, Tyre, and Motor-Car Exhibition is to be held in the Royal Dublin Society's premises at Ballsbridge, Dublin, from the 16th to the 23rd of January, 1897. Applications for space should be made to Mr. R. Wilson, 14, D'Olier-street, Dublin.

TRADE NOVELTIES.

A New Solid Rubber Tyre.

Messrs. J. W. and T. Connolly and Co., of Wharfdale Road, King's Cross, London, are the introducers of the "Ideal" tyre, which, although comparatively new in this country, is a tried and proved success in the United States. It comes from the land of its origin with unquestionable evidence in its favour, as most of the leading carriage-makers have sent testimonials in its favour—until they bulk up into a very considerable volume. Many of those who have fitted it to all descriptions of vehicles state that they prefer it to all other makes, and in proof of their faith in it have discarded other tyres which they had previously used, and rely entirely on this one. We have had an opportunity recently of testing this tyre, and we are of opinion that it is exceedingly well suited to automotor carriage work of all kinds, and will be extensively employed in this industry. The details of the construction of the tyre and the means of securing it will be readily seen from the following illustrations:—

Amongst the many advantages which are justly claimed for it we think the most important may be briefly summarised as follows:—From the method in which the tyre is fastened on to the rim by two heavy endless wires it is a mechanical impossibility for the tyre to roll out of its rim, while the rim cannot cut or injure the rubber. Here we may incidentally mention the fact that the material used in making the tyre is of the best quality, and is quite equal to that used by our own leading manufacturers. In consequence of the method of making, and the high-class character of the rubber, it is found possible to highly compress the rubber in placing it upon the wheel, so that, should the tyre be cut or damaged by contact with sharp stones, bottle glass, or any undesirable obstacles of that kind, it will rapidly close up, and no distinguishable injury is sustained. As a consequence the wheel rims look fresh and well, even after a considerable amount of hard wear. Those in search of a reliable tyre for all kinds of work, which will stand all sorts of usages and still ride smoothly, should communicate with Messrs. Connolly, who have already introduced it largely into the metropolis. It is claimed that the amount of rubber used in one of their 1½-inch sections is greater than that contained in an English section of 1¾-inch. The broad fact that in America there are more than 10,000 sets of wheels running with these tyres without any complaint will doubtless be the most effective testimonial in its favour.

The Britannia Company's Motor.

Experiments have been in progress for some months past at the Britannia Company's works in Colchester, with a view to the perfection of an engine and auto-car to meet the requirements of the Act. The engine is very small and light for its power.

The motor and carriage are not yet quite completed, but we trust in an early issue to publish a sectional detail and the result of an experimental ride on the vehicle. In the meantime we publish an external view of the motor, which is to be called the "Facile."

The advantages claimed by the manufacturers are the following:—

1. Great simplicity.
2. Automatic ignition after a few minutes of preliminary heating.
3. No heating tube is required, hence the burstings and renewals are avoided.
4. A battery is not used.
5. An impulse takes place every revolution.

We look forward with interest to a test of this motor and carriage.

Gearing for Motor-Cars.

A patent has been taken out by Mr. Nightingale, of Chester, for an improved gearing for bicycles and motor-carriages. The chain is so constructed that it runs on a drum between discs on studs, pins, or rollers, which are said to "give it tremendous gripping power, and at the same time reduces friction to a minimum." The gearing can be changed at will for one of greater or smaller diameter, to suit the rider's choice, thus adapting the machine for hill-climbing. The advantages claimed by the patentee are that it is impossible for the chain to kink or slip. The chain differs in design from any other, and although each section is made of solid steel of great strength, it is lighter than those in ordinary use, its weight being only ¾ lb. The sections are so formed that it can be worked over a much smaller driving-wheel than those at present in use for high gears. On account of the chain running between discs there will be no necessity for a gear-case, and there is no danger of the clothing getting entangled in the gearing, as only a smooth surface is presented, the conical portion of the groove facing downwards. This gearing will, it is stated, be exhibited at the Stanley Show.

IT has occurred to a lady resident in the outer London suburbs to patent a detachable motor, which shall be alike available for a family carriage, a farm wagon, a common cart, a plough, a thrashing machine, or a chaff-cutter. She has given her motor the figure of a horse, on which the driver may or may not sit, on the assumption that the real live horse already in possession may not take with kindly sympathy to its rival.

"THE coming of the motor-car," writes a correspondent in the *Illustrated and Dramatic News*, "seems to me to be a certainty as far as parcel traffic is concerned. The wear and tear of London van horses has immensely increased of late. In the large establishments the average working life of a horse is but three years, although each pair-horse van has two pairs, and each single one two. I am sure that for the quick-trotting vanner the demand will be much less in the future, and I strongly advise breeders and farmers to turn their attention from these to other sources of profit."

THE BERSEY CARRIAGE.

THE electrical carriage which is here illustrated is operated on the Bersey system, and the rights in it are held by the Universal Electric Carriage Syndicate (Limited), 39, Victoria Street, Westminster.

The accumulators are of special patented design and suited to the variations of discharge which are at times necessary. Instead of using an ordinary fluid electrolyte, a special "afnidic" or "dry" material is used, thus practically converting the cell into a dry battery. The many advantages of this are obvious, among others being the impossibility of spilling, splashing, and spraying of acid in the carriage. The strength is regulated by a single driving switch, giving any degree of speed required and also causing the vehicle to run either forward or backward. Re-charging can be readily effected, as the accumulators are carried in a tray, which slides into a well in the vehicle. A fresh set can be substituted for a discharged one in two minutes.

These carriages are lighted by electric lamps, supplied from the same accumulators working the vehicle.

An average run for a carriage is about 35 miles at about eight miles per hour without taking in a fresh supply of storage batteries.

Two motors are used in each vehicle, connected through a special two-speed gear to each of the carriage wheels. The speeds may be readily altered by the driver. The whole of the motors and gear and also the carriage wheels are run on special ball bearings. The steering is very easy, and can be readily acquired with a very small amount of practice.

MR. ANDREW W. BARR.

IN our last issue we published a photograph of Sir David Salomons, the President of the Self-Propelled Traffic Association, and in this, which is published a few days after the legalisation of such vehicles on our roads, it is, we think, appropriate to select Mr. Andrew Barr as the subject for our portrait gallery. As Secretary of the Association of which Sir David is the President, Mr. Barr has many qualifications in his favour. He is young, energetic, and clever, but besides all these attributes, invaluable as they are in themselves, as Secretary of the Institute of British Carriage Manufacturers and a member of the Coachmakers' Company it was a happy idea to ally him with the automotor vehicle. He has formed the connecting link between the old order of things and the new, and his unique position has enabled him to assist in bringing together the somewhat antagonistic elements which are comprised in the coachbuilders of to-day and the engineers who are hopeful of displacing the horse by steam, gas, or electrical power equivalents. The importance of combination in this matter can scarcely be overestimated—the coachmaker is as essential to the evolution of the horseless vehicle of the streets as the engineer, and without the hearty co-operation of the two the ideal vehicle which we all hope to see—and to own—will be almost an impossibility.

The constitution of the Self-Propelled Traffic Association has assisted materially in the getting together of an able and independent council. When a body of men of high standing are combined to obtain the repeal of an obnoxious law, without any ulterior objects in view, success can hardly fail to attend their efforts; and the ltimate result of the labours and advice of the President of this Association, and of its Council and Secretary, is to be found in the Locomotives on Highways Act, 1896, and the Local Government Board regulations, which we publish in another column. The aim of this public-spirited body has been not the aggrandisement of a few, but the welfare of the many, and as a natural consequence their representations have been treated with deserved respect by the great public departments and by the Minister in charge of the Government measure of last Session.

Like Sir David, Mr. Barr is by no means an enemy of the horse. In response to an interviewer he gave vent to the following views:—

"With regard to the equine world it will mean the survival of the fittest. We shall have good horses. The lame, the halt, the blind, and the 'roaring,' will go to the knacker's. There will be no use for the five-pound-ten 'work-him-till-he-drops-down-dead' animal which some omnibus and cab proprietors are in the habit of sending out to be 'used up' after dark. Our eyes will no longer be greeted with the spectacle of curious people crowding round the corpse of a horse which is awaiting the van that is to take it to the tan-yard. Horses will still be ridden and driven for pleasure, but for commercial purposes they will be almost universally discarded, so soon as the self-propelling cart is a recognised boon to every tradesman."

"Who will be the first to adopt the horseless carriage, do you think?"—"The omnibus companies, without a doubt. Why? Why, because they will save what they now spend on the up-keep of their horses—that is to say, they will save on each pair of horses from a pound to twenty-five shillings a week, and as each 'bus requires about five teams, the saving in horseflesh, stabling, and stablemen's wages will be very considerable. As far back as 1834 an omnibus used to run from Paddington to Regent's Park and the City, carrying 14 passengers at 6*d.* per head. It is certainly strange that 60 years have been allowed to pass by without an attempt being made in London to organise self-propelling vehicles of the same kind."

"I suppose there wouldn't be so many 'blocks' in the traffic if horses were dispensed with?"—"Well, there would be far more room, and, as the traffic would be less congested, self-propelling vehicles would widen the streets without making any charge for it. Another important advantage would be the diminution of the wear and tear which the streets suffer from the horses' hoofs. There would be a lot more room, you see, considerably less noise, a great saving in road-mending, and not half so much work for the hospitals in the shape of street accidents."

"But I suppose these self-propelled vehicles would occasionally cannon into one another?"—"Accidents of that sort would be very few and far between. A self-propelled carriage can be manœuvred as easily as a tricycle. Besides, there would be no loss of life occasioned by runaway horses."

"Can't the autocar run away?"—"No, nor blow up. The autocar, you must understand, is in very much the same stage now as the steam-engine was in 1820. But invention is encouraged in these days as much as it was stifled in those; so that directly the 'driving' of a self-propelled carriage in the streets is made legal, the manufacture of the New Vehicle will spring up all over the country."

With this slight statement of his opinions on automotors in general we must leave Mr. Andrew Barr for the present, with the addition of an opinion of our own, that he is distinctly the right man to hold a none too easy post, viz., that of smoothing the difficulties in the way of the transition of the carriages of to-day into the automotors of the future.

NEW INVENTIONS.

Compiled for "THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL" by HERBERT HADDAN and Co., Registered Patent Agents, of 18, Buckingham Street, Strand, W.C., London.

Patents Applied For.

20,951. September 22nd, 1896. W. S. ROSS and W. ALEXANDER. Improvements in driving gear for auto-cars and other vehicles and navigable vessels.

21,101. September 23rd, 1896. W. LOWE and G. R. WILFORD. Improvements in velocipedes, motor-cycles, motor-cars, and the like.

21,114. September 23rd, 1896. W. H. DEAVILLE. Improvements in motor wagons and vehicles for common roads.

21,122. September 23rd, 1896. E. A. ASHCROFT. Improvements in the propulsion of bicycles, tricycles, motor carriages, and like vehicles.

21,136. September 24th, 1896. F. LISTER. Improved oil or gas engine applicable for use in the propulsion of vehicles.

21,264. September 25th, 1896. F. C. BLAKE. Pneumatic spring or vibration insulator for motor-cars or other vehicles.

21,274. September 25th, 1896. W. J. MUNDEN. Improvements in motor vehicles.

21,307. September 25th, 1896. W. J. PERRETT. Improvements in motor-cars. (L. Lockert, France.)

21,330. September 26th, 1896. A. BAGSHAW and J. T. B. BENNETT. Improvements in driving chains for use in bicycles, tricycles, velocipedes, motor-cars, carriages, vehicles, and other such purposes.

21,429. September 28th, 1896. W. WOOLF. Improvements in driving chain for bicycles, tricycles, and other velocipedes and horseless carriages.

21,558. September 29th, 1896. E. THOMSON. Improvements in and connected with gearing for motor-cars and such like.

21,675. September 30th, 1896. C. M. JOHNSON. Improvements in and connected with motor carriages.

21,697. September 30th, 1896. F. W. LANCHESTER. Improvements in power-propelled vehicles.

21,731. October 1st, 1896. W. RICHARDSON, A. RICHARDSON, and S. GREEN. Improvements in velocipedes, bicycles, tricycles, motor-cars, and other road wheel machines.

21,743. October 1st, 1896. C. MARTEL. Improvements in the construction of hydro-carburetted air engines, and in their application to tram and other road carriages. (Date applied for May 5th, 1896.)

21,772. October 1st, 1896. F. W. LANCHESTER. Improvements in power-propelled vehicles.

21,802. October 2nd, 1896. S. GORTON, W. TAYLOR, and THE NEW BEESTON CYCLE CO., LTD. Improvements in or relating to velocipedes, auto-cars, and the like.

21,821. October 2nd, 1896. A. PFLUEGER. A new or improved alarm signal device for use on tramcars, motor-cars, and like vehicles.

21,968. October 3rd, 1896. C. A. BOUNEVIALLE. Improvements in driving gear for cycles, motor-cars, and similar vehicles.

22,085. October 6th, 1896. A. BLECHYNDEN. Improvements in self-propelled vehicles.

22,090. October 6th, 1896. D. CUTLER. Improvements in driving mechanism for cycles, common road vehicles, and machines generally.

22,144. October 6th, 1896. THE BRITISH THOMSON-HOUSTON CO., LTD. Improvements in electric or other motor-trucks. (N. C. Bassett.)

22,261. October 8th, 1896. L. B. TRISTRAM. Protector from motor-vehicles.

22,286. October 8th, 1896. W. H. WAUD. Improvements in gas or vaporised-oil driven locomotives or cars.

22,412. October 9th, 1896. F. F. WELLINGTON, E. P. ALLAM, and H. W. W. DRUMMONDS. Improvements in or connected with reversing gear for motor-driven vehicles.

22,453. October 10th, 1896. W. A. MARTIN. Improved driving gear for motor road cars.

22,609. October 12th, 1896. A. J. BOULT. Improvements in or relating to driving and guiding mechanism for self-propelled and similar vehicles. (G. Lacoste and H. O. Duncan.)

22,637. October 13th, 1896. G. PRIESTLY. Improvements in cycles, motor-carriages, and vehicles of a similar character.

22,668. October 13th, 1896. C. BURGESS. New or improved chain speed gear for motor-vehicles.

22,738. October 13th, 1896. THE STEAM CARRIAGE AND WAGON CO., LTD., and J. E. THORNYCROFT. Improvements in motor-propelled vehicles.

22,979. October 14th, 1896. L. GUNN. An automatic signalling appliance for motors, auto-cars, and ordinary carriages.

22,871. October 15th, 1896. W. SIMPSON, W. L. BODMAN, and D. H. SIMPSON. Improvements in the construction of steam generators for motor-vehicles.

22,915. October 15th, 1896. T. COULTHARD, jun. Improvements connected with the driving gear of auto-cars or mechanically-propelled vehicles.

22,922. October 15th, 1896. W. T. BURBEY and H. A. HUTTON. Improvements in and connected with motor-cars.

23,066. October 16th, 1896. R. J. WILKINSON. Improvements in brakes for cycles, carriages, motor-cars, and other road vehicles.

23,174. October 19th, 1896. E. T. WAINWRIGHT. Improvements in or relating to the construction of carriages (road vehicles), horse or horseless.

23,265. October 20th, 1896. J. M. COLLINS. Improvements in the driving mechanism of velocipedes and motor-cars.

23,337. October 21st, 1896. R. H. SMITH. Oscillant driving wheels for motor-carriages.

23,386. October 21st, 1896. G. MABBUTT and B. G. PRICE. Improvements in bicycles, tricycles, and other velocipedes, and in motor-cycles.

23,424. October 22nd, 1896. J. GRAHAM, Balbride, Carlogie Road, Carnoustie. An improvement in the apparatus for steering of vehicles, motor-cars, and the like.

23,604. October 23rd, 1896. J. ROOTS and C. E. VENABLES. Improvements in or connected with oil motors for vehicles, cycles, boats, and the like.

23,615. October 23rd, 1896. M. ARCHER. Improvements in auto-cars and like vehicles.

23,802. October 26th, 1896. J. O. O'BRIEN. Improvements in auto-cars. (L. M. D. Triouleyre.)

23,825. October 26th, 1896. H. BELCHER and A. H. NIBLETT. Improvements in or relating to motor-vehicles.

23,992. October 28th, 1896. R. A. MARPLES. A new system of electrical propulsion for cycles, and common road and other vehicles.

24,058. October 28th, 1896. R. A. MARSH. Improvements in gas and oil motors, especially applicable to motors intended for the propulsion of vehicles.

24,085 October 29th, 1896. W. ANGUS, and D. LEWARS. Improvements in the method of attaching motors to road carriages, vans, and other vehicles.

24,154. October 29th, 1896. A. ROUBLEFF. Improved means for preventing or reducing vibrations and shocks in motor-cars, cycles, and other vehicles.

24,280. October 31st, 1896. F. R. SIMMS. Roller springs for motor-cars and other vehicles.

24,306. October 31st, 1896. T. MCCARTER and T. COOPER. Improvements in fluid pressure motors.

24,338. October 31st, 1896. H. H. MULLINER. Improvements in motor-carriages.

Specifications Published.

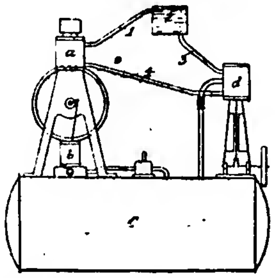
16,068. August 27th, 1895. Propulsion of road or other vehicles. MICHAEL HOLROYD SMITH, 161, Trinity Road, Upper Tooting, Surrey, Engineer.

According to this invention it is proposed to employ a small explosive engine such as indicated at *a*, which drives directly or otherwise an air-pump or compressor such as *b*, which serves to charge a receiver *c*, which supplies the compressed air to a small air-engine *d* running at a high velocity, and communicating its power to the shaft it is required to drive or to the axle or wheels of the vehicle either directly or by means of worm or other gearing.

In order to secure lightness, which is especially desirable in the case where the above arrangement is employed to operate a motor-car, the air receiver *c* may be made to serve as the foundation or bed plate for the explosive and air engines, and the oil-tank may be placed either below the receiver or in any convenient part of the vehicle, the stopping, starting, and speed of the air-engine *d* being controlled by valves and operating handles placed so as to be easily operated.

When compressed air escapes from the exhaust-pipe of an air-engine intense cold is usually produced, which may cause the outlets to become choked, and it is therefore proposed to employ an arrangement such as that shown, in which the the water in the jacket round the explosive engine cylinder *a* circulates by means of a pipe 1, tank 2, and pipe 3, round the exhaust port and cylinder, if desired, of the air-engine *d*, and thus imparts the heat the water has derived from contact with the explosive cylinder, to the ports, &c., of the air-engine, the water, which has then fallen considerably in temperature, being returned by pipe 4 to the cylinder *a*, which it thus tends to keep cool.

A valve arrangement for supplying the compressed air to the explosive cylinder for producing the compression charge (and thus saving the engine the work of compressing on its return stroke) is used, in which a piston-valve reciprocated by some moving part, and having a regulated stroke, works in a casing, preferably cylindrical, situated beneath or near to the cylinder *a*.



When an explosive engine operating in the ordinary manner is running and charging the receiver *c*, the pressure of air in the receiver may be made to operate a valve controlling the engine, and the arrangement may be used alone or in conjunction with a centrifugal governor.

As the duty of the explosive engine is to keep the receiver charged, thus maintaining a pressure and volume of air to work the air-engine, it follows that if the air-engine is doing light work the pressure in the receiver will rise and the load upon the gas-engine increase, and, unless some provision were made, the receiver would burst or the gas-engine be pulled up, and therefore it is proposed to employ a relief arrangement which may be a separate valve, or made in conjunction with the valves of the air compressor *b*, in which the inlet valve of the air-pump chamber is controlled by a diaphragm in a passage leading from the exit valve to the receiver.

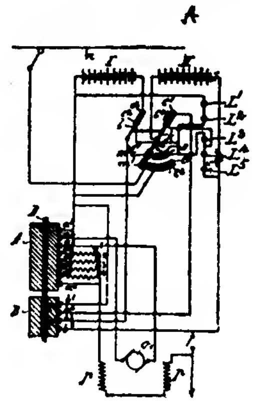
The axle is driven by means of worm gearing contained in a casing, the receiver *c* being then arranged in the form of tubular chambers placed above and below the main axle, so that a low centre of gravity is obtained, or said receiver may be in the form of a coil or in other suitable forms.

11,552. May 27th, 1896. Means for switching current, applicable for electric motor-cars operated by a mixed supply. CLEMENS ADAM, 7, Tulpenstrasse, Hanover, Germany.

This invention relates to a switch device for those electric motor-cars wherein the current is supplied in sections from the outside and from an accumulator battery carried on the cars.

The present invention affords an extremely simple method or means of switching current, by means of which both useless consumption of energy and interruptions in the working caused by seizing wrong handles, short circuiting, and the like are avoided.

The improved method of switching is based on the use of two switch drums coupled in a peculiar manner, one of which operates the switching on or off of the current during the starting or stopping of the car, the other the switching on of the batteries in parallel and in series, whilst a main switch assumes various fixed positions in order to allow of current being sent simultaneously either into the motor and the batteries, or into the batteries alone, or from the outside conductor to the motor, or finally from the batteries to the motor.



In the drawing, the three switching devices are indicated by the letters A, B, and C. The two switch drums A and B are arranged on a common spindle D with which the drum A may revolve whilst the drum B is revoluble independently on said spindle.

Both drums are also connected in a peculiar manner, as will be more particularly described hereinafter.

The main switch C, which is independent of the spindle D, comprises two switch arms *k* and *l* connected by a link and contacts c^1, c^2, c^7, c^8, also an arm *m* attached to the arm *k* with contacts m^1 and m^2 and concentrically arranged contacts c^3, c^4, c^5, c^6. The arrangement is so coutrived that the main switch can assume three different positions. In the position shown in the figure, the switch arm *k* rests on the contact c^1 and the switch arm *l* on c^2. The contacts c^1, c^7, and c^2, c^8 are simultaneously interconnected, whilst contacts c^3, c^4, c^5, c^6 are out of contact with the contacts m^1, m^2.

The connections of the separate contacts and brushes with the halves of the battery I and II with the outside conductor *n*, with the two drums A and B, the armature *o*, the field coils *p*, and resistances R^1, R^2, R^3, R^4, and with the lamps L^1, L^2, L^3 L^4, and L^5 are shown in the drawing and can easily be understood.

Printed Copies of the above Specifications Published may be obtained by forwarding 1s. for cost of each copy and postage to Messrs. Herbert Haddan and Co. Applications not yet Published.

MOTOR-CAR PASSENGER INSURANCE.—A new departure in accident insurance has been made by the *Whitehall Review* in conjunction with the Ocean Insurance Company. Our contemporary has signalised the inception of the motor-car era by insuring its readers for £1,000 in case of fatal accidents.

The SUBSCRIPTION LIST OPENED MONDAY, November 16, 1896, and will CLOSE on or before WEDNESDAY, November 18, at twelve noon, for Town and Country.

This Company will work under a sole license from the British Motor Syndicate, Limited, and will at once contract with the Great Horseless Carriage Company, Limited, for the manufacture of electric cabs, which will be let out to ply for hire in the public streets.

THE

LONDON ELECTRICAL CAB COMPANY, LIMITED.

SHARE CAPITAL - - £150,000.

DIVIDED INTO 150,000 SHARES OF £1 EACH.

Payable—5*s.* on application, 5*s.* on allotment, and the balance of 10*s.* two months after allotment. Of this issue £100,000 in cash or shares is for working capital.

DIRECTORS.

H. R. PATERSON, Director of Carter, Paterson, and Co., Limited, Carriers.
The Hon. REGINALD BROUGHAM, Director of the London Electric Supply Corporation, Limited.
H. H. MULLINER, Director of the Coupé and Dunlop Brougham Company, Limited, and Chairman of Mulliners, Limited.
The Hon. EVELYN ELLIS, Director of the Great Horseless Carriage Company, Limited.
J. H. MACE, Director of the Daimler Motor Company, Limited, and of the Northampton Street Tramways Company.

CONSULTING ENGINEERS.

KINCAID, WALLER, and MANVILLE, 29, Great George-street, Westminster, S.W.

SOLICITORS.

ASHURST, MORRIS, CRISP, and CO., 17, Throgmorton-avenue, E.C.

BANKERS.

LONDON AND MIDLAND BANK, LIMITED, 52, Cornhill, E.C., and all Branches.

BROKERS.

G. H. and A. M. JAY, 17, Old Broad-street, and Stock Exchange, London, E.C.

AUDITORS.

MONKHOUSE, STONEHAM, and CO., 28 and 29, St. Swithin's-lane, E.C.

SECRETARY AND REGISTERED OFFICES.

MAURICE JENKS, A.C.A., 6, Old Jewry, E.C.

PROSPECTUS.

This Company has been formed to place on the streets of London electrically-propelled cabs (British Motor Syndicate Patents), to supersede the present hansoms and four-wheeled cabs.

There can be little doubt that electricity is about to become the motive power for cab traffic in London, and the Act of Parliament passed last session (coming into operation on the 14th instant) opens up great financial opportunities in this direction.

The British Motor Syndicate, Limited, by far the most important corporation dealing with this industry, claiming to possess all the patents of value in connection with motor-carriages, will grant to this Company a sole license to work within the metropolitan area under such of their patents as this Company will require, at a royalty of £4 per cab per annum.

The Great Horseless Carriage Company, Limited, concur in the license, and will enter into a contract to manufacture the cabs for this Company as and when required.

Whilst petroleum may become the motive power in country districts, and steam will probably be used for very heavy vehicles, there is no doubt that electricity will be the most advantageous where the traffic can be located within a radius. There is no smell, no noise, no heat, no vibration, no possible danger, and it has been found that vehicles built on this Company's system do not frighten passing horses.

Electrical cabs have great advantages over those at present in use. They are far more under control than horse-driven vehicles; they can be driven at any speed; and no accidents can arise from horses falling, shying, bolting, or moving when the vehicle is entered, &c.

The drivers require no knowledge of electricity—in fact, the present cabmen will doubtless become the drivers.

FORM OF CAB.

The cabs (the construction of which has been provisionally protected) will fulfil all the requirements of the new Act, and of the police regulations.

They have been most carefully studied, and they will possess many more luxuries than those now in use, such as arrangements for opening windows and doors; electric light inside and in the outside lamps; rubber tyres, improved upholstering, spring cushions, and other advantages.

The necessity for keeping them up to a high standard of excellence has also been realised, and a larger amount than is usual has been provided in the estimates for this purpose.

METHOD OF WORKING.

The cabs will ply for hire in London in the same manner as the present hansoms, and at the same rates.

Two sets of accumulators will be suplied to every cab, each set capable of propelling the vehicle forty miles with one charging. These accumulators can be changed in a few minutes. The same cab can thus be used continuously day and night.

It is intended to open depôts in different parts of London, so that the driver will be able to change accumulators without always having to return to his own station.

The electric supply companies have shown great willingness to co-operate with this scheme, as their current can be taken when not required for lighting purposes. The London Electric Supply Corporation, Limited, are prepared to make special arrangements for supplying the electricity at a very low price.

THE ELECTRICAL SYSTEM TO BE USED.

The system under which this Company will work is that of Mr. W. C. Bersey, A.I.E.E., who has agreed to act as electrical manager, and who has devoted the last eight years to the subject of electrical motor-carriages, one of his carriages having already run several hundred miles.

Mr. W. C. Bersey has been able, owing to his large experience in building electrical motor-carriages, to obtain several valuable patents in connection with their construction. The sole right to manufacture under these patents for the Company's purposes is included in the license from the British Motor Syndicate, Limited.

The electricity is carried in cells placed underneath the vehicle. These are of special patented design and suited to the variations of discharge, which are at times necessary, and are regulated by a single driving switch, giving the degrees of speed, and enabling the vehicle to run either backward or forward as required.

In order to thoroughly satisfy themselves respecting the electrical system under which the Company propose to work, the whole scheme has been submitted to Messrs. Kincaid, Waller, and Manville, the leading experts in this country in connection with electrical traction, whose opinion is as follows:—

EXPERT'S OPINION.

"29, Great George-street, Westminster, S.W.;
"November 12, 1896.

"The Directors of The London Electrical Cab Co. (Limited).

"Gentlemen,—We have examined the electric motor-vehicles built on your system, and carefully considered their suitability for use as hackney carriages in London, and we are of opinion that they are thoroughly adapted to meet these requirements, being practically noiseless and vibrationless, and easy of control, also extremely economical in maintenance, as the following estimates we have prepared will show:—

COST OF EACH VEHICLE.

Each cab, including painting, upholstering, electric lights, door-opening apparatus, wheels with rubber tyres, brake, steering apparatus, together with motor and gearing, switches, and resistance, fixed complete..	£150 0 0
Two complete sets of accumulators, each capable of propelling the vehicle 40 miles without recharging, at £50 each	100 0 0
Total capital cost ..	£250 0 0

COST OF MAINTENANCE PER ANNUM.

"We have estimated the cost of working, maintenance, or depreciation on the following liberal basis:—

Repairing, painting, depreciation, &c., per cab per annum	£42 0 0
Maintenance of two accumulators, including all risks (other than street accidents), at 10 per cent. per annum of costs, as quoted by manufacturers	10 0 0
	£52 0 0

TOTAL COST PER DAY.

Maintenance as above, at £52 per annum, equals per day	£0 2 10½
Electrical energy amply sufficient to run a cab 50 miles—22 B.O.T. units, at 1½*d*., equals per day	2 9
	£0 5 7½

"The contract which the accumulator makers are prepared to make is an excellent safeguard of your interests on the only point that might be open to question, *i.e.*, the maintenance of accumulators.

"From our experience as engineers to many of the electrical tramway campanies, we see no reason why electric traction for hackney carriages should not supersede horse traction.

"Yours faithfully,
(Signed) "KINCAID, WALLER, and MANVILLE."

FINANCIAL ESTIMATE.

The present reduced price paid by the cabmen for hire of a hansom, with use of two horses (under the Asquith award), averages 12*s*. 2¼*d*. per day, and assuming that this Company charges the same (though it is fair to suppose that they will be in a position to charge more) there will be 6*s*. 7*d*. per cab per day available as profit.

This is equivalent, on a basis of only 320 cabs (which, at £250 each, as above, would cost £80,000) to an annual profit of £38,446 13*s*. 4*d*.

From this would have to be deducted the sum of £1,280 to cover the royalty of £4 per cab, and the usual administration expenses, including rent, rates, taxes, and management charges.

As there are over ten thousand licensed hansom and four-wheeled cabs in London, the scope for profit to be made by this Company is very great.

Should further capital be required at a future date for the construction of more cabs, it is intended to make an issue of Preference shares at a fixed rate of interest only, or Debentures secured upon the Company's stock of vehicles, thereby increasing the profit divisible on the present issue of shares.

PURCHASE OF LICENSE, CONTRACTS, &c.

This Company will acquire for the price of 50,000 shares, or cash in lieu thereof, on the terms of the contract hereinafter mentioned, the license herein referred to from the British Motor Syndicate, Limited, subject also to the payment of a royalty of £4 per cab per annum. The said price has been fixed by The Traffic Syndicate, Limited (in which the last three-named directors of this Company are interested), who are the vendors to this Company, and will pay all expenses of and incidental to the promotion of this Company and issuing of this prospectus, excepting the cost of stamp duty on registration and the legal expenses of this Company's solicitors. The following contracts have been entered into (1) dated the 12th day of November, 1896, and made between The Traffic Syndicate, Limited, of the one part, and this Company, of the other part, whereby for the consideration above mentioned, and subject to the provisions of such contract, The Traffic Syndicate, Limited, agree to procure for this Company the license and agreements above referred to: and (2) dated the 12th day of November, 1896, and made between the Great Horseless Carriage Company, Limited, of the one part, and this Company of the other part.

Applications for shares should be made on the form accompanying the prospectus, and forwarded, with the amount due on application, to the Company's bankers. If the number of shares allotted is less than that applied for, the surplus application money will be credited to the amount due on allotment, and any balance will be returned to the applicant.

Copies of the above-mentioned contracts, and of the memorandum and articles of association of the Company, with the original report, can be seen at the offices of the solicitors for the Company.

Prospectuses and forms of application may be obtained from the registered offices of the Company.

London, November 12th, 1896.

LONDON ELECTRICAL CAB COMPANY, LIMITED.

APPLICATION FORM FOR SHARES.

To the Directors of the London Electrical Cab Company, Limited.

Gentlemen,—Having paid to your bankers the sum of £.........., being a deposit of 5*s*. per share on an application for .... shares of £1 each in the above-named Company, I request you to allot me that number of shares, and I agree to accept the same or any smaller number that may be allotted to me, subject to the memorandum and articles of association, and upon the terms of the prospectus dated the 12th day of November, 1896, which I have read; and I authorise you to place my name on the register of members in respect of the shares so allotted me, and I agree to pay the further instalments upon such allotted shares when the same becomes due.

Name (in full) ....

Address ....

Description ....

Date .... 1896.

Signature ....

All cheques to be made payable to the bankers.

THIS FORM MAY BE CUT OUT AND USED.

THIS

is the "FACILE" Petroleum Oil Motor, which requires

No spirit or dangerous essence.
No heating tube.
No constant-burning lamp.
No battery.

All of these are causes of trouble.

SOLE MAKERS:

BRITANNIA CO.,
Colchester.

"FACILE"
CARRIAGE MOTOR.

No connection with other firms advertising under similar name.

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AUCTIONEERS, LAND AND ESTATE AGENTS, AND SURVEYORS.

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Surveys and Valuations for Partnerships, Company Promoters, Probate and Administration, Land and Agricultural and Trade Valuers.
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Advances also made to any amount on Property intended for Sale.
Estate Development and Sanitation a Speciality.

SITUATIONS WANTED.

GENTLEMAN (33), having considerable practical experience of oil motors, desires engagement as representative, manager, or any position of responsibility; highest references. Address, "Motor," care of Messrs. King and Co., Limited, 62, St. Martin's-lane, W.C.

AS DRIVER.—Capable of taking charge of dynamos, motors, and electric fitting, &c.; age 20. H. Millman, 9, Leslie-street, Barnsbury.

AS DRIVER.—Can take charge of cars, &c.; fitter and erector; age 36. W. Robinson, 11, H Block, Peabody-buildings, Bedfordbury, W.C.

AS DRIVER or CONDUCTOR.—Capable of taking charge of cars, &c.; age 21. G. Snell, 11, Rodney-place, Islington.

COMPETENT DRIVER.—Knows London well; age 45. A. Fox, 2, Lyall-place, Eaton-place, S.W.

AS DRIVER.—Electrician and mechanic; thoroughly experienced. Walter Woods, 23, Grove-place, Ealing, W.

AS DRIVER or CONDUCTOR.—Capable of taking charge of motor. F. Lancaster, 12, Hall-street, City-road.

AS DRIVER.—Engineer and fitter; thoroughly capable; age 32. G. Rowell, 54, Lydford-road, Paddington.

AS DRIVER or CONDUCTOR.—Licensed bus driver; good references. F. F. J. Piper, 9, Upper-mall, Hammersmith.

ASSISTANT DRIVER.—Cycle engineer; good references; age 19. William Hedrick, 8, Westmoreland-row, City-road.

AS DRIVER or CONDUCTOR.—Experienced; good references; age 46. Chas. Little, 362, Lillie-road, Fulham.

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MOTOR
VANS AND CYCLES.

A Motor Carriage and Delivery Van can be seen in operation in London by Appointment.

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JULIUS HARVEY & Co.,
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Illustrated Catalogue with Copy of New Act, One Shilling.

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CHAMELEON ELECTRIC SIGN.

E. L. BERRY, HARRISON & Co., Electrical Engineers and Contractors.
Office and Show Rooms—Lyric Chambers, Whitcomb Street, London, W.C.
Telegraphic Address—"Kathode, London."

AS DRIVER or CONDUCTOR.—Machinist; long experience. J. Graham, 5, New-street-cottages, Vauxhall-bridge-road.

CONDUCTOR or INSPECTOR, &c.—Experienced. Henry Bassett, 42, Newman-street, Oxford-street, W.

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CONTENTS.

RECENT DEVELOPMENTS IN MECHANICAL ROAD CARRIAGES.

THE following paper was read before the Society of Arts,* on Wednesday, the 25th ultimo, by Mr. Worby Beaumont, M.I.C.E. Sir Frederick Bramwell occupied the chair, and there was a full attendance.

Mr. WORBY BEAUMONT said:—Since I last had the honour of addressing you on this subject in December last year, the most important development has been that of public opinion, which has forced upon the Legislature the necessity for the removal of the restrictions which until now have effectually prevented the development of road traction, and of carriage by mechanical means on the common roads of the United Kingdom. British engineers were fined for running a motor tricycle for experimental purposes on our roads at a speed of more than two miles per hour unless preceded by a man on foot to clear its way, until the 14th of November, 1896, the day on which the Locomotives or Highways Act of 1896 came into force. The long existing and extremely absurd restrictions against travelling over the country by mechanical means must ever be regretted, not simply because of the deprivation of those who would have reaped the benefit of mechanical transport for trading purposes, but because of the prohibition of all experimental running, which prevented British engineers from developing the steam or other road carriages, the construction of which might by this time have formed a greater industry than it has already done in the hands of our unrestricted competitors abroad. The result is that everything towards the construction of light motor vehicles has now to be commenced, while for a foreign trade other countries are now two years ahead of us.

All this is to be regretted, but it is past, and there now only remains a few restrictions which the lapse of a very few years will probably see removed from the Local Government Board list of regulations. These regulations have, in general, the assent of the motor carriage building and using public, but there are some which are of the nature of dictates to mechanical engineers, who, on such structural detail as reversing gear, brakes, and wheels, should be left to provide that which they, by past or coming experience, know or will find is best.

A year ago the modern mechanical road carriage, as distinguished from the steam boiler and engine vehicles, with a few seats attached, made in England between 1858 and 1876, was almost entirely the French and German ordinary carriage driven by a Daimler or a Benz petroleum spirit motor. Several of these were, in their more developed forms, the product of the incentive in the form of prizes offered by the French *Petit Journal*. For those prizes, it will be remembered, these vehicles ran from Paris to Bordeaux and back, several of the carriages doing some remarkably creditable running. The most striking feature of the results of those trials was the defeat of the steam vehicles by those driven by petroleum spirit motors, although in previous shorter races the steam vehicles had given much promise. The speaker then proceeded to give a detailed description of the French and American contests, which has already appeared in our columns.

Turning now to the lessons of the Paris-Marseilles race, Mr. Beaumont said: It will first be noticed that no steam vehicles were present; all these long distance runs were made by benzoline-motors. The well-known Serpollet carriages were not even entered, although they had done so well in the *Petit Journal* competition in 1894 and 1895, and attracted much attention, when shown in the Hurlingham grounds and in the recent Crystal Palace exhibition.

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In these competitions there were other steam carriages by Scotte, and by De Dion and Bouton. In 1894 the second prize was awarded to the latter firm for their steam tractor or steam bogie, and the third prize was awarded to M. le Blant for a steam carriage for nine persons, fitted with a Serpollet boiler. It is thus evident that that the Continental motor-carriage builders with their now very extensive experience in this matter, have found the construction of a steam motor-carriage a much more difficult problem than the construction of one operated by benzoline or petroleum spirit. One of the first difficulties is the much greater weight of the steam carriage, almost all of which is due to the weight of the boiler and its connections, and also to the weight of the supply of fuel and water required for a journey of any distance. The steam motor itself may be very light indeed and yet sufficient for the purpose. The Serpollet instantaneous generation boiler seemed at one time to be likely to meet the requirements of this essential part of the equipment of a steam motor-carriage, and but for the weight of it and its case, and the coke fuel, there is no doubt it would, and it seems probable even yet that with certain modifications it may provide all that is required. The boiler, as is well known, is built of tubes having exceedingly small water capacity as compared with their thickness and weight, as is shown by the view on the screen.

Now, in connection with the use of steam under the circumstances of very variable demand, as in the case of the motor-carriage, there is no doubt very distinct advantage accruing from the use of heavy thick tubes carried within a refractory case and heated by a powerful coke fire, because the mass of heated material constitutes a very effective heat accumulator capable of instantaneous conversion on demand. The frequent stoppages, the easy work on level roads, the complete absence of work in going down hill, all are conditions which make a heat accumulator steam generator with small water capacity desirable, and especially as such a generator will respond to the sudden call for a quantity of steam for starting or for climbing short hills largely in excess of its mean capacity. But there is nothing mysterious about the capacity or performance of such a boiler, and it has to be remembered that the steam required for mounting a long hill gives the measure of the boiler capacity required. When the accumulated heat in the mass of material forming the tubes has been used up during the mounting of a hill, then the Serpollet boiler, like any other, depends upon the quantity of its heating surface and upon the amount of fuel which can be effectively burned in heating it or, in other words, upon the grate surface and draught or fuel burning capacity. It is from this cause that the Serpollet as made in 1894 and 1895 was heavy for ordinary easy road travelling though very efficient for the purpose when it was made with sufficient surface for long hill climbs. More than a year ago M. Serpollet ceased for a time to give his attention to his steam-carriage so as to enable him to develope the application of his system to mechanically propelled tramcars, with which he has attained considerable success.

Whilst he has been so engaged very little progress has been made in France with steam for road traction. His old vehicle was not suited to everyday use. It could only carry a supply of coke for a run of from 40 to 50 kiloms., or from about 25 to 30 miles. It attained high speeds on level roads or easy gradients, was handy to drive, and economical, but it was cumbrous and heavy, and coke was not a pleasant fuel to use. The steam tricycle constructed in 1889 also used coke. The generator weighed 350 kilos. with the fuel.

The vehicle more lately constructed runs on three wheels, the rear wheels serving for propulsion, and the front bicycle wheel for steering. The generator is placed at the back of the carriage, and the two-cylinder motor, inclined at 90°, is under the seat, bolted to the steel tube underframe which curves up in front for the steering head. The crank-shaft carries a pinion which gears into a large wheel on the driving axle, so that the usual intermediate gearing is dispensed with. For fuel, petroleum is now used, a Longuemare burner being employed. The ordinary lamp petroleum is admitted at the bottom of the burner, and is forced up through a spiral tube, where it volatilises under the heat of the flame, and descending to the bottom of the burner, passes through a form of metallic filter to relieve it of impurities. It then enters a chamber, from which it passes through small holes into a second chamber containing eight jets, through which it issues as petroleum vapour and burns with an intense flame, spreading out to cover the whole area of the funnel formed by the spiral tubes and space above it containing the Serpollet steam generator. The burner is started in the ordinary way with a little methylated spirit, and in from eight to twelve minutes the machinery is said to be ready for starting.

The new three-wheeled carriage is merely an experimental one. It was not intended to do any serious work, and yet it has already, it is stated, run more than 1,000 kiloms. They say that they can run at higher speeds than have yet been attained. They can run easily at 35 kiloms. an hour, and even in going up the Surenes Hill, which is particularly long and steep, they can go at 25 kiloms. Everything is tested in France by speed of travelling. The speed can, with steam, of course be regulated with precision, and with the power this carriage appears to have there is no necessity for mechanism for changing speed. The speed mentioned is, however, unnecessary, and its possibility shows that the boiler and engine are larger than necessary. In the experimental vehicle a reserve of 22 litres of petroleum and 50 litres of water can be carried. With this supply of petroleum the carriage has run from Paris to Rouen —about 140 kiloms., or 88 miles—without replenishing the oil. The time occupied in covering the distance was, the author is informed, six hours. The weight of the carriage without load is 700 to 800 kilos., or from 7 to 8½ cwt.

M. Serpollet is building a new carriage with four wheels, in which he will make certain modifications. The steam generator, instead of having circular spiral vapourising tubes, will have them arranged in a square placed one above the other, so as to obtain a larger heating surface. It will also be fitted with a condenser underneath the carriage. With this he intends to condense the steam in the winter, and return it to the boiler, so as to suppress the exhaust, and make renewal of the water supply less frequently necessary. In the summer, he says this is of no importance, as the steam, being sent away with the heated gases, will not then be visible. The gearing is light and compact, and will be enclosed in a gear case to protect it from dust and mud.

The same system of boiler construction for oil fuel is to be applied to tramcars, the weight of the boiler being very much reduced by it.

The De Dion and Bouton boiler is a much more delicately constructed boiler, consisting as it does of an exterior annular water case, connected to a central, similarly-constructed, annular water and steam space by a large number of upwardly inclined radial and steam tubes.

One of these boilers, weighing about 530 lbs. empty, contains 22·75 square feet of heating surface, and has a grate area of 1·86 square feet. It will, it is said, evaporate about 6 lbs. of water from average temperatures per lb. of coke, and yet it is said to be sufficient for an 18 horse-power motor. It thus has only about 1·26 square feet of heating surface per horse-power, and only 0·103 square feet of grate surface per horse-power. Assuming the little engine employed, which was a small compound engine, to be capable of giving a brake horse-power for 30 lbs. of steam, then it will be seen that each square foot of surface would have to evaporate no less than 23·8 lbs. of water per square foot per hour, and, further, that no less than 52½ lbs. of coke would have to be burned per square foot of grate surface per hour.

Now, inasmuch as the Serpollet boiler is not credited with evaporating 6 lbs. of water per lb. of coke, it will be readily understood that both these boilers have been very much overrated, and hence the difficulty of providing steam for full power for more than a very short time. The Serpollet mass of heated material will, of course, enable the user for a few seconds, or a minute or two, to obtain many fold the average power of the boiler on continuous load, but the store of heat is soon gone, and the boiler soon flooded if water is sent in at maximum rate.

This will be easily seen when it is remembered that the latent heat of evaporation of water from, say, 62° is 1,116 units, and, therefore, no less than eight times the total heat of the iron tubes, even assuming them to be at a 1,000° in temperature when called upon to give up their store. If then, as appears to be the case, these two boilers are the best, or, at all events, the most favoured by those who have been working at this problem for years, it would appear obvious that the great advantages offered by the steam-engine have hitherto been unattainable because of the difficulty which besets the problem of constructing a sufficiently powerful boiler of sufficient lightness.

It is owing then to the hitherto unattainable in steam-generators that the light oil-motor has, as in the recent Paris and Marseilles race, displaced the steam-engine, and it is not easy to see how with the low weights possible with the oil-motor anything yet known in the form of steam-generators, the steam-engine with everything else in its favour can compete. It is true that success is said to have attended the trials of the Blackburn dog-cart in which a comparatively small coiled tubular boiler, heated by a Bunson methylated spirit burner, was employed, but inasmuch as the trials of this dog-cart were made over very short distances, and the engine employed not of high efficiency, it does not appear to have been demonstrated that this boiler was capable of generating sufficient steam for meeting the demands of ordinary road travelling. Considerable advances have been made in the last few years in the construction of water-tube boilers, and some of these boilers will no doubt generate more steam per unit of their weight than was possible with most of the boilers used in steam-carriages between 1858 and 1878, or any of the boilers used in the modern light road locomotive, highly efficient as some of these are. They do not appear, however, to offer any advantage not equally secured by the boilers of Dance, Gurney, Church, Hancock, and Macerone 60 years ago, and it is possible that some of these and the high pressure tubular boiler of Loftus Perkins may even yet, aided by the possible very high temperatures obtainable by the combustion of petroleum as fuel, yet enable us to employ the steam-engine.

It may be asked what, after all, are the advantages which steam offers, and we may answer this question by saying, firstly, the steam-engine affords greater range and ease of manipulation within the limits of no power, and full power than any other motor; secondly it may be stopped and started with more freedom, certainty, and smoothness than any other motor, with the exception of the electrical; thirdly, it may be employed for travelling any distances with fuel everywhere available, is easily fitted with reversing gear, and is easily understood.

Now, as against these high qualifications there is the great disadvantage, as compared with the oil motor, of the necessity for manufacturing on the road the working fluid by means of a boiler. With the equivalent of this the oil motor is able to dispense, for even where a vapouriser is employed, or a carburettor, the weight of these parts is comparatively insignificant, and they require but little, if any, attention. Recent advances seem to show that even this may not in future be necessary, for, with a mixture of oils, or with a light oil or petroleum spirit, the carburettor may be dispensed with, and the vaporiser may be either rudimentary or non-existent. To this point return will be made hereafter. The chief disadvantages at present attending the use of the oil motor are, firstly, the necessity for keeping the motor running while the car is standing; secondly, the vibration set up by the explosive impulse, which is very irregular, especially when the motor is running light, or nearly so; and, thirdly, the necessary use of clutches and rather complicated gearing for putting the light running motor into gear, of changing the speed by means of gear. In spite of these difficulties, however, the oil motor vehicle has made such advances in details of its construction that the race from Paris to Marseilles and back was not only a possibility under adverse circumstances with vehicles of various types, but may be looked upon as a certainty for everyday purposes in the hands of people who are willing to bestow upon them their careful attention.

All the carriages of the Paris-Marseilles-Paris race were fitted with gearing very much the same as that which was in, more or less, general use by the several leading makers more than a year ago, and it does not appear that anything more than slight additional strength and improved form of clutches—by means of which the motor can be put in and out of gear with smoothness—are necessary to enable vehicles to run any length of time, as far as this detail is concerned, with satisfaction.

The carriage which won the first prize in this contest was of the Panhard and Levassor construction, driven by a light oil or benzoline motor of the Daimler type. It drove gearing by the arrangement described by the author last December, and as shown by the view now thrown upon the screen.

It cannot be said that any development can be particularly referred to in this carriage, its motor, or gearing, but great care has been bestowed on the design, construction, and workmanship in particular of all the details. The second and third prizes were also awarded to these makers for vehicles similarly operated, and the fourth and sixth prizes to M. Delahaye for vehicles similar to that, a view of which is now thrown upon the screen. This vehicle was exhibited in England last summer at the Crystal Palace Exhibition, and is one of those in which the motion is transmitted from the engine shaft by belting, the motor being, as most makers now prefer, of the horizontal type. It is one of those which received a diploma for gold medal at the Crystal Palace Exhibition. The carriage with which the fifth prize was won by MM. Peugeot et Cie., was similar to that described last year, and was driven by a modified Daimler type motor. The seventh and eighth prizes were won by the Maison Parisienne, or the Benz Company, of France, with vehicles fitted with the Benz horizontal petroleum spirit motor, the ignition of the charge in which is effected electrically. The ninth prize was won by a vehicle by MM. Landry and Beyroux with a cabriolet, driven by a petroleum spirit horizontal motor. Both the tricycles which took prizes in the third-class were of the Dion and Bouton type, as shown by the view now thrown upon the screen. The motor used in these tricycles is not fed directly with the petroleum spirit, as in the case of the latest forms of Daimler motor, but receives a charge of carburetted air from a carburettor. Its arrangement is shown by the diagram on the wall.

Another carriage of which notice should be taken is that of M. Triouleyre, made by the Compagnie Générale des Automobiles, of Paris, which did some excellent running, and is operated by means of a horizontal benzoline motor, which drives a second motion shaft by means of leather belting, the driving wheels being actuated from this shaft by pitch chains. Two of these vehicles entered for the Paris-Marseilles race. A feature of M. Triouleyre's carriage is an arrangement of tubes and air blast for cooling the jacket water, the details of which are not, however, yet made public.

It is worth notice that M. Roger, the French concessionaire of the Benz motor-carriages, refused to enter the Paris-Marseilles trials, because they were races rather than tests of useful qualities.

The steam-van illustrated by a plan, section, and elevation in Fig. 1 has been made this year by the Thornycroft Steam Carriage and Van Company, Chiswick. It was one of those exhibited at the Crystal Palace Exhibition. It is a light van designed to carry 1 ton, with floor space available for goods of 25 square feet.

Its length over all is 11 feet, of which 4 feet 6 inches are devoted to the boiler and machinery. It is fitted with a Thornycroft water-tube launch boiler, having 50 square feet of heating surface and 2½ square feet of grate, and water-tube fire-bars, as shown in the engraving. The engine is a little double compound, having cylinders 2-inch and 4-inch by 3-inch stroke, and arranged so that the steam can be admitted to the low-pressure cylinders direct for steep hill climbing. The engine is geared to the driving wheels at the ratio of 9 to 1. The fuel used is mixed coal and coke, about 4 lbs. per average mile being consumed. A skew-toothed pinion of large size gears into the corresponding teeth of the rim of the wheel carrying the compensating gear, this wheel being carried by the two inner ends of the second motion shafts, which at their outer

F 3

ends carry the chain pinions by which motion is communicated to the driving wheels. An air condenser is fitted on the roof of the van, which is capable of condensing all the steam at ordinary rates of working, and weighs less than 2 cwt. Its construction will be gathered from the end and side elevation, and it contains about 130 feet of surface, the tubes being of thin copper, half inch diameter, connected in groups to short lengths of 1¾-inch tubes held together by long bolts. The van complete weighs unladen about 30 cwt., of which 22 cwt. is on the driving wheel.

The general arrangement of the van and its machinery is well shown by the engravings. The bearings which carry the intermediate shaft are connected by radius bars to the main axle, to preserve the proper distance between the two sets of chain-wheels, and have free play of the springs by which the van is carried. The chain-wheels are fixed to the back of the driving-

slight improvements in the steering arrangements might be made, and, if possible, the number of handles to be used should be lessened, and the exhaust should be capable of diversion into the chimney for hill climbing. All these are more or less easy of achievement, and the van meets the requirements of the Local Government Board under the new Act. The van recently ran from Chiswick to Windsor Castle, a distance of 20 miles by road, carrying over ½ ton of load, in 2¾ hours, with 90 lbs. of coal and coke mixed in equal bulk, the run to Chiswick and back being made without any stoppage for adjustment or other purposes, and the Castle Hill was climbed without difficulty. This steam van may be taken as representing a class for which it may be expected considerable demand will arise, namely, a van to carry a ton and upwards of goods. The example shown is of the smaller size of a type which, running at a maximum speed of about eight miles an hour, would perform

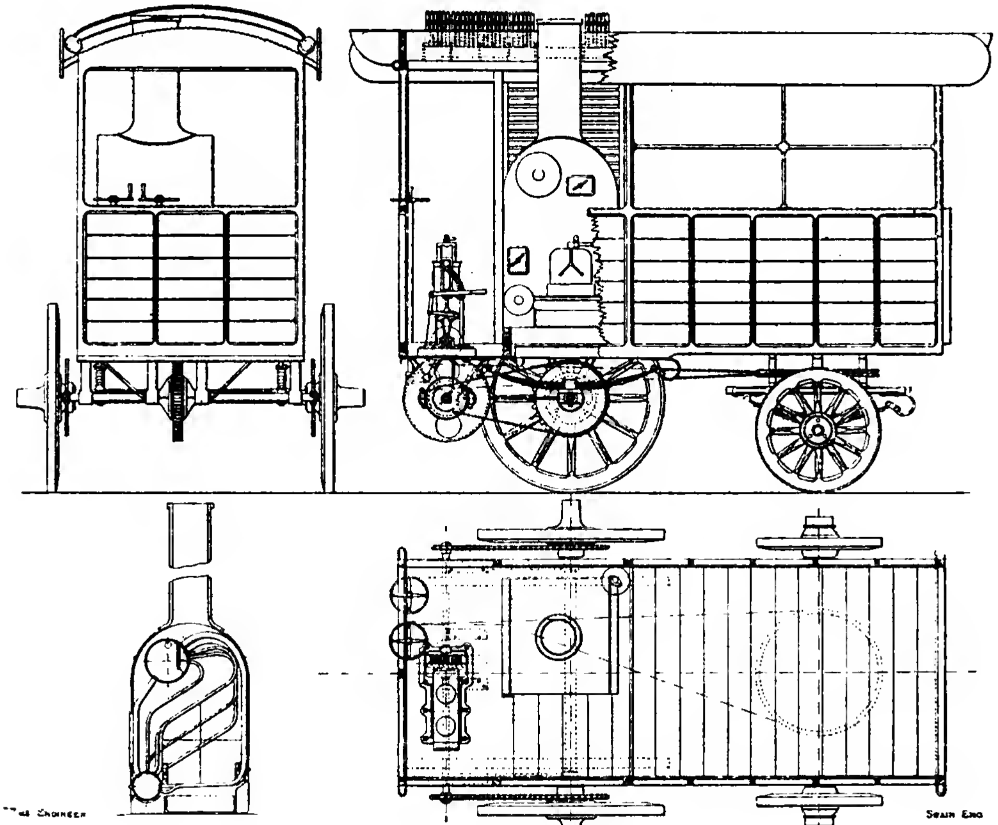


FIG. 1.—THORNYCROFT STEAM VAN—PLAN AND SECTION.

wheel naves. The steering is effected by a hand-wheel on a verticle spindle, at the lower end of which is a worm gearing into a wheel of about 8 inches diameter, cast with which is a wheel which carries an ordinary link chain. This chain is led to a horizontal steering wheel on the locking-shaft steering wheels at the rear end of the van. The chain on this wheel is capable of adjustment for taking up slack. The brake is also put on by means of a hand-wheel and vertical spindle next the steering wheel. The steam connections between the engine and boiler are not shown in the illustrations, but they are of simple kind, a stop-valve being within easy reach of the driver, who can also reach the link motion lever. The van was shown running in the Crystal Palace grounds, over roads which are in some places small loose gravel, which is trying, especially for iron-tyred driving wheels. The van runs very satisfactorily and smoothly, and will meet the requirements of a great many who, as carriers, are now waiting for such a vehicle. Some

the work of country carriers and numerous classes of traders. In these the small extra weight of parts not admissible in the light passenger vehicles hitherto referred to, is a matter of smaller importance, and the maximum speed being low, they may be worked and steered with safety and certainty. The heavier class of vehicle, to carry and haul from three to seven, or more, tons, have yet to be made; and while for the light, quick passenger vehicles the experience and practice of the carriage and the cycle makers will be invaluable, it is the experience of the light road locomotive and traction-engine builders which will be drawn upon to make a success of the heavy motor-vehicles. The author was recently called upon to express his views on motor-vehicles for the heavy traffic of the Liverpool traders, and surprise was shown when he stated that although for those who really required them, light vehicles of a useful character could be had at the present time, those suitable for heavy traffic had yet to be made. For this reason he advised those whose expectations had been unduly raised with regard to such vehicles, not to be in a hurry to part with their horses. This view he still holds; but the realisation of the requirements of merchants, of places like Liverpool, or of some of them, is perhaps within a measurable distance. The problem to be solved is, however, anything but an easy one, and if it is to be solved by means of the steam-engine, it would appear that very high pressures, high-speed engines, and high-class light boilers will have to be employed, rather than the very heavy boilers, and comparatively low-speed engines at present used for light road locomotives. The development of the oil-engine is, however, sufficiently rapid to lead to the belief that this form of motor will ultimately take the place of the steam-engine for this class of work. Some indications of this are already afforded by the efforts of Messrs. Hornsby and Sons. Much attention has yet, however, to be paid to the transmission and stopping and starting gear to be employed.

The Duryea carriage, to which reference has already been made as being one of those present at the opening run from London to Brighton, contains several features of interest, one of which is that the motor has an oscillating cylinder; that it is supplied with gases the product of explosion of carburetted air under pressure from a separate explosion chamber. A lamp is used to effect evaporation, an electric arrangement being used for ignition of the charge. The motor transmits motion to a second shaft by means of belts for three speeds, and a cross-belt is used to obtain reverse motion at another speed. Jockey pulleys are used for giving either the one or the other of the

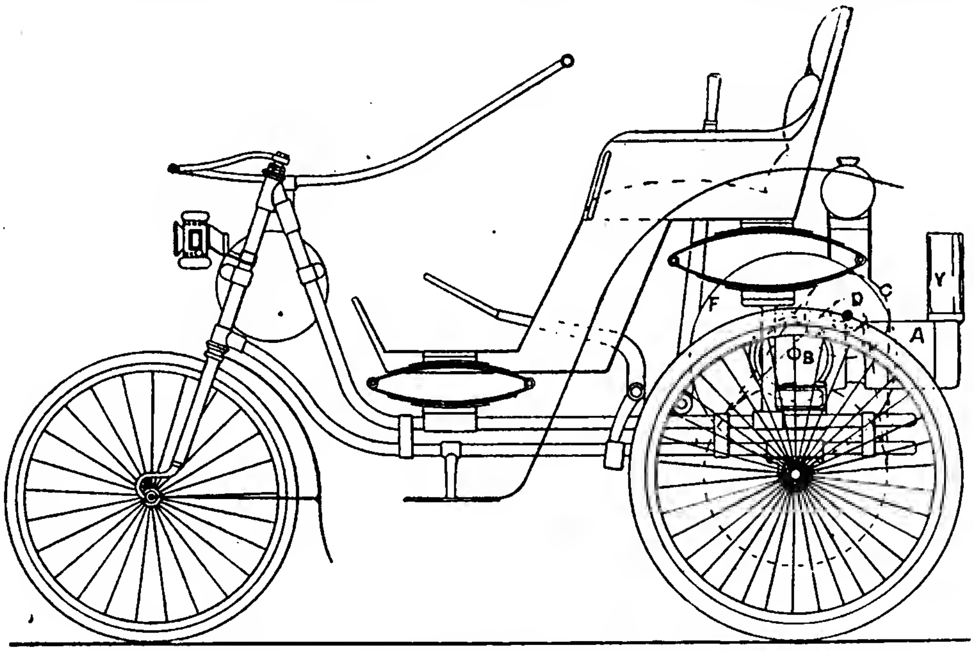


Fig. 2.—Roots and Venables' Petroleum Oil Carriage.

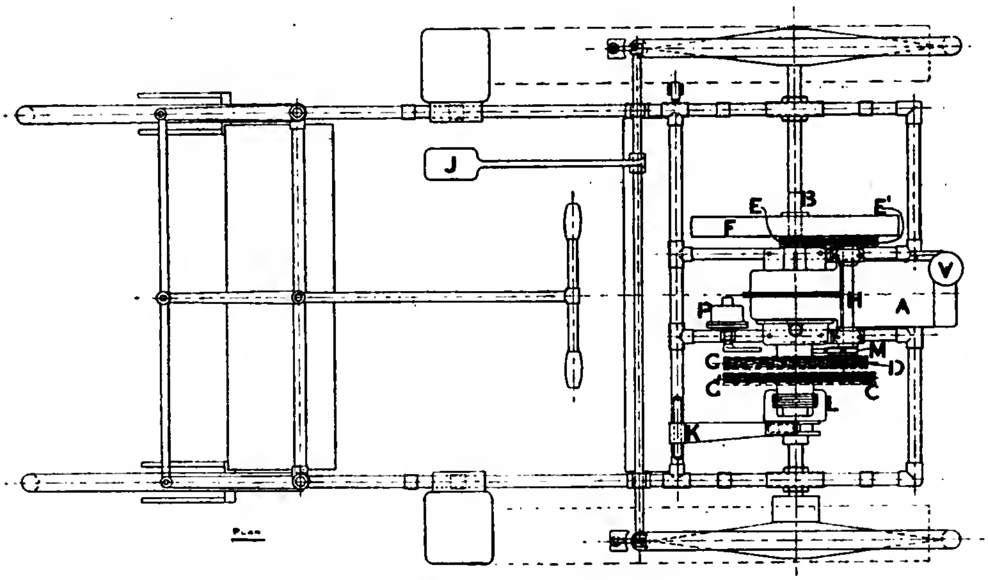


Fig. 3.—Roots and Venables' Petroleum Oil Carriage—Plan.

belts sufficient tightness to enable it to drive. Spur pinions on the end of the second motion shaft convey motion direct to a hollow axle surrounding the driving axle, and carrying a compensating gear in the centre. It carries benzoline sufficient in quantity for about 100 miles' run.

The carriage, of which two views are shown in Figs. 2 and 3, is one which has been built by Messrs. Roots and Venables, and is fitted with a motor which works with the ordinary lamp petroleum. The arrangements are in several ways novel and interesting, and it is one of the first finished carriages yet constructed to use the heavy oils of high flashing point. The motor works on the Otto cycle, and the rotating valve shaft, which must run at half the speed of the crank shaft, is utilised as a means of obtaining the first speed reduction. This is a very considerable gain, and allows of convenient arrangement.

In the engravings, A is the motor cylinder, B, the crank shaft geared to the wheel, C, by means of a Reinhold chain, this wheel being on the rotating valve shaft, which is made large enough to transmit the power either by the chain on the small pinion, D, or the larger one, C, either of which are thrown into gear by means of a clutch at L. The oil supply is seen at O, and the vaporiser, on Root's system, is at V. J, is the foot lever for a brake, and a vertical lever enables the driver to throw the motor in or out of gear, or to give the carriage one or other speed. The frame is formed of a double set of tubes which act as water coolers for the jacket water which circulates through them.

The carriage shown in Figs. 4, 5, 6, and 7 is a petroleum motor-carriage made by Messrs. Petter, Hill, and Boll, of

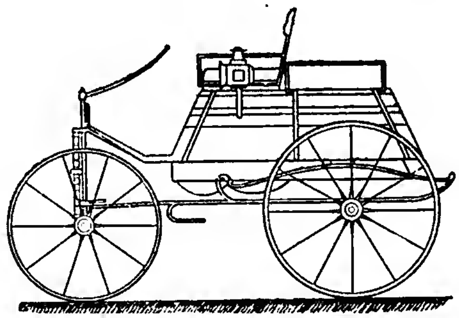


Fig. 4.—Petroleum Motor Carriage by Messrs. Petter, Hill, and Boll.

Yeovil, the motor being the design of Mr. Percival Petter, and the vaporisor used in connection with it is shown by Fig. 5 to be rudimentary only. Several carriages fitted with the arrangements of machinery shown in the figures have been made by this firm, and the author is informed that they are running with success. The motor is of the horizontal type, having two parallel cylinders, M M′, coupled to one crank shaft, N N′, upon which is a flywheel, W, and the pulleys A, B, and C, upon which are belts for driving either the high speed pulley, A′, or the low speed pulley, B′, or the reversing pulley, C″, through the medium of the rider pulley, C′, the three pulleys, A′, B′, and C′ are fixed upon the second motion shaft, H, in the centre of which is the usual compensating gear, G, and on the ends of which are the two chain pinions, J J′, communicating motion to the driving wheels by means of pitch chains running on the wheels, K′ K′. From the sectional elevation it will be seen that by means of the handle, E, at the right hand of the driver, the belts connecting the pulleys, A A′, or B and B′, are thrown alternately into gear by pressing either the jockey pulley, D or D′, upon those belts. As shown in the engraving with the handle, E, in the position 3, the jockey pulley, D, is tightening the belt on the pulleys, B B′, for driving the carriage at the slow speed. When the handle, E, is placed in the position 2, both sets of pulleys are out of gear and the belts free to slip; but when the handle is in the position 1, the jockey pulley, D′, comes into play, and the belt connecting the pulleys, A and A′, is tightened upon them for driving at high speed. The handle, E, is on a shaft, F (Fig. 7), which carries levers from which depend links having on their ends the stud spindles of the jockey pulleys, D D′, which are controlled in their movements by the radius rods, G′ G″. An ingeniously simple reversing motion is obtained by means of the belt connecting a pulley, C, and pulley, C′, the latter being carried upon a stud spindle held by the arm, F′, and under control of the foot by means of the pedal, I. When not in action, a spring at S keeps the pulley, C′, and the belt upon it from contact with the driving pulley, C″, but when it is desired to bring the reversing motion into gear, pressure upon the pedal, I, brings the pulley, C′, with the lower part of the belt running over it intervening, upon the pulley, C″, and thus a slow movement in the reverse direction to that given by the other pulleys is obtained. The pulley, C″, acts also as the brake pulley by means of a band brake embracing about half its circumference, and brought into play by means of the pedal, L. In Fig. 5, A is the compression space and combustion chamber; B, oil inlet cock; D, inlet

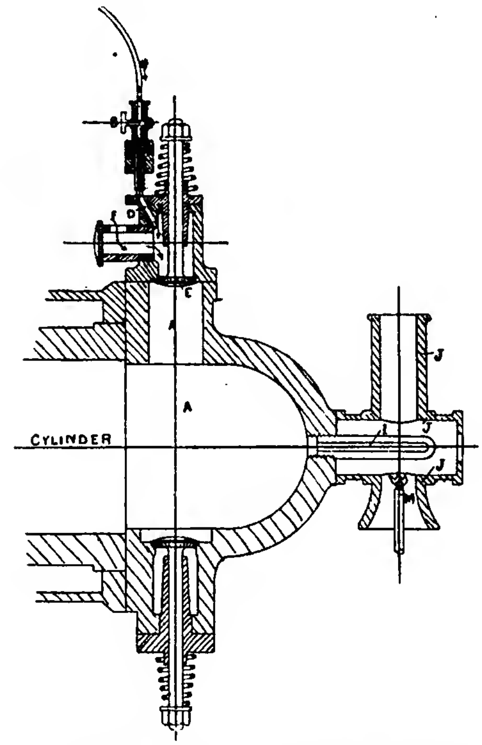


Fig. 5.—Petter's Oil Motor Cylinder and Valves.

passage to valve space; F, air inlet to valve; E and J, ignition tube, heated by burner, M.

The views which are shown in Figs. 8 and 9 illustrate a motor quadricycle made by Mr. P. Crastin, of Holloway, and operated by an oil-motor using ordinary lamp petroleum. In the motor employed there are some details of interest, and, though not at liberty to describe some of these, some views and details are now given. From the general views it will be seen that the quadricycle with two seats is driven by a motor through the hind axle, and the first speed reduction is obtained from the rotating valve-driving spindle; which, as in other Otto cycle-motors, runs at half the speed of the crank shaft. By means of the remaining gear, which is clearly seen, the speed of the motor, which runs at about 580 revolutions per minute, is reduced to the 130 revolutions per minute for a speed of 12 miles per hour, of the driving wheels, which are 2 feet 6 inches in diameter.

The motor itself is double acting, that is to say, it has a double-ended cylinder in which the explosive impulse takes place alternately, so that one impulse is given for each revolution. A sketch diagram of one end of this cylinder is shown in Fig. 8. A shows the casting carrying the water jacket and the internal steel tube, T, which is fixed within it and protrudes into the cover, B. Wiihin the steel tube, T, which has a slot, S, in the middle of its length for the accommodation of the cross-head pin, P, is a second tube, T′, carrying at the centre of its through a valve at D, and an ignition tube is placed at E; exhaust valves are fitted at F. The vaporiser employed is shown in a case at the back of the vehicle, and it consists of a small annular vertical vessel formed by an inner and an outer steel tube closed at both ends, the inner tube forming the chimney for a small vaporiser lamp. At the lower part

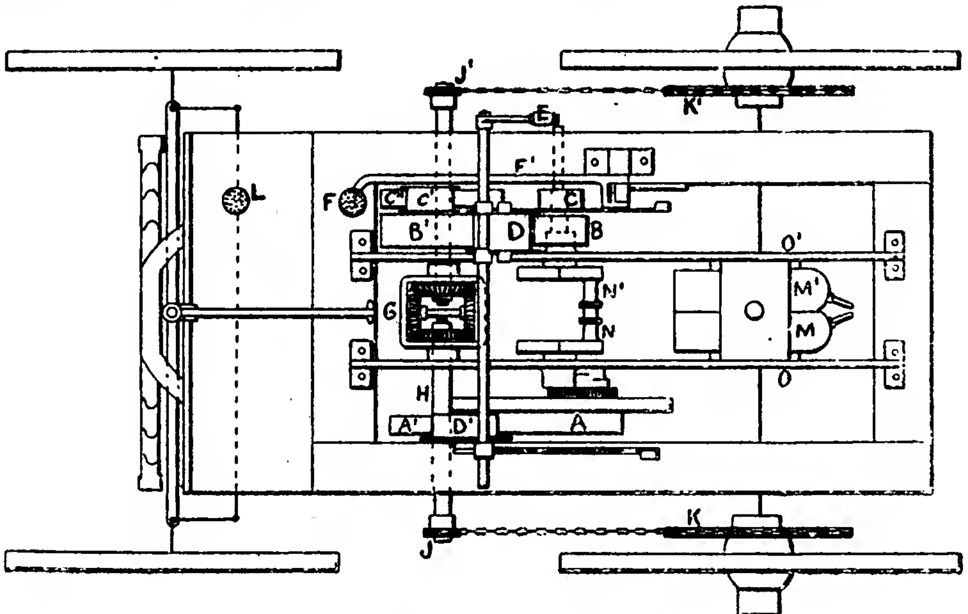


FIG. 6.—PETTER, HILL, AND BOLL—PLAN.

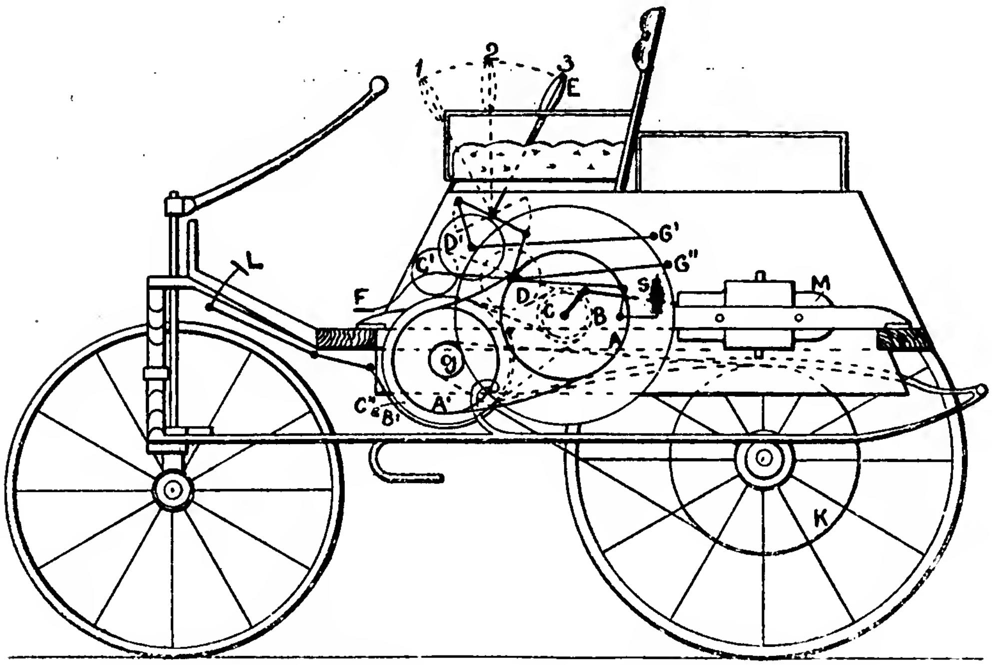


FIG. 7.—PETTER, HILL, AND BOLL—SECTIONAL ELEVATION.

length the crosshead, C, and at each end the piston block, C′. In the lower part of the cylinder casting is fixed the tube, H, which provides for the circulation of the water through the jacket, G, from which it passes by a pipe at the cylinder top.

The cylinder is fixed to the frame of the quadricycle by the clamp piece shown. Air and vapour enter the cylinder cover of the annular space a tube is inserted, into which oil, from a form of sight-feed lubricator, drops, and is drawn into the vaporiser when a suction charge is made, but passes away into an overflow tank when a charge is not required. The double-ended piston of this motor is 1·75 inches in diameter, and has a stroke of 4 inches.

Figs. 10, 11, and 12 illustrate a steam-carriage under construction, largely from the designs of Mr. Percy Holt, and although not yet completed, a description of it will be of some interest as being, as far as the author knows, one of the very few attempts to produce a steam carriage of considerable power and of light weight to carry four persons. From the three views it will be seen that there are two small steam-engines carried in two cases completely enclosing them, and driving, by gearing also enclosed, a pair of grooved driving pulleys acting directly on the peripheries of the pneumatic tyres to the driving wheels. The cases containing the engines are so mounted that when steam is turned on to set the carriage in motion the grooved pulleys are automatically brought into contact with the driving wheels. The boiler is of a novel type, and will be described hereafter. From the engines, either or both of which may be used, the exhaust steam passes into a condenser which is an air condenser acting partly on steam is only admitted to one engine, but when gradients require it, it is automatically admitted to both engines by a movement corresponding to the loosening of the reins. When steam is shut off from the engines for stopping or for running downhill, a simple form of regulator cuts off the oil supply to the greater part of the oil burners by which the boiler is heated, the other burners being so situated that they are automatically relighted when steam is turned on by those which are not extinguished when steam is turned off. The boiler, which is shown in Fig. 10, consists of two main parts, namely, a water-heating part in which the water fills the entire capacity, and is maintained under a pressure of from about 500 lbs. per square inch and upwards. This part is connected by a reducing-valve automatically controlled by the consumption of steam by the second part in which steam at a low pressure of say 250 lbs. per square inch is generated. The first part or receptacle consists of the larger tubes, A, B, and B′, and the second part or recep-

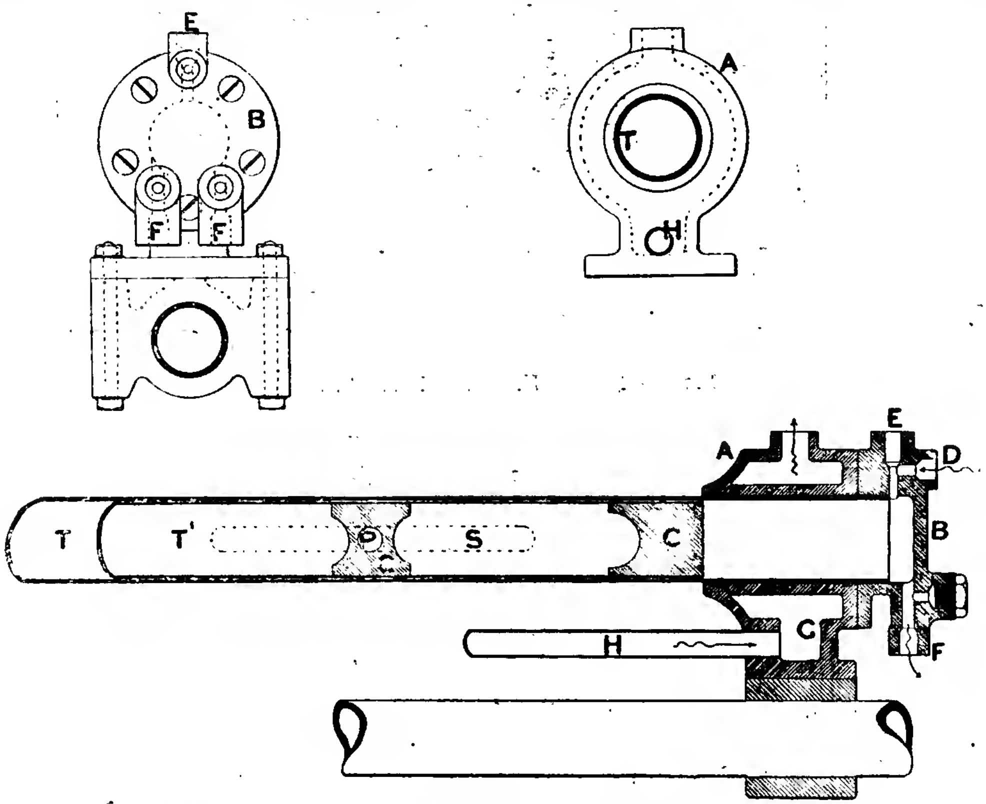


Fig. 8.—Crastin's Motor Quadricycle—One End of Motor Cylinder and Piston.

the principle of an evaporate condenser, the exhaust steam itself actuating a fan which assists in the action of the air-cooling current. As far as is possible, the control of all the parts has been made automatic, dependent only on the action of the steering handle influenced as far as more or less steam, *i.e.*, more or less speed, and as to the quantity of steam generated, and as to the amount of fuel used, and the application of the brake, all as far as possible controlled by a movement simulating the action of the driver of a horse who gives more or less rein to his horse for more or less speed, or pulls very hard on them if he wishes the horse to understand that he is direly in need of all his help for a sudden stop. When the carriage shown is standing the brake actuated by the steering levers is in action. When the driver is in his place the steering levers, with a sleeve on the rod connecting them, are raised more or less, and this admits by the lever connections, shown in rather exaggerated dimensions, steam to one, or by further movement, steam to both of the engines. When running on a level and good road tacle consists of the interior smaller tube, C, within the water-tubes, A, B, B′. The feed-water is admitted at the top at A, and passes downward through the coil, A, to the junction piece at A′. Here it passes from A into the annular spaces within the coils, B, B′, and outside the coils, C, in which it passes up to the reducing-valve and connection at R. When steam is required, some water is automatically admitted into the inner tubes, C, in which from its high temperature and pressure it partly flashes into steam, and is partly vapourised by the heat transmitted through the high temperature water to these inner tubes, the steam passing off to the engine at D.

There are many makers in this country busy on the construction or the design of motor-carriages, but few of them are at present prepared to show what they have done. Some, including the makers of the Pennington motor-cycles and bicycles, are so well known as to need no reference here.

There are several questions which arise in connection with the subject of this paper to which reference must be made.

One of these is the speed question, because with it is involved that of power. For the present, at least, it must be conceded that the maximum speed for which motors and gearing for any motor-carriages should be designed ought not to exceed the reasonable 12 miles an hour permitted by the Local Government Board regulations. This should not only be admitted on the grounds of public safety, but because of the lesser power which such a speed, as a maximum requires, as compared with the speeds which are being attempted, but because of the smaller weight of the necessary motor. It may be further urged that all the purposes of the greater number of users of these vehicles will be best served by the power which is sufficient for this speed as a maximum on good roads, and a correspondingly lower speed on any ordinarily steep gradients which can be surmounted by the same power. There is nothing fine or particularly laudable in rushing up steep hills at high speed, any more than there is in doing so with horses, while there is, on the other hand, very considerable possible gain by adopting the slow speed for hills, which also secures greater power for starting and working over bits of bad road. This consideration shows that for most vehicles, and particularly for trading vehicles, even when driven by steam, an effective arrangement of speed gearing, which can with smoothness be put into or out of gear, so as to provide high-power by slow speed for starting and hill climbing, is necessary. In this way the small boiler power sufficient for maximum speed on good roads will be sufficient for bad roads and hills.

A diagram was then shown giving the power required for different speeds on different gradients for a vehicle and load of 2½ tons, and shows how very much the power increases with the higher speeds.

The limit to speed for lighter vehicles is possibly a very high one, but for vehicles for the average user it must be determined by some reference to economic running, to cost of the vehicle, and to the average conditions imposed by the observance of legal restrictions, and ordinary traffic convenience. In towns the limit and the maximum power required are in most places soon reached.

Fig. 9.—Crastin's Quadricycle—End View, Vaporiser and Casing Removed.

With regard to the use of petroleum or petroleum spirit motors, the recent alteration of the conditions under which the latter may be used in this country has removed the necessity, from a legal point of view, for adhering to the use of oils having a flashing point of above 73°. There is no doubt that there are good reasons for wishing that the oils of high specific gravity should be used, but it must be admitted, on the other hand, that the employment of benzoline has been singularly free, both on the Continent and in America, from mishap in connection with motor carriages. Some English firms, as already mentioned, have succeeded in making motor-carriages propelled by motors which will use ordinary petroleum lamp oil, and having done so much, there are reasons for expecting that development in this direction may take place.

It cannot, however, be denied that the advantages from the point of view of simplicity of the motor attending the ready vaporisation of the lighter oil in the motor admission valves and passages, and ignition in the cylinder, are very great indeed, and that the objectionable smell of the exhaust gases is very much less than from the heavier oil. The great variation in the power required from the motor of a mechanical carriage, namely, as between the maximum power for climbing a stiff hill and the no power required when descending hills, introduces variations as to vaporisation, quantity of oil to be dealt with, temperature of cylinder, and ignition, which, as far as at present can be seen, must occasionally cause the ejection of much partially-burnt oil with the exhaust, a difficulty which is much lessened by the use of petroleum spirit. The advances which have been made in the last year in the construction of oil or spirit-motors are not of a striking order, and the best known and most used of all is the Daimler of the improved form, described by the author in the Cantor Lectures last December. The float-feed regulator of this is used by M. Bollee in his tandem tricycle, which has done such remarkable running, and the new horizontal motor by M. Peugeot is made on lines similar to the Daimler. The feed apparatus cannot very well be conceived to be much simpler, and the automatic spray making preparatory to vapouring is so introduced that it adds nothing to the parts to be attended to. One at least of the makers seem to have courted disaster by using horizontal Otto cycle motors. the end of the cylinders of which were open for the reception of any dust and dirt that could find its way there, and several of the makers use horizontal motors of moderate speed, and consequently large diameter of cylinder, as the stroke is not long. There seems to be no doubt that in the future exceedingly good design, workmanship, and material must be combined, and very high speeds for motors be observed. This makes possible, not only small area of piston, but smaller impulse and less variation in the strength of the impulse. Some of the very small motors made by Mr. Pennington are said to be very good indications of the lines on which the motors for light vehicles will have to be made.

In the use of the heavier oils some advances have been made, but as the author has not actually tested any of the motors said to work satisfactorily without vaporisers, even of the simpler forms, he is unable to say more than that he is informed these motors do work with the heavier oils of specific gravity 0·8, and flashing point of over 73°.

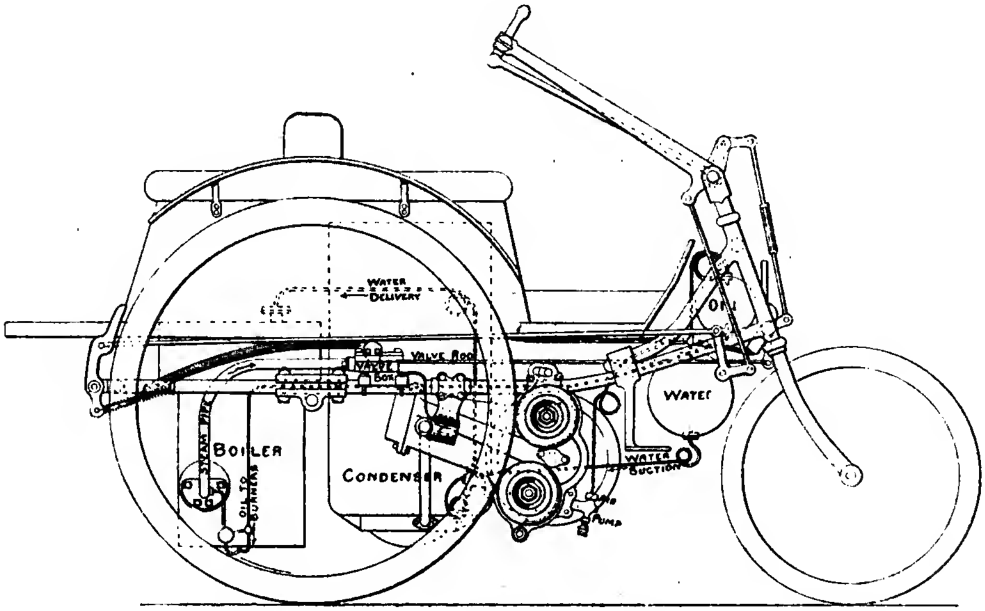
In the construction of frames for motor-carriages, the experience and inventions of the cycle manufacturer will be of very great help. Not only may the systems of building-up be employed, but the tubular form may be usefully employed as storage or cooling surface for jacket water.

In some of the machines which took part in the Paris-Marseilles trials, it was found that under the excessively severe ordeal of a 1,000 miles race, often over excessively bad roads, the frames were severely tested, and brazed joints in several instances were found defective. On the other hand, mechanically connected frame members behaved well. When motor-carriage construction has been sufficiently standardised, it will, no doubt, become common to connect members of the frames by castings and stampings, which are employed also as parts of the machinery.

The only novelty in the method of building up frames which has been announced is that of Mr. C. T. Crowden, according to which the tubes are slipped into their connecting collars or other parts, such as the cycle head and crank bracket, and then subjected to an internal water pressure of about $2\frac{1}{2}$ tons to the square inch. The inside of the sockets, of whatever form, are first grooved, so that under the water pressure the thin tube is swelled into the grooves. The sockets and tubes being, for the purpose of the process, placed within strong, well-fitting, cast-iron clamped dies, or moulds, so that the water pressure does not burst either the thin pipe or the sockets. Some samples of frame joints made this way are here upon the table.

There seems to be great probability that the light aluminium alloys having a specific gravity of from 2·9 to 2·95 appear to be well suited for making the castings for the frame and machinery connections, because excellent castings of any form can now be made with these alloys, and the strength for a given weight is not only ample for every purpose when the thickness is enough to secure stiffness, but it is considerably stronger than steel, weight for weight. Steel castings cannot be made very light,

FIG. 10.



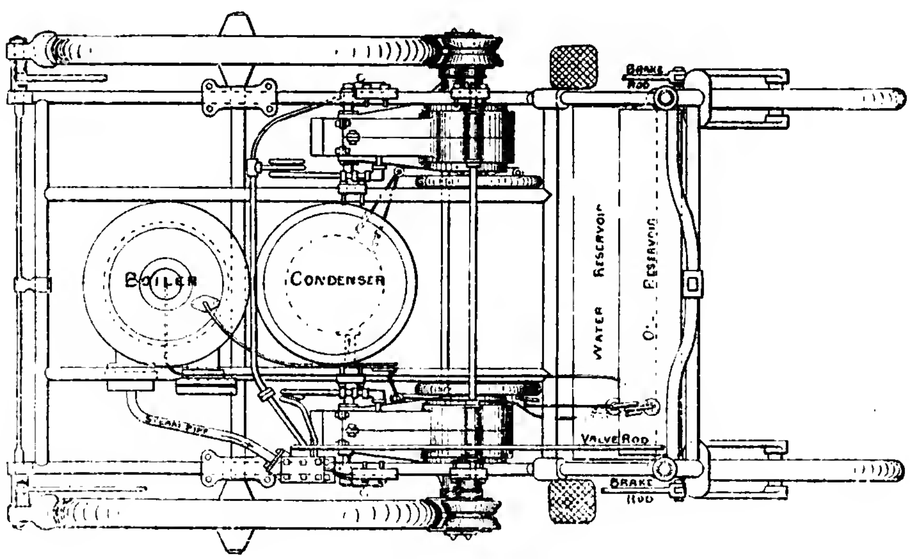


FIG. 11.—HOLT'S STEAM CARRIAGE.

and when necessary stiffness is taken into consideration, an alumininm alloy of specific gravity 2·95, and tensile strength of from 12·5 to 15 tons per square inch offer very considerable advantages, especially as such alloys work well in the machine shop and with the fitter.

With regard to the tyres of wheels for light carriages and the lighter omnibuses and vans, experience to the present time seems to confirm the opinion of those who strongly favour the use of indiarubber, and particularly of pneumatic tyres. Experience and invention are no doubt developing the air tyre, so that its advantages will ere long far outweigh the disadvantage of their high cost. Very high speeds are, however, especially with any considerable weight, very destructive both of solid and of pneumatic tyres. For the heavier vehicles now permitted under the recent Act and regulations there seems little doubt that wheels fitted with renewable wood treads may be very favonrably mentioned, and it may be hoped that the Local Government Board Rules will in this respect, and in one or two other matters on structural points, be modified in accordance with the experience which will soon, it may be expected, make modification necessary.

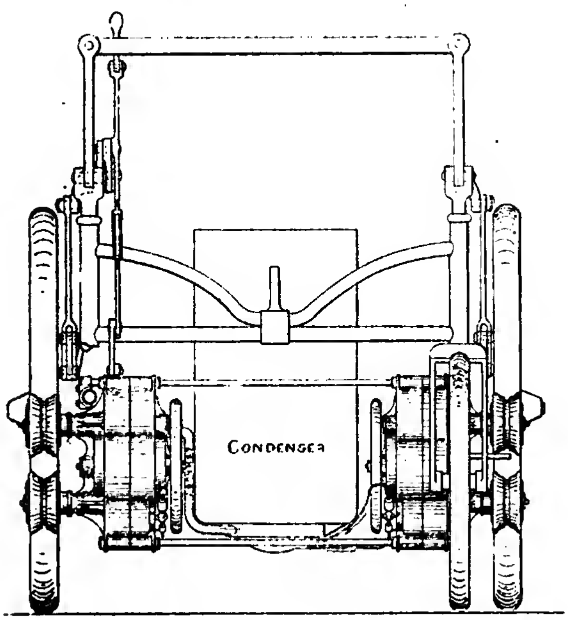


Fig. 12.—Holt's Steam Carriage—Front View.

With a consideration of the kind of tyres most suitable for motor vehicles, arises the subject of road improvement, and the opinion may be confidently expressed that if mechanical transport on the high roads is to acquire the importance and the universality that its promised advantages make desirable, more attention than ever will have to be paid to the construction and maintenance of roads, and more money than ever will be profitably employed on this work.

Thus far no reference has been made to the development of electrically operated motor vehicles. This is because the development resolves itself almost entirely into a question of secondary battery construction. There can be no doubt that the electrical motor is, at present, the only one which offers a complete equivalent of the steam-engine with regard to range of power within the maximum, facility of starting and stopping, easy working, and freedom from vibration. It must, however, be left to those who have had recent personal experience in the use of secondary batteries for this purpose to state what the recent developments actually are, for the author's own experience in their construction cannot be quoted in connection with recent developments.

During the coming year great activity may be expected in connection with mechanical road carriages. British engineers are busy, and the prizes offered by the proprietors of *The Engineer*, to the value of 1,100 guineas, will, it may be expected, bring forward a great many vehicles, which will take part in the competitive trials to be held at the end of May, or beginning of June next. The conditions of this competition were published in *The Engineer* of the 20th of that month (November).

DISCUSSION.

The Chairman said this subject was now occupying public attention a great deal. It interested engineers at very nearly the beginning of the century, but now the public had got hold of it, and probably there would be the usual story—a good many failures, a good many accidents, a great deal of dissatisfaction, and then it would fall into disrepute. After the pendulum had swung in that direction, it would probably come back, and after a time the matter would be taken up in a proper and true spirit—that of engineering, not of company promoting. When that point was reached, it would be found that this mode of locomotion was really very valuable. He had so often spoken of his own experience, which went back, he was sorry to say, for 60 years, that he hardly liked to repeat it, beyond saying that, according to his judgment, nothing had been done recently which surpassed what was done then. There had certainly been a change from steam to oil motors, but he was glad to see that the reader of the paper appeared to be of opinion that the last word had not yet been said with regard to steam. Mr. Thornycroft's steam-van, and Mr. Holt's steam-carriage were illustrations. He did not consider that the flashing of water into steam was a very nice way of doing the work. It did not follow because you used water that you need carry several hundredweight of it; and, he might remark, that whether it were in a boiler or in a tank it weighed exactly the same. It was only the initial low-water level in the boiler which was extra, and the boiler need not be very heavy. With regard to reversing gear, Mr. Hancock, who was most successful in the use of road locomotion 60 years ago, told him that he never would allow his carriage to be reversed in London by the driver. The driver would only get into a fluster and back into something, and they would have the pole of an omnibus going through the casing of the boiler or something of the sort. All he allowed the driver to do was to steer, or put on the brake with his foot, or stop, and that was found quite sufficient. If the Serpollet system used coke, he did not understand how the fire was damped down, or how they avoided getting too high a temperature when standing. He could understand that with petroleum it would be easy to prevent that taking place. Many present were probably aware of the arrangement of Mr. Howard, of the King and Queen Iron Works, many years ago, in which the boilers had no water in them, but just enough was injected to make one stroke of the engine, and that was repeated. There the reservoir to take up the heat of the fire was an amalgam of lead and mercury, and the water was injected on to a plate covered by this amalgam, the plate being indented so as to give more surface. There was another boiler, called the Parks boiler, very much like it. This system was used on a steamboat which ran from London to Ramsgate during the whole of one season; it was applied to a ship of war, and for years it drove the engines for the rolling mill at the King and Queen Iron Works at Rotherhithe. He did not know what objection there was to coke as a fuel when properly burned. All fuel must give off carbonic acid if burned properly, or carbonic oxide if burned imperfectly, and he did not know that coke gave off anything else. They all knew the difficulties with coal, but he could not speak from experience as to the lighter oils. When he was putting up an engine for an electric plant in a house he had in the country, he was deterred from using an oil-engine by an epigram. A friend said to him, "Do not use that thing; it will stink like a cat, and bark like a dog." Not liking that prospect, he put up an ordinary steam-engine. He did not gather how the draught was obtained in cases where a fire was used; as a rule it appeared to be produced merely by the ignition of the vapour in the cylinder; nor did he gather how the noise of the exhaust was got rid of. Some years ago he was much interested in an endeavour to introduce in London tramcars worked by compressed air, as they had been worked now for 15 years in France. They had to get rid of the noise of the exhaust air, and after trying many costly things, he at last thought of something very simple. He took an old hamper, doubled it up, and broke it, and put it in a case, and then turned the exhaust air into that, and the twigs of the hamper so bothered the compressed air, that they never heard any more of the noise. A similar kind of device was used with gas-engines. He did not quite understand one of the boilers which had been described as having a high-water pressure, and low-steam pressure. Perhaps Mr. Beaumont would explain it.

Mr. Beaumont said there was a reducing valve between two parts of the boiler. The part containing the water was constructed of tubes, and the water in those tubes was carried very much in the same way as it was in the Perkins hot-water heating apparatus, from that the water was taken through a reducing valve, and converted into steam.

The Chairman said he was surprised to hear that pneumatic tyres would stand the wear incident to traction wheels. He remembered Mr. Hancock telling him that he had much less trouble with the wear of his engines and boilers than with the wear of his tyres. If pneumatic tyres by reason of their pneumaticity (so to say) were capable of getting over that trouble, it would be a very important matter. He often thought that if he were a man of wealth and leisure, he should like to make a servile copy of one of Hancock's steam-omnibuses, and put it to work, as the original did, between Paddington and the Bank, and then ask the present generation of engineers to try and improve upon it.

Mr. Walter Hancock said no one was more surprised and delighted that so much had been done with petroleum motors, but at the same time the advantages of steam were so thoroughly worked into his whole thoughts, that he could not but think that there was a good deal to be done yet by the steam-engine, when the attention of the engineers of the present day was directed to the problem of road locomotion. Going back to the time when his uncle first worked at steam-carriages, and comparing the steam-engine of those days with those of the present—considering the form of the slide-valve, which then had none of the advantages of lap and lead—which had produced such an economy in working, and thinking also of the change introduced by the link gear by which the expansion was now controlled, and, therefore, the consumption of steam according to the varying load, it might be safely said that the little van described by the author was one which pointed very strongly to the advantage to be gained by the use of steam. The engines in that van were little more than toys: the cylinders were only 2 inches and 4 inches, in fact, he thought it carried economy of engine-power to exception. If the cylinders had been 2½ inches by 5 inches he thought it would have been a most economical machine for traction on roads. As it was it, it would carry something like a ton. He hoped the engineers of to-day would devote their skill and energy to this question, and adopt all the improvements of the modern steam-engine to road motors, and then he believed steam would hold its own for both economy and comfort.

Mr. A. R. Sennett, referring to the Chairman's remark that he regretted that his experience went back 60 years, said he was inclined to think that he would rather have lived 60 years ago, for that was evidently an engineering epoch. Then a man who wanted a machine went to an engineer, whereas now he went to a company promoter. He had had some experience of the Serpollet boiler, and that afternoon had run some 30 miles with a carriage constructed by that inventor. With regard to the damping down of the fires where coke was used, there was no precaution taken, except that the ashpit door was opened towards the front of the carriage only. The blast up through the bars due to the motion of the carriage was all that was required. He had slightly altered M. Serpollet's arrangement by putting a hopper in front at an angle of 30° from the horizontal downwards; if anything, that acted rather too well, and all that afternoon they had rather too much steam. It now only required to be fitted with a butterfly-valve damper to be under perfect control. He understood the author to intimate that the reserve of therma energy in the Serpollet tubes was a matter of seconds—that it was soon exhausted. He would wish to emphasise the fact that the draught upon this reserve was made concurrently with the normal steaming of the boiler. It was far more than a matter of seconds, and its utility was of the greatest importance. That afternoon he drove from Worthing to Horsham—not the most level of roads—but though the carriage was provided with a hill-climbing speed and a high speed, they never put on the hill-climbing speed the whole time, and never saw any visible steam, even on the longest hill. His experience was that by putting on the slow speed you made such a vast number more revolutions in climbing a hill, and before you got to the top of it, if it took more than (say) 10 minutes, the superheating became ineffective, and you got visible steam, which was forbidden by the Act. It was curious in what a slipshod way the French carriages were put together; the syphon tubes outside the boiler were not protected in any way, and while the boiler tubes were at such a high temperature, immediately outside there was a rush of cold air. The same with the cylinders; they were not lagged in any way, and were placed in such a position as to catch all the grit and dirt. It was really wonderful how well the carriages behaved, built in the way they were. Of course, Serpollet was not the first to invent a flashing boiler, nor even to apply it to a carriage, and he was inclined to think that the Serpollet system was really an English invention. It was Jacob Perkins who taught them to use a flashing boiler, and Mr. Loftus Perkins, who did so much in high-pressure steam, built a little tractor, much smaller than any that Dion and Bouton's built in Paris to-day. It ran about London for some time, but being exiled by Act of Parliament, went to Brussels, where it ran a considerable time; then the boiler was taken out and copied and put into tramcars, and now the same system was carried out by M. Serpollet in a manner which did him great credit.

The Chairman said according to his recollection the Perkins' carriage, on which he had ridden, had a boiler containing water at high pressure—not a flashing boiler.

Mr. Sennett said he believed it was a flashing boiler. It was a tractor with only one wheel, which was attached to a four-wheel van. The single driving wheel was covered with india-rubber. As the Chairman had said, a flashing boiler did not reduce the weight; it was heavier if anything, but the extra weight was more than compensated for by its safety and flexibility. The Dion and Bouton boiler required a very large area or a very high rate of combustion, as a means of raising steam rapidly for hill climbing, and it was a most dangerous boiler to place in the hands of unskilled drivers. With a tubular flashing boiler all danger was eliminated. If you had to stop suddenly an ordinary boiler went on making steam, and up went the safety valve and frightened the horses. With boilers of the Thornycroft or Yarrow type you had great power, but there ought to be some means of arresting the combustion or radiant heat when the carriage stopped. He should like to know how the oil-feed in the Serpollet carriage was regulated. In the historic Parkinson and Bateman tricycle there was a regulating arrangement similar to one recently introduced by Mr. Cross, consisting of a steam piston, held down by a strong spring, so that directly the steam rose above a certain pressure the spring compressed, and the different jets were automatically shut down. He found nothing at all objectionable in coke, which was a much cleaner fuel than petroleum. They never put any coke on the fire; it was put in a hopper, and the shaking of the carriage shook it down. That afternoon they had rather less than one sack of coke put into the hopper at Worthing, and as a precaution about one quarter of a sack more was put on the front of the carriage. They ran the 25 miles into Horsham with the use of about three parts of a sack. It was, of course, very unscientific to use petroleum or liquid fuel for a steam-engine, because a steam-engine was a heat engine of low efficiency; whereas an internal combustion engine was one of high efficiency; but, nevertheless, the ease of manipulation, the simplicity, and the much-to-be-desired flexibility of power was so great in the case of steam, that now English engineers had a chance of working at it he thought they would put a different complexion on the matter. In reply to a question from Mr. Beaumont, he said he believed the carriage he had been describing weighed about 24 cwt., but he had not weighed it.

Mr. S. H. Terry said he was very glad to hear from so high an authority as the Chairman that steam was not dead yet, and he gathered that Mr. Beaumont also thought it had yet a future before it. He had brought with him some photographs, which perhaps might be thrown on the screen, of a once well-known steam carriage, called the "Fly-by-Night," built some years ago by Messrs. Carrett and Marshall for Sir Titus Salt, which afterwards became the property of Mr. Des Vigne, who was present, and, he hoped, would say something about it. It ran a great many thousand miles, but, unfortunately, owing to difficulties raised by the local authorities, its career came to an end.

The photographs having been shown,

Mr. Des Vigne said the "Fly-by-Night" had many points of interest, even at the present day. When first constructed from the design of Mr. George Salt it was not by any means perfect. The steering gear was not first rate, and it did not go round corners well. It had, perhaps, the first example of the "Jack-in-the-Box" compensating gear of bevelled wheels and hollow shaft. Then they could not keep steam; and after trying several sorts of feed water-heaters, they at last put some hanging tubes in the smoke box of a peculiar construction, by which they got the water into the boiler rather above boiling point, and that acted very well. There was also an expansion gear, which saved a lot of water, and seemed to do almost as well as a compound-engine. They could not use it except on a fairly level road, for when going up-hill, or over rough stones, the consumption of water went up rapidly. It weighed about 6 tons, and of course that wanted a lot of propelling; still they went up Chatham Hill with it all right. Mr. Aveling, who was present, said it carried too much steam, and that the pressure (150 pounds) was too high. However, when they had the expansion gear on, they put on another 30 lbs., and it stood it all right. When the Act was passed, the engine could no longer run; the engines were put into a steamboat, and the wheels were sold, but he still had some of the parts.

Mr. Terry then showed a photograph of another steam-carriage now being constructed at Teddington, by Messrs. Des Vignes and Co., with vertical tube boilers, the engines being entirely self-lubricating. He did not think any passenger would know there was an engine on board, which was not a common feature in motors. He did not want to disparage oil motors, for he thought the builders of them had taught them all some useful lessons, one of the principal being that they must keep down the weight. The "Fly-by-Night" was very heavy, but the one of which he had shown the photograph was not so heavy as it looked. The points required were strength and rigidity, with great elasticity between the road and the passengers, and even the engines, for you did not want the engine to receive violent shocks from the road, so that he thought they must employ some form of india-rubber tyre.

The Chairman, having proposed a vote of thanks to Mr. Beaumont, which was carried unanimously,

Mr. Beaumont, in reply, said the recent development in these carriages were necessarily matters of detail, and those who were engaged in perfecting them were not disposed to say much about them. In many cases, although he knew what was going on, he was not at liberty to publish the information. The value of the Serpollet flashing boiler lay in the fact that it was constructed of tubes, which were perfectly happy whether they had water in them or not. They were of considerable thickness, and being surrounded by cast-iron, might remain safely exposed to the heat of the furnace, much of the heat being accumulated in the mass of metal. The advantage was that when steam was not required, it was not being made, and no risk was being run of a sudden pop of the safety-valve. No doubt the tubes would gradually burn away, but that process would be very slow, and of little importance compared to the advantages secured, of generating steam only when required, and of having a boiler which anybody could use, and hardly know it was there. In reply to a question by the Chairman, he said he did not know what temperature the tubes reached, or whether the water in those very small tubes got at all into the spheroidal condition. The noise of the exhaust was prevented in some cases by passing it into the furnace, and out with the products of combustion. Pneumatic tyres had been used for a long time for traction purposes, but not for the heavier work, and for that further experience was required. The Perkins tractor he had described in his lectures last December. It had a Perkins boiler—not a flashing boiler—and was a single-wheeled engine attached to a four-wheel van. The Dion boiler was open to the objection that there was a certain quantity of water on which the fire still acted when the carriage stopped, and, therefore, steam was still generated. No one had a higher appreciation of the work done by Hancock, not only as regards actual achievement, but as indicating what might be done at the present time, and he wished that work was more studied. In the *Times* of that day there was a paragraph calling attention to the successful working of a coach built by Ogle and Summers, which ran from Oxford to Birmingham about 64 years ago. If they could do that with a steam-engine, and if Hancock did it continuously, as we know he did 60 years ago, surely those going into the question now would do well to study their work, and not throw away the advantage of the experience then gained. In those days the coaches or vehicles were much heavier than now, and the weight of the boiler and engine was, therefore, less in proportion to the total weight than in the small light vehicles now aimed at, and of course this introduced new conditions which had to be met. Still there was too much inclination to go to work without taking account of former experience. The carriage described by Mr. De Vigne was really only an engine and boiler on wheels, with a seat or two put upon it. It would not do now to build a vehicle weighing 2½ tons to carry four people.

PUBLIC ADDRESSES ON AUTO-MOTORS.

Mr. Shrapnell Smith at Liverpool.

In connection with the series of Corporation Free Lectures at the Picton Hall, an interesting paper was delivered on the 17th ult. by Mr. E. Shrapnell Smith, hon. local secretary of the Self-Propelled Traffic Association, upon the subject of "Horseless Carriages: their Past, Present, and Future." Mr. Isaac Turner presided over a crowded audience. After reviewing the early history and development of horseless carriages, the lecturer proceeded to describe the latest machines, and introduced his audience, by means of the limelight, to the various French motor-cars, to the Serpollet car (weight, 3½ cwts.; cost, £120), the Beeston-Humber motor-tricycle (weight, 120 lbs.; price, £50), the Pennington motor-bicycle (50 lbs.; price, £50), and other machines. Discussing the suitability of steam, oil, and electricity as motive power, he said that steam had the advantage of having no smell or vibration and great flexibility—that is, high maximum horse-power in order to admit of the negotiation of hills; that oil-motors were noisy, gave considerable smell, always vibrated when going slowly, and were troublesome to manage; and that electricity was the cleanest and easiest to manage but most expensive. Comparing the cost of working, a steam motor-car of the Serpollet type would run 80 miles in 10 hours at a cost of 2*s.* 6*d.*, an oil-motor for 3*s.* 4*d.*, and an electric-car for 4*s.* 8*d.*, taking the cost of electricity at 1½*d.* per Board of Trade unit. The initial cost was heavy, but he looked for a great reduction in the near future, and was confident that English engineers would do for motor-cars what they had done for bicycles and railway-engines. He anticipated great popularity for the motor-cars for touring purposes, and mentioned that four

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friends might tour to Llandudno at a cost for travelling of 3s. The use of mechanical power would lessen the cost of repairing roads, as 60 per cent. of the wear and tear is caused by the horses' hoofs. A demonstration would be held in Liverpool in about two months' time, when it was hoped that specimens of the most practical machines at present made would be seen.

Professor W. H. Watkinson at Glasgow.

A paper on "The Mechanical Propulsion of Tramway Cars" was read on the 18th ult. to the members of the Glasgow Philosophical Society by Professor W. H. Watkinson, of the Glasgow and West of Scotland Technical College. Dr. Eben. Duncan, President of the Society, occupied the chair, and there was a large attendance, which included several members of the Corporation and a number of civic officials.

Professor Watkinson said he had made a special study of the subject during the past 12 years. There had been until recently no pronounced demand in this country for rapid street transit, and on this account comparatively few of their engineers had devoted much attention to this department of engineering, which, owing to recent legislation, promised to become in the near future one of our greatest industries. The great benefits to be derived from rapid street transit were now recognised, and the loss to a city like Glasgow through the lack of it, being seen to be enormous, the public would not long tolerate our present slow and cruel system of horse traction. After reviewing from an engineering standpoint the merits and prospects of the more common systems of rapid street transit—steam engines, compressed air motors, gas engines, oil engines, underground cable, and electric motors—the lecturer showed that recent developments in the knowledge of the principles underlying the design and construction of light engines and boilers had rendered it possible for any of these motors to be successfully and efficiently applied to the propulsion of tramway cars. He gave the preference to gas and oil engines as being the most likely to satisfy all the requirements of a large city. The cable system was the most economical of all when the traffic was very heavy, and he suggested a method of surmounting the principal difficulty in connection with this system—the extension of it to other districts after the plant had been laid down. For comparatively light traffic distributed over a large area, the electrical overhead trolley system was at present by far the most successful. In Glasgow it was absolutely necessary either to spend a large sum on increased stable accommodation and other matters, or to adopt at once mechanical propulsion, and it would probably be best to adopt the electrical method, although it was almost certain that the present overhead system and the present type of motors would be obsolete and so have to be replaced within a very few years. It would also be well to equip, say, the Whiteinch and Dalmarnock sections with cars propelled by gas engines. The outlay involved in the adoption of this would be comparatively small, and cars of this type were working very successfully at Blackpool and other places. The lecture was illustrated with lantern views.

Mr. G. F. Thompson at Liverpool.

"Self-propelling Vehicles" was the title of a lecture delivered on the 23rd ult. by Mr. G. F. Thompson, at the Royal Institution, before the Liverpool Polytechnic Society. After tracing the development of the self-propelling vehicle, the lecturer referred to the absence from the market of motor-cars of English design and make—a deficiency which, he thought, would soon be filled. Comparing the advantages and deficiencies of the horse and the motor, he said the horse adapted itself to greatly varying conditions without much guidance or assistance from its driver, while the mechanical carriage depended upon its manœuvring facilities and the skill and presence of mind of the driver. The motor had the advantage of having no vitality to tire or ailments to contract, while its initial cost was no more than that of a horse, and its keep less. The most objectionable features of large cities were noise and dirt, and the modification, if not the entire removal, of these nuisances, largely due to the horse, was a strong argument for the introduction of motor-carriages. After discussing the arguments for and against steam, oil, and electricity—the latter the perfect motive power for self-propelling vehicles, except with regard to cost—he urged the claims of the hot-air engine, which possessed all the conditions of success, and all the advantages of both steam and oil and some of those of electricity. He was strongly of opinion that the hot-air system offered a good field for inventors in the perfecting of effective and economical motors. The lecture was illustrated by a number of limelight views.

MOTOR FINANCE.

Under this heading our contemporary, *The Statist*, of the 21st ult., in the course of an analytical article on the subject, states that the registrations as public companies of concerns for dealing with this new industry have not so far this year been very numerous, and those where the capital runs into six figures are ten in number, some of them having not yet appealed to the public for capital. The list is as below :—

1896.			£
Jan.	17.	Daimler Motor Company .. .. .. (Prospectus, February)	100,000
March	24.	Britannia Motor Carriage Company .. (Prospectus, June)	100,000
April	21.	Motor Carriage and Cycle Patents	5,000
May	6.	British Horseless Carriage and Motor Cycle Company	10
May	18.	London Electric Omnibus Company .. (Prospectus, May)	250,000
May	14.	Great Horseless Carriage Company .. .. (Prospectus, May)	750,000
May	14.	Pennington Motor (Foreign Patents) Syndicate	100,000
June	5.	British Motor Carriage and Cycle Company (Prospectus, June)	200,000
July	25.	Tavenner Safety Motor Syndicate	3,000
July	25.	Anglo-French Motor Carriage Company .. (Prospectus, August)	300,000
July	31.	Motor Carriage Syndicate of Australia ..	5,000
July	31.	Motors	5,000
Aug.	7.	Davies Motor Company	160,000
Aug.	13.	Central London Omnibus Company	1,000
Aug.	28.	Millet's Patent Motor Wheel and Cycle Company	100,000
Sept.	29.	Esson Motor Company	20,000
Oct.	5.	Coventry Motor Company	10,000
Oct.	22.	Selections	2,000
Nov.	2.	Armstrong-Dove Motor Syndicate	6,000
Nov.	4.	Traffic Syndicate	10,000
Nov.	5.	Yeovil Motor Car and Cycle Company ..	1,000
Nov.	6.	London Motor Car Works	10,000
Nov.	11.	Pioneer Motor Car Syndicate .. .. (Prospectus, November)	10,000
Nov.	12.	London Electrical Cab Company .. .. (Prospectus, November)	150,000

We now deal with some of the above companies in their chronological order :—

Daimler Motor Syndicate.—This Company was formed in May, 1893, with a capital of £6,000. It acquired the goodwill of the engineering business of F. R. Simms, and contracts, including the agency for selling patent rights in England of the Daimler Motoven Gesellschaft. The purchase consideration was £3,000 in shares, and £562 10s. 2d. in cash. On January 14th, 1895, all the capital was issued, and held by 20 shareholders. In April following the capital was increased by £2,000 to £8,000, and at a meeting held December 5th, 1895, confirmed January 2nd, 1896, voluntary winding-up was determined upon. By an agreement of October 24th, 1895, H. J. Lawson acquired for £35,000 the business of the Daimler Motor Syndicate, the Syndicate having previously entered into a contract to purchase the patent rights of Daimler Motoven Gesellschaft's right for United Kingdom and Colonies (except Canada) for £18,750.

This motor, for the patent rights of which £18,750 was paid, seems to be the main basis of the group of companies now dealt with.

British Motor Syndicate, Limited.—This concern was registered November, 1895, with a capital of £150,000, which was increased in May, 1896, to £1,000,000 in £1 shares. In the return filed at Somerset House showing the position at April 30th, 1896, there were, of the then £150,000 capital in £1 shares, seven shares issued to seven subscribers £7 paid, and 135,000 shares issued to H. J. Lawson and others "considered as paid." Many transfers had been effected prior to the filing of this return. There were at April 30th, 1896, in all 33 shareholders, and amongst the principal holdings were :—

	At April 30th, 1896.	Previously disposed of.
H. J. Lawson	99,801	15,200
M. D. Rucker	5,000	25,000
Company Registration Syndicate ..	15,000	—
Somers Vine	1,000	—
E. T. Hooley	Nil	31,500
B. B. van Praagh	Nil	2,500
T. Robinson	1,000	—

The last three persons named appear as having acted as directors of the Syndicate. Two, it will be seen, did not hold shares in April last. Various contracts at different dates had been filed as between H. J. Lawson, as vendor, and the Syndicate. Reference to the Daimler Motor Syndicate particulars above mentioned shows what had been acquired by such Syndicate, including £18,750 paid for the Daimler patents for the United Kingdom and Colonies (Canada excepted), and that Mr. Lawson bought up the business that had been conducted by the Daimler Syndicate.

It would seem that what was represented by 135,000 shares fully paid was as follows :—

	£
Lawson's payment to Daimler Motor Syndicate ..	35,000
Lawson's payment to Baines for rights—Kanes Pennington Motor—for patents for mixing and volatilising gases for United Kingdom and West Australia	35,000
Lawson's purchase of electric motor car patent ..	500
Lawson's payment for letters patent	2,000
	72,500

Having got to this stage of what represents £135,000 "considered as paid," we have the feature that in July a contract was entered into by which the British Motor Syndicate acquired from Lawson, for 12,993 shares, rights of application for two patents. To carry this out, in the following month the capital of the Syndicate was raised to £1,000,000; but a resolution to change the name Syndicate to Company was ignored by the Somerset House authorities. Other contracts for the acquisition of rights in consideration of fully-paid shares seem to have since been made, as an advertisement this week refers to £250,000 having altogether been paid for patents. The advertisement referred to gives some fine illustrations of works erected or to be erected, the owners of which have secured licenses from the British Motor Syndicate.

Daimler Motor Company, Limited.—This undertaking was formed to manufacture and sell the Daimler Motor in this country. It was offered for public subscription in February, 1896, with a capital of £100,000 in £10 shares, paying the British Motor Syndicate for license to use patents in the United Kingdom £40,000 in shares considered as fully paid, or cash in lieu thereof. The return of shareholders on June 2nd, 1896, shows that apparently this Company was rushed for, there being some 700 shareholders, and no shares being mentioned as having been allotted as fully paid.

Great Horseless Carriage Company.—This Company was formed in May last, with £750,000 capital, to manufacture horseless carriages, vans, &c., but not to make motors. A contract was entered into for license to use patent rights belonging to the British Motor Syndicate. The consideration, according to the prospectus, was £500,000 in cash or shares, at the option of the vendors. Eventually, as to £250,000 the consideration was in fully-paid shares. So huge a sum to start a carriage-building business and right to pay for motors did not deter a large section of the public from applying for shares, when the prospectus was issued in May last. A contract with the Daimler Motor Company, the motor manufacturing concern, gave the Great Horseless Carriage Company the concession of purchasing Daimler motors at 10 per cent. less cost than any ordinary customer. The lease of a block of 12 acres, with mill, weaving shed, &c., at Coventry was acquired from the British Motor Syndicate. The return filed at Somerset House in respect of the Great Horseless Carriage Company's capital of £750,000 shows 61,502 £10 shares issued, with 25,000 shares "considered as paid." The Company has, approximately, 3,000 shareholders. In the return as at September 25th there is a curious feature, that only 3,116 £10 shares (say £31,160) stood in the name of the British Motor Syndicate. Among other large shareholders were :—

	£
J. H. Sturmey (director)	13,980
H. J. Lawson (director)	109,920
Company Registration Syndicate	15,670
T. Robinson	4,870
M. D. Rucker	5,500
B. B. van Praagh	2,500
F. Simms	3,870

Company Registration Syndicate, Limited.—This Company, registered in April, 1894, with a capital of £6,000 and powers to promote companies, figures as a large shareholder in both the British Motor Syndicate and the Great Horseless Carriage Company. The Company Registration Syndicate at the end of 1895 had a paid-up capital of £210 15*s.* in respect of 1,637 shares of £1 issued, 2*s.* 6*d.* called up on 1,630, and seven shares fully paid. Among the shareholders figured the following :—

	Shares.
T. Robinson (director of British Motor Syndicate, Limited)	280
C. Osborn	100
H. J. Lawson	100
London Mortgage Banking Company	1,000

Traffic Syndicate, Limited, registered November 4th, 1896, with a capital of £10,000 in £1 shares, has a contract with London Electrical Cab Company. Some of the same seven subscribers as of the Traffic Syndicate have figured in like capacity, or otherwise, in what we may term the Lawson group.

London Electrical Cab Company, Limited.—This concern issued its prospectus last week. It is formed, with a capital of £150,000, to acquire the sole license to work, within the metropolitan area, patents secured from the British Motor Syndicate, the Traffic Syndicate, Limited, receiving for such rights 50,000 shares, or cash in lieu thereof.

In the judgment of the House of Lords delivered on Monday, the action of the Aberdeen District Tramway Company in clearing away the snow from their lines so as to cause an obstruction is a public nuisance and must be interdicted.

Perhaps the best evidence, after all, of the reality and importance of the new movement in favour of horseless vehicles is the substantial air of The Automotor, the new monthly organ of automatic locomotion. The second number, published by Messrs. F. King and Co. (Limited), St. Martin's Lane, is a solid publication of 84 pages, full of articles on topics directly and indirectly connected with the subject at home and abroad, together with a large number of pictures of typical vehicles described in detail in the number. We need hardly say that the number also includes an authoritative account of the proceedings on Emancipation Day, together with a report of the dinner and speeches at the Hotel Métropole.—*Daily News.*

CONTINENTAL NOTES.

Motor Omnibuses for Paris.

The General Omnibus Company of Paris has published the following programme of a competition for designs for an automobile omnibus to replace those drawn by horses now in use. An illustration will be forwarded by the Company to intending competitors as a guide to the general requirements, the omnibus shown being that now in use, the form of which is by preference to be adhered to as much as possible.

Part I.—Motor and Mechanism.

1. *Data.*—(1) The weight of the vehicle fully loaded may be about 6,000 kilogs. (6 tons). (2) It must be able to travel up a slope of 65 per cent. (1 in 15) at a minimum speed of 6 kiloms. (3¾ miles) per hour. (3) The dynamometric trials made by the Company have shown that the starting effort may be 120 kilogs. per ton, and the average tractive force 20 kilogs. per ton. The power of the motor and the adhesion of the driving wheels to be adapted to these values.

2. *Character of the Motor.*—The motor, with its generator or accumulator of energy, may be of any kind, provided that it does not give off smoke, steam, or objectionable odours when at work. It must work as silently as possible. The transmission mechanism must as completely as possible be submerged in a permanent oil bath.

3. *Arrangement of the Motor.*—The motor, while placed so as to be easily accessible, must be enclosed in a sheet metal case to protect it from mud and dust.

4. *Length of Run and Duration of Stoppages.*—The run may be assumed at 6 kiloms. (3¾ miles) and the period of stopping at the ends of the line at six minutes each. If accumulators are proposed, two intermediate stoppages may be allowed for changing them, but not exceeding three minutes each.

5. The present programme may be modified by competitors in any way that they think necessary, if the reasons for the changes are explained.

6. The items to be submitted in competition are:—(*a*) Drawing of the generator or motor; (*b*) descriptive account; (*c*) prices and conditions of construction and delivery. The above programme is independent of the frame of the carriage, which forms the subject of the second, although it is desirable that they should be considered conjointly.

Part II.—Frame with Accessories.

1. *Frame.*—The framing should be of such a character as to enable the present thirty-seat omnibus to be utilised. The total weight should not exceed 4,000 kilogs. in running order without passengers, distributed as follows:—(1) Body of the omnibus, for carrying thirty passengers, 1,000 kilogs.; (2) allowed for motor or generator, 1,800 kilogs.; (3) leaving for the frame, properly so called, 1,500 kilogs.; total, 4,000 kilogs.

2. *Wheels.*—In principle, driving shall be done by the hind wheels, and steering by the front ones, although making both axles motors would be preferable. Constructors are therefore at liberty to adopt any system of driving, providing that the mobility of the forward axle and facility of steering is not prejudiced.

3. *Steering.*—Special steering gear must be provided, allowing the driver to guide the vehicle easily, which must be able to turn in curves of 6 metres—19½ feet—radius.

4. *Brakes.*—Sufficient brake power must be provided to enable the omnibus to be stopped, when running 7½ miles an hour, in 7 metres—23 feet—on a slope of 1 in 15. Each truck must have a brake, utilising, if possible, the motive power in addition to one applied by hand. Sand boxes to be attached to driving wheels front and back, and clearing guards to the front wheels.

5. *Driver's Platform.*—A platform rounded in front with a screen overhead for sheltering the driver, to be placed in front, with the steering wheel, brake, starting, and reversing handles, conveniently arranged for use.

6. *Buffers.*—The vehicle shall be supplied with elastic buffers.

7. *Suspension.*—Particular care must be taken in the suspension arrangements.

8. *Modifications.*—Builders are at liberty to make any alterations in the present programme that they may think useful, subject to the same being explained in their specification. As a preliminary, it is desirable that their attention should be confined to the omnibus carrying thirty passengers—inside and out.

9. *Items to be Submitted.*—Competitors are desired to submit (*a*) a drawing of the carriage; (*b*) a descriptive explanatory memoir; (*c*) propositions for construction, including price, conditions, and time of delivery, &c.

The following dimensions are given in *Le Genie Civil*:—Diameter of axle arms, front, 55 mm.; back, 64 mm.; length of axle arms, 24 cm.; inclination, 1 in 10; number of plates in the springs over front axle, 8; cross spring in the front, 10; over hind axle, 10; cross spring at back, 10 leaves; total length of body, 5·52 m.; surface occupied by omnibus, 12·58 square metres; total length over all, 7·54 m.; width of body, 1·48 m. to 1·56 m.; length of seat per passenger, inside, 0·48 m.; outside, 0·46 m.; weight, empty, 1,970 kilos.; full, 4,050 kilos.

The French Automobile Club Contest for 1897.

As briefly stated in our last issue, quite an original competition has been decided on by the Committee of the Automobile Club de France, and it will be invested with particular interest to manufacturers in this country, as it is international. It is to be decided on July 1st, 1897, and the five following days, within a certain radius of a town situated in the neighbourhood of Paris. Only large and heavy motor-cars will be eligible. The vehicles entered must be able to carry at least ten persons besides the drivers, or to convey goods weighing one ton as minimum. They will compete as if they were on the special services for which they have been constructed, each being provided with a timekeeper approved by the committee. The number of the motor-cars taking part in the contest will not be limited, but each manufacturer can only enter one vehicle of the same type and size, though he may send a dozen of different models and dimensions, and try his luck with all. The entrance fee for each car will be 200 francs up to June 1st, and double that sum afterwards up to the 25th, inclusive, when the list will be closed. Photographs of the vehicles entered, together with the sale price of each, must also be forwarded before the latter date. The total amount of ground to be got over in the six days will be 300 kilomètres, divided into three series, the first consisting of 40 kilomètres, with a stoppage at the end of every kilomètre, the second of 50 kilomètres, with a halt at the termination of every five, and the third of 60, with a stoppage at the close of every 10. Each series will be gone over twice by every vehicle. In the town selected as the centre of the operations a place will be set apart for the reception of the motor-cars, and any repairs that may be necessary will be effected in the presence of members of the committee, who will also carefully watch and take note of the qualities of the various vehicles. Medals and diplomas will be given to those which are found to be best adapted to the purposes for which they have been constructed, and an exhaustive report will be drawn up for publication. In fact, this is to be a thoroughly practical competition of the utilitarian order, under the auspices of the Automobile Club, which is anxious to demonstrate the advantages of motor-cars, not only for promenades, amusement, and journeys, but also for solid and substantial work in the carriage of a number of passengers and goods.

NOTES OF THE MONTH.

JUST as we are going to press we hear that Mr. McKim, of the Duryea Wagon Company, has purchased the rights in Messrs. Roots and Venables' patents.

AT a meeting of the East Ashford Rural District Council, Mr. Amos called attention to the fact that no stipulation was made in the regulations laid down for the traffic of motor-cars, compelling the drivers of such cars to assist a restive horse past. It was resolved to write to the Local Government Board stating that the Council thought it necessary that such a stipulation should be made.

MR. J. M. ANDREW, C.C., who was one of the occupants of the motor-carriage which led on the return journey from Brighton to London, writes:—"It was a most thrilling and novel ride; and when the course was clear in the country roads the first and second cars travelled at a very high speed. They ascended and descended hills with facility, and the skill with which they were steered through the towns and villages, instantly slowing or stopping, or quickening directly the road was clear, showed that they were under perfect control, and conclusively proved that these mechanical marvels can be driven with safety. They caused no inconvenience to anyone on the road, and no accident occurred. It was a record ride not to be forgotten, and made memorable in the infancy of this new industry. It may be mentioned that the cars travelled at the rate of 30 to 32 miles an hour, when the road was good and the course clear. It was most exhilarating travelling against the wind at 30 miles an hour, though it made breathing rather difficult, the sensation being similar to that experienced when riding on a switchback railway car."

WE learn from Ireland that Mr. Walsh, proprietor of the mail cars running between Sligo and Ballina, is making inquiries with the view of placing a motor-car on the road. We have also reason to believe that the new mode of locomotion, thanks to the enterprise of Mr. Maughan, may not unlikely be availed of for the busy traffic between Ballina and Ennismore next season.

MR. A. H. GIBBINGS, the electrical engineer to the Bradford Corporation, has presented an elaborate report recommending the adoption of electricity for the tram system in that city. The total cost of working a 15 minutes' service on the Horton route is estimated at 9·43*d.* per mile per car, and for a 10 minutes' service at 8·25*d.* The total capital cost for the Horton section is placed at £18,660, of which £2,000 is for sheds and offices, £1,600 for four cars at £400 each, and £15,060 for rails, cables, paving, &c. The length of the Bolton section being considerably less, the cost per mile per car is calculated to come out at 25 per cent. more than on the Horton section. If the two sections were worked conjointly, the cost would probably be reduced to 8*d.* per mile per car. The additional capital required for a 10 minutes' service, as against a 15 minutes' service, would be small compared with the material reduction in the mileage cost. As for the effect on the electricity works a charge of $1\frac{1}{2}$*d.* per unit would yield a profit of $\frac{1}{2}$*d.* per unit, or an income of £277 1*s.* 8*d.* on a sale of 133,000 units in the year, which would be gained without further expenditure on the works.

THE directors of Messrs. Campbells (Limited), Aberdeen, have under consideration the abolition of the large number of horses employed by them, and propose to substitute automotors in their stead.

THE Joint Committee of the county and burghs of Dumfries contemplate the purchase of an automotor for the use of their sanitary and weight inspector.

NOW that everybody is talking about motor-cars, and a wonderful vista of development is presenting itself to the eye of the sanguine, it will interest many to learn that half a century back a motor-car used to run for evening pleasure trips on the turnpike road from Neath Abbey. The car was built at the then celebrated Neath Abbey Ironworks. It was driven by steam, which was generated in a small vertical boiler, and carried from four to six passengers.

A GASOLINE inspection car for railways has been introduced in America. It runs along the rails at a speed of 15 miles an hour, and is very convenient. The car was built by the Daimler Motor Company, of the United States.

THE motor-car as an advertising medium does not find favour with the Leeds Corporation Carriages Committee. At a meeting of this body a letter was read from a large firm of cocoa manufacturers, asking to be allowed to continue to run a motor-car along the streets of the city as an advertising vehicle. Temporary permission to do this had been previously granted, but the committee, however, fearing that if such a method of advertising were permanently allowed they would be deluged with applications from other traders, deemed it advisable to pass a resolution prohibiting advertising of this kind. They have no objection, however, to the firm using the motor-car for carrying on ordinary trade purposes.

THE necessary steps preparatory to bringing the scheme for providing the township of Bray with a system of electric tramways connecting the main street with Bray Head before the Privy Council have been taken.

AT a recent meeting of the Sedgley District Council the general manager of the Dudley, Sedgley, and Wolverhampton Tramways Company, Mr. Hatch, attended the meeting, and gave an explanation respecting the proposed scheme for the adoption of electric tramways in South Staffordshire district, and also asked the Council to support it. He explained that an electrical engineer would visit the district. The Council expressed their willingness to confer with him with respect to the proposal to adopt the electric mode of traction.

The Liverpool Tramways Company are taking the necessary steps to obtain powers which will enable them to provide the public of Liverpool with expeditious mechanical traction on all their tramway routes. The Parliamentary notice seems to point more especially to electrical traction by means of overhead wires in the less densely-populated parts of the town, and by means of underground wires in the central districts.

At a special meeting of the Coseley District Council on the 18th ultimo, an engineer of the British Electrical Tractions Company attended, and stated that the Company were entering into negotiations for revolutionising the tramways in South Staffordshire by obtaining power to adopt overhead electric traction in lieu of steam. It was proposed to spend a million of money in reconstructing and extending the tramway, and it is believed the undertaking will prove remunerative, as by means of electricity a 10 minutes' service can be guaranteed.

General Frost will be one of the best allies of the motor-car. When during his skirmishing advance the London streets are strewn with fallen horses, when nervous people dare not drive, and the hearts of the sympathetic are wrung by the painful sights they witness, many will gladly surrender to the motor-car, which cannot stumble and cut its knees, or fall and have to be shot.

The directors of the Dublin and Kingstown Railway have determined to apply for powers to use electricity instead of stoking coal on their line in future. Their traffic is large and heavy, but they consider electricity would be cheaper for their purpose, and it seems that trains can be more easily stopped on the electric principle than by the system at present in use. If this Company succeeds in the venture, no doubt others will rapidly follow in their steps, but, of course, in the first instance it must be more or less experimental.

According to statistics just issued concerning the development of electric tramways in Europe during the past year, Germany possesses the greatest mileage of lines; France comes second, and England a bad third. Of the 111 lines now in operation, it is noteworthy that no less than 91 are worked on the trolley system—that is, with overhead wires.

The Links and Parks Committee of the Aberdeen Town Council have, without a dissentient, declared in favour of electrical cars, and an effort is to be made to introduce them at an early date.

The Blackpool Town Council have at length approved their big scheme for improving the Promenade. The proposal is the result of a tour of the watering places in England recently made by several members of the Council. It provides for a 15-feet footpath on the easterly side, a roadway 55 feet wide, a 10-feet island footway, a double line of electric tramways, and a Promenade 42 feet wide on the outer or westerly side, the whole width being not less than 140 feet. The estimated cost is £300,000.

At a ratepayers' meeting it was, on the 24th ult., unanimously resolved to adopt electric power for the Bristol tramways. A keen fight, however, took place over a proposal to compel the Company which works the lines to obtain its current from the municipality. After a prolonged discussion this was defeated, the supporters of free trade in the matter gaining a decisive victory.

The Stockton Rural District Council has had before it an application from the Middlesbrough Imperial Tramways Company for permission to reconstruct the tram lines in the Council's district (extending from Stockton borough boundary to Norton village), and to work the cars on the electric trolley system. The whole scheme is to amalgamate the Middlesbrough and Stockton companies, to carry the line from the terminus at Newport, Middlesbrough, to the terminus at Thornaby, thus making a continuous line from the Royal Exchange at Middlesbrough to Norton Green, viâ Thornaby and Stockton, and extending over a distance of about seven miles. The Council referred the matter to a committee for consideration.

Mr. Herkomer's great vivacity and determination to be of artistic assistance to everybody has made him turn his attention to the motor-car. Of course, Mr. Herkomer, in common with many other people, thinks that the form of the car is all wrong, and that the designers have failed to grasp the fact that a horse would not finish off the extremity of the vehicle. The master of Bushy's suggestions point to a form of vehicle which would approximate more nearly to the outline of a boat than anything else. He would allow craftsmen to exercise their skill on the motor-car, and secure for it a decorative appearance that will tend to make the streets picturesque.

The *Financial News* is responsible for the statement that the profits of the Dunlop Company for this year will not only reach the £600,000 which the prospectus stated to be probable, but that, from the orders in hand, profits amounting to £1,250,000 are certain. Our contemporary adds: "It is simply stupendous." In this we agree—but is the forecast an accurate one?

Mr. Charles Allan, the proprietor of the omnibuses plying between Aberdeen and Cluny, is inquiring for motor-cars to replace his present omnibuses. The kind of vehicle Mr. Allan requires is one that would carry about thirty-five passengers and a reasonable weight of luggage, and the difficulty, if it could be called a difficulty, would be to get a motor of sufficient power. At present the Aberdeen and Cluny 'buses, which are of the capacity indicated, are drawn by four horses, and Mr. Allan calculates that the motor would require to be of 8-horse power. Petroleum would be used for fuel. There are some rather stiff inclines on the route, particularly in the first five miles from Aberdeen, but it is not considered that these would be any impediment to the traffic.

The Ealing District Council have resolved to oppose the application of the London United Tramways Company for power to run their lines through Ealing.

MR. JOHN RICHARDSON, M.I.C.E., one of the managing directors of the firm of Robey and Co., the famous engineers of Lincoln, has been interviewed on the question of automotors. After passing in review the past history of the subject, and detailing some of the early experiences of his firm in the matter, he appeared to be somewhat dubious of rapid developments being made. His views may be best judged by the following expression of opinion:—"I think they would serve admirably for distributing light goods. They could be used by commercial travellers with samples, and possibly would be useful for the conveyance of passengers in some districts where there are no railways. But Lord Winchilsea's idea is absurd that automotors would answer the purposes of light railways for the conveyance of farm produce. It is very unlikely that, as an article of luxury, they will ever be used in the place of a carriage and pair. Either petroleum or steam engines require more attention and care than ordinary users would ever bestow."

SIR WM. ERROL, M.P., the well-known engineer, in addressing his constituents at South Ayrshire, said "He looked to the development of road locomotives or motors to do a great deal in the way of assisting the farmer. By their use he would be brought into closer contact with consuming centres, and in more remote districts with railway stations." (A voice: "What about the horse dealers?") "Well, the horse dealers could do as the rest did. When the railways were constructed there was a great outcry about horses being done away with altogether. The result had been, however, that more horses had been used in connection with railways than had been used before them. He thought that a similar experience would follow the introduction of the motor-carriage."

THE Edinburgh Town Council are considering the advisability of adopting some of the more recent mechanical motors, in view of the tramway extension to Portobello.

THE Rathmines Tramway Scheme—described in a recent issue—has been rejected by the ratepayers, and consequently falls through for this year.

AT a meeting of the Aston Urban Council, held on the 1st inst., the Clerk announced that he had received a communication from the City of Birmingham Tramway Company, notifying their intention of applying to Parliament for powers to construct a tramway along Summer Lane, up Alma Street, across High Street, Aston Newtown, down the Witton Road to Bevington Road. Mr. Sidney Fisher asked what the motor power was to be. The Clerk said he was not in a position to say. Mr. Fisher: I only wanted to know, as I shall certainly oppose the adoption of steam. The matter was referred to the Highway Committee.

As the local authorities object to tramways being laid in Llandudno, the neighbouring lines intend to fill up the gap by supplying a service of motor-carriages. The promoters estimate that six or seven vehicles will be sufficient at present; but in the summer these will have to be increased to about 40 or 50.

AT a recent meeting of the Valley Bridge Sub-Committee of the Scarborough Town Council, the Committee having considered the question of motor-cars or light locomotives, and other light vehicles passing over the bridge, and the tolls that should be taken for the same respectively, it was resolved to recommend that application be made to the Local Government Board by provisional order to alter or amend Sections 41, 44, and 45, and Schedule A of the Scarborough Valley Bridge Company's Act, 1864.

THERE does not at first sight seem to be any very clear connection between horseless carriages and sparrows. Our contemporary, *Lightning*, however, discussing automotors, asks, "What will become of the London sparrow? When the nosebag has departed from the cab-rank and the ordure of the streets exists no more, his precarious livelihood will be lost. He will peak and pine and slowly starve, till, faint and emaciated, he will fall, a disappointing morsel, into the claws of the London cat." 'Tis a sorry picture, but, we hope, a too dismal one. The sparrow may be able to adapt himself to circumstances, and cultivate some new tastes.

K. S. RANJITSINHJI is tempting Nemesis. To top the cricket record, to have at least three pet names with the public, to have a clause all to himself in a New South Wales Act of Parliament, and now to possess a motor-car, which he has ridden with a firm and graceful seat all the way to Cambridge—these things are too much for one young man in one year.

THE Dublin Cycle and Motor-Car Exhibition is filling up with rapid strides. The latest exhibit has been secured through the energy of Lord Mayo, that is the Great Horseless Carriage Company. They have signified their intention of showing their latest motor-cycles, carriages, and the famous car that won the great motor-car race between Paris and Brussels. Mr. R. Wilson, of Dublin, the secretary, has been working the exhibition in London for the past ten days, and in every case he has met with great courtesy and support among the English manufacturers.

PLANS, &c., of an electric tramway for Dundalk and Blackrock have been lodged with the local authority in compliance with the Act of Parliament. The Tourist Development Syndicate are seeking for a Provisional Order to enable them to carry out the projected work in conjunction with which they hope to establish a system of public and private electric lighting for Dundalk.

IN the course of an interview which a *Daily Telegraph* correspondent recently had with Mr. Edison, the following paragraph occurs:—"We began with the subject of the propulsion of motor-cars. For these, at present, he considers that the best form of motor lies between steam and the gas engine. The advantage might at any moment change to electricity, but such an occurrence depended wholly upon the discovery of some more efficient and stable system of storage batteries. Excessive weight, cumbrousness, and other drawbacks stand in the way of stored electricity as a motive power."

IN our last issue we fully described the motor vehicle run to Brighton, and have now only to briefly record the fact that most of them returned on the day we published, viz., the 17th ultimo. Taking advantage of some rather wild statements which were made, the London evening papers described in vigorous descriptive matter a wild race which ensued on the way to the metropolis—the carriages careering along at a mad speed of from 30 to 32 miles an hour. We understand, from one who took part in the journey, that although a few high speeds were undoubtedly reached for short stretches of level and down hill roads in unfrequented places, the mean speed was not excessive. The risk is too great, however, for anyone to again tempt the authorities—or rather, we should hope it is.

MR. J. A. WHEELER, of Natal, is sending out to Mafeking some motors on trial in order to test whether they can be utilised for service in dealing with the transport of food among the natives of Rhodesia.

WHIP-MAKERS have been deploring the advent of the motor-carriage, on the assumption that with its arrival their trade would come to an untimely end. It appears, however, that the street-boys of London have found out that as there is no danger of "whip behind" in the new vehicles, they can enjoy unlimited free rides without danger. A judicious application of a few electrical shocks when they can be conveniently applied will soon dissipate confidence on the part of the cockney gamins.

IT is stated that at present there are in use in America from 150 to 200 miles of street tramway lines, the joints of which have been all welded, either by the electrical or the "cast-welding" system, so that the rails are actually continuous. As to the success of this system, the testimony is rather conflicting; but it is obvious that the difficulties to be encountered are serious.

AT the close of the Aberdeen Town Council business on the 7th inst., the members of the Links and Parks Committee met, and appointed Councillor Wilkie (convener) and Councillor Gray as a deputation to visit London and report on the motor-cars in operation there.

A PRIVATE company has been formed in Falkirk with the object of acquiring two motor cars, to be used in conveying passengers from the Cross of Falkirk round by Camelon, Larbert, Stenhousemuir, Grahamston, and *vice versâ*. The shares, which are of £10 each, have all been taken up privately. The secretary of the company has been in communication with London to ascertain what kind of carriages would be best adapted for the local roads. Each is to hold from 25 to 30 people. Should the company prove a success a third car will be purchased.

THE management of the Grand Colosseum Warehouse Company of Glasgow have put on the streets of that city a motor-car for business purposes. It is the first of its kind to run in Glasgow, and, so far as is known, the only one in Scotland. The car is of French manufacture, and is driven by a Daimler oil-motor.

LAW REPORTS.

Mr. Humber and the British Motor Syndicate.

IN the Chancery Division, on the 2nd inst., before Mr. Justice Stirling, Mr. Graham Hastings, Q.C., moved, in an action Humber and Co., Limited, *v.* Thomas Humber and the British Motor Syndicate, Limited, that Thomas Humber be restrained by injunction, until trial or further order, from acting as a director or other officer or servant of the defendant Syndicate, and from being connected with or advising or assisting in the manufacture or sale of cycles or cycle accessories or any business cognate thereto, except on behalf of the plaintiff Company, in breach of an agreement of January 28th, 1892, between plaintiffs and the defendant Thomas Humber; and that the Syndicate be restrained from employing the defendant Humber as a director or other officer, and from representing by advertisement or otherwise, that he was a director. There being no appearance for the defendants, his lordship granted the injunction over Friday; but, soon after, Mr. Butcher appeared for the Syndicate, and asked and obtained leave to re-open the matter later in the day.

Just before four o'clock, Mr. Butcher again mentioned the case. He said his clients had not been able to communicate with Mr. Humber, who was, he believed, at Nottingham. He was, therefore, not in a position to argue why the injunction should not be made; but he understood there were negotiations between the plaintiffs and defendants as to bringing the matter to a conclusion. Unless some such settlement could be arrived at, he took it that his lordship would continue the injunction; but he would ask that it should only be until Thursday, by which time he hoped to have instructions from Mr. Humber.

Mr. Hastings said that the only injunction he had obtained was to restrain the defendant from acting as a director of the defendant Company till over Friday; and if Mr. Humber was at Nottingham the injunction over Friday would not inconvenience him much.

Mr. Butcher said that there might be a board meeting on Thursday, which he might desire to attend.

His lordship said that the motion had been brought on upon short notice.

Mr. Hastings' clients at this stage entered the court, and it was ascertained that an arrangement had been come to between the parties, that nothing should be done till over Friday, the defendant Company undertaking to pay the solicitors and clients' costs of yesterday's proceedings.

On this undertaking, the matter stood over until the following Friday, without any injunction. On that day, when the matter came on, Mr. Graham Hastings, Q.C., for the plaintiffs, stated that the parties had come to terms; and Mr. Butcher, for the defendants, said that the passing difficulties had been arranged to the entire satisfaction of all parties. In these circumstances, his lordship, by consent, made an order staying all further proceedings in the action.

Alleged Infringement of a Patent.

THE Pneumatic Tyre Company (Limited) *v.* the East London Rubber Company was an action for an injunction and an inquiry for damages in respect of an alleged infringement by the defendants of the plaintiffs' patent (No. 14,563 of the year 1890), the invention of Mr. Charles Kingston Welch, for improvements in rubber tyres and metal rims or felloes of wheels for cycles and other light vehicles. The hearing of the case occupied the Court for several days, and at the conclusion his Lordship reserved judgment.

Mr. Moulton, Q.C., Mr. Roger Wallace, Q.C., Mr. J. C. Graham, and Mr. A. J. Walter appeared for the plaintiffs; Mr. Bousfield, Q.C., Mr. Terrell, Q.C., Mr. C. E. Jenkins, and Mr. Munns for the defendants; and Mr. Micklem and Mr. W. E. Hume Williams held watching briefs for the defendants in other actions.

Mr. Justice Romer, in giving judgment on the 8th inst., said that he had come to the conclusion that the patent was valid; but as the case was one of considerable importance, he would give his reasons for arriving at this conclusion at length. He went in detail through the points of disconformity between the provisional and the complete specification, and decided that there was no such differeuce between them as to invalidate the patent. This matter of disconformity between the two specifications had been the principal thing contended for by the defendants. The patentees, in drawing up the complete specification, had not gone beyond the limits allowed to the patentees under the circumstances. His Lordship having disposed of other points which had beeu raised on the part of the defendants, said that his holding was that infringements having been proved the plaintiffs were entitled to the usual relief, and he granted an injunction against the defendants, an inquiry as to damages, aud an order to pay costs; but on the application of the defendants he stayed execution conditionally upon an appeal being forthwith entered.

Judgment for the appellants.

Damages against Motor-Carriage Owners.

BEFORE Judge Shand and a jury, at Liverpool County Court, on the 7th inst., John M. Sutherland, hay and straw dealer, claimed damages from the North of England Horseless Carriage Company, for injury caused to his pony and trap in consequence of the former having beeu frightened by a motor-car belonging to defendants. The plaintiff stated that the motor-car made a loud noise resembling the sound produced by a threshing machine, and it so frightened his pony that it bolted and collided with a van. The jury found for the plaintiff, and awarded him £12 10s. The owner of the van also brought an action against the Company, and he was awarded £5.

BUSINESS NOTES.

ONE of the first charging stations put down in England for the direct purposes of charging accumulators for electric motor-cars has just been completed at the White Hart Hotel, Reigate, by Mr. W. R. Wakley, the chief engineer of Maple and Co., the well-known Tottenham Court Road firm The dynamo is by John Turner and Sons, Denton, and the whole of the plant is of a high class.

MOTOR AWARDS OF MERIT.—The following notice was, with many others, crowded out of our last issue:—In connection with the exhibitiou of motor carriages at the Crystal Palace awards have been made as under: Diploma for gold medal—C. C. Burrell and Sons, for light compound traction-engine; Emile Delahaye, for benzoline-carriage; Mons. Serpollet, for steam-carriage; the Steam Carriage and Wagon Company, for steam-van. Diploma for silver medal—Société Franco-Belge, for steam-brake; L'Hollier, Gascoigne, and Co., for benzoline-carriages. Diploma for bronze medal—Arnold's Motor Carriage Company, for benzoline-carriage. The report by the jurors is signed by W. Worby Beaumont, M.I.C.E., Walter Hancock, M.I.E.E., H. A. O. Mackenzie, C.E., and Alf. R. Sennett, A.M.I.C.E, Hon. Executive Commissioner. "Although none of the vehicles exhibited approached that degree of perfection which would place them beyond adverse criticism," the jurors consider the prospects of benzoline motor-carts hopeful, and of steam motor-carts more hopeful. As to electric-carts, "the jurors considered it matter for regret that no electrically-propelled vehicle had been submitted for trial."

MR. CYRIL D. WARE, of Kimberley, has arranged jointly with Mr. Julius Harvey, of 11, Queen Victoria Street, London, a motor-carriage agency for South Africa.

THE DRAKE MOTOR.—The Drake patent motor, which will shortly be put on the market, is suitable for carriages, omnibuses, and vans of every description. A carriage may be seen at work in the course of a few weeks at Mr. W. Drake's private residence, South Road House, South Road, Clapham Park. The works, *pro tem*, are situate at 64, Westbourne Grove, W.

SOUTHAMPTON AND MOTOR-CARRIAGE BUILDING.—Acting in conjunction with a patentee who lives at a distance, but whose special type of steam launches is well known in Southampton Water, Messrs. Andrews, Brothers, of the Above Bar Carriage Manufactory, have now in hand the construction of a motor-car, which, whilst designed in strict accordance with the regulations of the Board of Trade, presents many features distinguishing it from any such conveyance yet built. It is intended for the carriage of goods, and will be fitted with a powerful motor. Oil will supply the motive power, but it is claimed that the method of its application in this instance will be free from the disadvantages observable in other cases, whilst the car will be capable of propulsion either backwards or forwards. The large capacity of the car will, it is thought, render it of great service for commercial purposes.

MOTOR-CAR REGULATIONS FOR SCOTLAND.

LORD BALFOUR, Secretary for Scotland, has issued regulations, applicable to Scotland, under the Locomotives on Highways Act, 1896, with respect to the use of light locomotives on highways and their construction, and the conditions under which they may be used.

Article 4 of the regulations states that a person driving or in charge of a light locomotive when used on the highway, "shall not, under any circumstances, drive the light locomotive at a greater speed than ten miles an hour. If the weight unladen of the light locomotive is one ton aud a half, and does not exceed two tons, he shall not drive the same at a greater speed than eight miles an hour, or if such weight exceeds two tons at a greater speed than five miles an hour. Provided that whatever may be the weight of the light locomotive, if it is used on any highway to draw any vehicle he shall not, under any circumstances, drive it at a greater speed than six miles an hour. Provided also, that this regulation shall only have effect during six months from the date hereof, and hereafter until the Secretary for Scotland otherwise directs."

OUR HORSE POPULATION.

THE inauguration of the new era in locomotion lends special interest to the live stock statistics contained in the latest returns issued by the Board of Agriculture. Farmers have been encouraged to devote a share of their attention and capital to horse-rearing, and the money which used to be wasted on Queen's Plates is now in fact as well as in name expended in promoting the improvement of the breed of horses. The change, however, does not seem to have been productive of any marked result. In 1895 there were in the United Kingdom 2,112,207 agricultural horses of one kind or another, including unbroken animals aud brood mares. In 1896 the total was 2,115,517, or only 3,350 in excess of the previous year. A growth in the stock of brood mares, however, seems to indicate that an extension of the horse-breeding industry was in progress. The figures for the four countries composing the union are as follows:—England, 1,190,038 horses of all descriptions, against 1,184,747 last year; Wales, 155,965, against 153,158; Scotland, 206,554, against 207,323; Ireland, 553,320, against 557,139. Scotland and Ireland, it will be seen, show decreases. It is in England and Wales that the development in horse-breeding has taken place.

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NOTICES.

Contributions and articles likely to prove of interest to our readers will receive due attention, but in all cases the name and address of the writer must be given, not necessarily for publication.

All matter intended for publication should reach us not later than the 10th of each month. Stamped envelope must be sent if the manuscript is required to be returned.

All Advertisements should be sent to the Advertising Department, F. KING AND CO., LIMITED, 62, *St. Martin's Lane, London, W.C., where Advertising Rates may be had on application.*

The Annual Subscription is 7s., including prepaid postage to any part of the world.

Cheques and Post Office Orders should be made payable to F. KING AND CO., LIMITED, *and crossed London and County Bank; otherwise no responsibility will be accepted.*

THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL *can be obtained through* MESSRS. W. H. SMITH AND SON, *and at* WILLING AND CO.'s *bookstalls.*

When any difficulty is experienced in procuring the Journal from local newsvendors, intending subscribers can obtain each issue direct from the Publishing Office, by filling up and forwarding, with remittance, the Subscription Form accompanying the Paper.

The Automotor and Horseless Vehicle Journal.

A RECORD AND REVIEW OF APPLIED AUTOMATIC LOCOMOTION.

DECEMBER 16TH, 1896.

ANSWERS TO CORRESPONDENTS.

J. E. P. (Wolverhampton).—In all cases where applications are withdrawn before allotment the directors are bound to refund the money sent. After allotment a contract exists between the Company and the applicants, which, speaking generally, can only be dissolved by an action at law, when substantial misrepresentation must be proved.

S. A. (Toronto).—We will send the specification as you are so exceptionally situated.

I. ZINGARI (Leeds).—Impossible; it is highly inflammable and dangerous, even at ordinary temperatures. Its use is prohibited in this country, except under almost impossible conditions.

MERIVALE (Manchester).—(1) No. (2) We have inquired at the address given, but without any satisfactory result.

J. W. (Ebberston Lodge, York).—Thanks for your suggestion; which shall be carried out in an early issue.

MOORE (Camberwell).—The publisher will attend to your request.

J. DOUGLAS (Liverpool).—Write to Mr. Shrapnell Smith, Royal Exchange, Liverpool. He will give you every information.

BUTCHER'S CART (Darlington).—Our advice is to wait a little. Prices will be fixed shortly. You will find the addresses of agents in our advertisement columns.

JAMES G. (Bedford).—The local authorities have only the power to make recommendations—the regulations are, thank goodness, only issued by the Central Board.

P. G. (Faversham).—We cannot reply to such communications by post. The matter is one for a patent agent; the information sent is too meagre to enable us to advise off-hand, and you can hardly expect us to finish your vaporiser for you, and then experiment. We have returned it to your order.

HYDRO-CARBON (Portsea).—Write to Mr. Dugald Clerk, Chancery Lane, London. He can—and may—give you the information.

J. JOHNSON (Cardiff).—Always glad to consider any communication on special subjects, but cannot make any more permanent additions at present.

PETER M. (Fulham).—We have sent you the photos for use at your meeting. Return when done with.

FAIR MAID OF KENT.—Why not have the common courage to sign your name and give your address when writing a scurrilous attack upon one of your neighbours? The anonymous libeller is beneath contempt, and your letter—carefully type-written to avoid risk—has gone into the waste-paper basket.

ERNEST S. (Wolverhampton).—Do not pay the premium. Mushroom establishments for the sole purpose of obtaining apprentices to the new industry are growing up in several directions. The advertiser is a fraud.

ANTIQUITY (Belfast).—Thanks; but we are looking forward, and prefer to leave all but the most interesting of the old types buried in the ancient volumes you possess.

PATENTEE (London).—The statement is obviously incorrect.

MOTOR (Brixton).—As it is an old Company there would not be any statutory meeting; that was held long ago.

W. WYNSTANLEY (Plymouth).—You would find it difficult to get on without a properly-drawn partnership deed. Printed forms are cheap but nasty; consult a respectable local solicitor. The costs will not be great, and you will save both worry and expense in the end.

ALTER EGO (Devon).—Respect the rights of the other man—while maintaining your own.

W. GIFFARD (Salford).—Your best course would be to write to one or other of the agencies advertised in our columns.

H. J. STEVENS (Salisbury).—The time occupied would be about three-quarters of an hour (rather less in your district); weight about 15 cwt. For other particulars you had—if only for the sake of comparison—better write to some of our advertisers. We could only give you an approximate idea of the cost.

*** *Although this issue is mainly printed in comparatively small type, extreme pressure on our space causes us to omit or reduce many items which have been sent for publication. Several letters from correspondents, reports of meetings, and interesting articles have had in consequence to be either condensed, held over, or—where the matter was only of current importance—hopelessly crowded out. We are taking steps which will, we hope, obviate this necessity in the immediate future.*

THE BRITISH MOTOR SYNDICATE (LIMITED).

A Discreditable Prospectus.

THE promoters of public companies often—in fact, despite the unsavoury disclosures which at times take place as to their doings, we think we may replace the word "often" by "mostly"—do good service by bringing investments before the public in such a shape that the large mass of unemployed capital in this country may be beneficially used in developing some new industry or discovery to the general benefit of the community. No one has a right to complain that promoters occasionally make large profits, for they always run considerable risks. Again, too, if they make mistakes, and the reports of experts are not fulfilled, all but the investors in the particular company which has been unsuccessful are, as a rule, charitable enough to condone the failure with the remark that "those who seek for high dividends must be prepared to risk the losses."

All this—and even more—we are prepared to advance in the promoter's favour; but when a prospectus is issued teeming with mis-statements, bolstered up with assertions which are only made tenable for the moment by a deliberate suppression of facts—and when, too, the sums sought to be extracted from the pockets of investors amount to no less than three millions sterling, the mildest term which can be applied to those who have concocted such a document is that they have been guilty of discreditable conduct.

The British Motor Syndicate (Limited) was registered about 12 months ago with a capital of £150,000—out of which no less than 135,000 shares were issued as fully paid. This capital was afterwards—as shown in another column—raised, by the simple expedient of a resolution, to a nominal capital of £1,000,000. As we have not seen the memorandum of association of this Syndicate, we cannot speak positively of its objects; but we know from the public actions and expressions of those connected with it, that they made a show of purchasing a monopoly of all the patents connected with motor-carriage work, and of exploiting the new Act of Parliament for their own advantage. They undoubtedly acquired many patents — the approximate value of which we will presently deal with — and with the assistance of the splendidly-boomed trip to Brighton, they centred universal attention upon the industry in which we are interested.

For their energy and enterprise the shareholders in the British Motor Syndicate are entitled to all the profits they can legitimately make. One of the first statements made in the prospectus is that the shares are freely dealt in at £3, and that—to quote from another page—"**THE EXCITEMENT** (*sic*) in the share market, the immense premiums now being realised, and enormous dividends paid in kindred industries, sufficiently indicate what the immediate future of the Company is likely to become." This is a deliberate mis-statement; the shares in motor-carriage companies are almost unsaleable on the Stock Exchange, and a member of the Committee advises us that he does not know a single jobber who makes a "book" in them. Let that be as it may. We would ask one pertinent question, viz., does any sane man imagine that if the shares of the Syndicate were being freely dealt in at £3—or, in fact, at any reasonable sum—those connected with it would spend tens of thousands of pounds in advertising a prospectus to sell them at that price, when they could dispose of them on the Stock Exchange by merely paying brokerage to a member.

We next come to a line setting out "**SUCCESS CERTAIN. BUSINESS HOUSES DECIDE.**" The names of some half-dozen of the most noted advertising drapery houses are set out as having ordered vans. We know why. Not because they are convinced that the Syndicate's carriages are the best, but because they naturally desire publicity for their wares. They buy "living pictures" with the same objects. This argument, as an inducement to invest any part of the £3,000,000 asked for, may be dismissed with the contempt it deserves. In the next place we are favoured with an abbreviated list of patentees, and the chief names which would weigh with an investor in this country are those of our contemporary the *Engineer* and the well-known firm of Crossley Brothers, of Manchester, ostentatiously set out as the makers of the "Otto" Gas Engine. Needless to state, both of these, in a prompt and contemptuous manner, repudiated the slightest connection with such a misleading document.

With the directorate we have little to do. We may take it that, as a general rule, they have their own private ends to serve. We regret, however, to see on the front of the document the name of Prince Ranjitsinhji. His popularity with the great body of Englishmen has evidently been the attraction for the promoter, but his knowledge of automotors is an unknown quantity. As all-round sportsmen and cricketers, we heartily wish him out of the tight place he is in now that he has started to play at a game he does not in any way understand. At Lord's, the Oval, or Hove, he is—next to "W. G."—our idol, but in the region of Holborn Viaduct he will find that Mr. Promoter is trickier than George Lohmann, and that his pace is faster—if his delivery is not quite as fair—as Tom Richardson at his best.

We next pass to the dividends which have—as stated—been paid by the Syndicate. These are set out as follows:—

"May—10 per cent., or at the rate of 30 per cent. per annum.

"July—30 per cent., or at the rate of 60 per cent. per annum.

"September—100 per cent. bonus in shares of licensed companies, which, if taken at market prices, equals a total of over 100 per cent. per annum on the issued capital."

These figures, which are evidently intended to attract the unsuspecting public, are allowed to stand as stated. No certificate is given; the verification of the figures by an auditor is evidently considered as an unnecessary detail; while, whether these alleged dividends were paid on a capital of £3,000 or £3,000,000 is considered a matter of such an immaterial purport that the figures are not given. Again, whether the actual amounts were in cash or in shares in allied companies is not indicated. We could go on in this way through every page of our issue—the scheme sketched out is all in the air. "Immense Prospects," set out in big black type, is the keynote which pervades the whole document. Subsidiary companies have been formed; these, with their more or less paper capital, offer to pay huge premiums for the use of the Syndicate's patents, and on this slender basis we are to put up our £3,000,000—out of which £2,700,000 is to go to the vendors.

Two million seven hundred thousand pounds is a good round figure—even in this era of monthly millionaires. Let us endeavour to see what the shareholders are to obtain for the money. The only real asset which they acquire is certain patent rights, the dates and titles of some of the specifications being set out in the prospectus. We should have expected that under these circumstances some expert opinions would have been obtained as to the possible validity of the letters patent. Just as a certificate from a leading firm of auditors would have been advisable as to the profits which have been earned, surely an opinion from an expert patent authority might have been expected as to the value of the specifications. But, no. The list is in the prospectus, the Syndicate have bought the patents: the public must take it on their authority—their *ipse dixit* is sufficient.

It has seemed to us a pity that, for the sake of a little trouble and expense, this defect should remain; we have, therefore, obtained all the patents set out which can be procured, and, in addition to examining them carefully ourselves, have submitted them to the highest authorities at our disposal.

The opinion we have obtained is unanimous in its purport. The Syndicate state that they possess all the master patents in connection with motor carriages, and that they will resist all attempts at infringement. If they go into Court we will not directly attempt to anticipate the judicial decision, but counsel and patent agents are at one in the statement that master patents they have not — every oil-engine they work or lease on royalty has for its basis the well-known Otto engine, and can only, at the best, hold good for improvements in respect of details specifically as set out and claimed.

Practically the only point in reference to the oil-engine of to-day in which a master patent could be obtained would relate to a novel method of vaporisation, which would ensure the complete combustion of all the components of the heavy and safe hydrocarbons. It is certain that such a patent is not in the possession of the British Motor Syndicate. It is, however, very probable, from information which has been placed at our disposal, that one of the many private firms experimenting on this important point has been very nearly successful, and may reap a good reward for their pains. The Syndicate possesses many useful designs for various parts of motors and carriages, which have been patented. Whether they would be sustained in a Court of Law, however, is much more than doubtful in more than a moiety of those examined; but they would form an admirable nucleus with which to start a factory to build carriages on the Continental lines of to-day.

But is this uncertain asset worth £2,700,000? The promoters can answer the question for themselves. The Great Horseless Carriage Company (Limited), one of their own bantlings, is the owner of one half of the rights in these patents. In spite of the "furore on the Stock Exchange in favour of these ventures," the £10 shares in this Company can be bought for less than £3, so that as it was capitalised originally at £750,000, the market value is now reduced to some £225,000. Why should the public be asked to give £2,700,000 for exactly the same property as they could, at the date of the issue, obtain for one-twelfth of that sum? On that valuation the £3 shares offered would have been worth exactly 5s. each—and in our opinion would have been distinctly dear at that.

There is one important feature, however, which, beyond any question as to patents or figures as to paper profits, those concerned in this issue have either carelessly or wilfully omitted to consider—we refer to the extensive steps which are being taken by scores of the leading engineers in this country to graft this new industry on to their old-established businesses and reputations. While having this object in view, they have no intention of buying the Continental patents, or of slavishly following existing models either of motors or vehicles. We have recently had the privilege of seeing the strides which many celebrated firms are making in this matter, and must confess to being astonished at the enormous progress already achieved.

By simply utilising all the technical skill at their disposal and working in accordance with the ordinary routine of any well-organised engineering or electrical establishment, they have evolved new designs, often in conjunction with leading coach builders, and these are now being executed in workshops equipped with the best of modern appliances, operated by the most skilful of workmen. Some time must necessarily elapse before the full results of their efforts will be seen, because until full tests have been made and the manufacturing placed on a basis for effective output such firms will not publicly exhibit, but their motors when finished will be worthy of their reputations, and hold the field against any but their native competitors. On this point it must not be forgotten that to the present generation of English engineers this trade has been a sealed letter. What they will ultimately achieve is certain to be worthy of the birthplace of modern locomotion.

It is but little use pursuing the matter of this unfortunate prospectus further. We could dilate at length on its crudities, mis-statements, and bad taste—but enough has been done. It was so outrageously bad that the entire Press of the country—with a few notorious exceptions which might have been expected—unanimously exposed its hollowness, and by their timely comments must have prevented very many from being entangled in the toils, who might otherwise have been caught. If the promoters of the issue wish to give an earnest of their repentance for the wrong which they must be conscious of having attempted to commit they will voluntarily return the money which they have received. If they do not, their last state may be worse than the first—as a Court of Law may compel them to make the sacrifice.

AUTOMOTOR CONTESTS IN 1897.

WE announce in our columns the conditions of three sets of valuable prizes which are offered to be contended for in the coming year by automotor vehicles. The first of these in priority of offer, and perhaps of importance, is the one for 1,100 guineas offered by the proprietors of *The Engineer*—which it was originally intended should take place during the present year. Owing, however, to the legal restrictions, since removed by statute, a sufficient number of entries could not be obtained, and a postponement was made until May, 1897—which still errs rather on the near side if a representative list of the English engineers who have just commenced to manufacture is to be obtained.

The revised conditions, which are eminently practical, as might be expected from the source from which they emanate, are fully set out on page 118, but we may briefly state that the total sum is to be divided up into five prizes. The chief is of 350 guineas, and will be awarded to "the best mechanically propelled vehicle constructed to carry—including the driver—four or more persons, the total weight, when fully loaded, not to exceed two tons." The next is to be of 250 guineas, for the best to carry one, two, or three persons, the total weight, when loaded, not exceeding one ton. Another 250 guineas will be given for the best to carry, in addition to the driver, not more than one ton of goods, the total weight fully loaded not exceeding two tons. A sum of 150 guineas will be given for a vehicle carrying five cwt. of goods, the fully loaded weight not exceeding one ton. Any method of mechanical propulsion may be used, but if oil be adopted for supplying motive power, either for the production of an explosive mixture or for fuel, it shall not have a lower specific gravity than 0·8, or a lower flashing point than 73° Fahr., Abel's test.

The remaining prize, of 100 guineas, will be devoted to "the vehicle, whether for passengers or goods, propelled solely by a motor actuated by the vapour of oil or spirit having a lower specific gravity than 0·8, or a flashing point lower than 73° Fahr., Abel's test, and constructed to satisfy the requirements of any Act of Parliament and the rules to be made thereunder for the time being respectively in force."

It will be noted that all the chief prizes go, as they should, to motors using safe explosives or fuel, while only a comparatively small sum is devoted to the class using the more volatile, or dangerous, oil or spirits. The speed trials are also to be carried out in a reasonable manner, a run of 100 miles out and home, in which the minimum mean speed to qualify is five miles an hour, while no greater speed than 10 miles an hour is to count will be sufficient for all purposes, and will remove the contest from any suspicion of being a race—in which the prize goes to the vehicle engined in the most powerful manner, without any reference to its other qualifications or drawbacks for road traffic. The judges are Sir Frederick Bramwell, Mr. J. A. F. Aspinall, and Dr. John Hopkinson, and it is certain that the vehicles selected by them for the premier awards will be the best of those entered. Our contemporary is to be congratulated on its enterprise, and for the business-like way in which it is proposed to carry it out.

The next contest in order is that arranged for by the Automobile Club of France, the official conditions to govern which are given in another page. We warmly approve of the new position taken up by the leading Continental club. It has—at any rate, on this occasion—decided to abandon mere racing, and submit all vehicles to tests which will try the many other qualities besides speed which are necessary in a motor-carriage which is to meet the exigencies of every-day use and traffic. The competition is to be an international one, and it is proposed that it shall commence on July 1st of next year.

The vehicles are restricted to those carrying one ton or over, and the judges are briefly to take into consideration the cost of running the motors, the ratio of weight-carrying capacity to the weight and power of the vehicles, and several other points, such as the utility of the brakes used and the ease of steering, which, as we have stated in reference to the previous contest, are often of infinitely greater importance than mere speed. Of course, that factor cannot be neglected, but in the past it has been made to assume such inordinate proportions in judging the merits of a motor-carriage that in this article we intentionally seek to minimise it. However, as the competition will last for some days, during which the vehicles will have to run a distance of some 186½ miles—running twice over distances of approximately 25 miles, 31 miles, and 37 miles respectively, one journey on each day, stopping at every kilomètre (·6214 of a mile), five kilomètres (3·1 miles), and ten kilomètres (6·2 miles), to test the brakes and auxiliary gear, their road efficiency will be fully tested. We heartily wish the Automobile Club every success, and trust that some at least of the entries will come from this side of the Channel.

The third competition emanates from the Motor-Car Club, and the leading characteristics of it may be found in Mr. C. Harrington Moore's letter, which appears in another column. The Club intends to offer £2,000 for a contest to take place in May next, but we greatly regret to find that the principal point which will be taken into consideration is speed, which the Club is "of opinion affords the most satisfactory test as to the excellence of construction of a mechanical vehicle." With this view we emphatically differ. The Club asks owners of suburban racecourses to communicate with its officials, as the place of trial must be near London, and the course should be a level straight mile. From the more or less officially inspired interviews which have appeared in the Press we learn that a special prize will be reserved for the motor vehicle which first succeeds in accomplishing a mile in one minute, and that the Club intends to institute a Motor Derby.

If this is to be simply an experiment undertaken with the object of providing a new form of sport we can only prophesy that the public will hardly be weaned from horse-racing by the spectacle of more or less cumbrous motor-carriages making the best of their way over a length of ground. To compare it with chariot-racing is to leave out all the virile interest which made such contests popular. The sight of plunging, living horses straining every nerve, guided by the skill of man to defeat all antagonists, is something to appeal to and excite mankind; but when the result of any race is to be determined mainly by one point, viz., which vehicle is propelled by the motor developing the largest amount of horse power, the public, at any rate after the first essay, will severely let such contests alone.

If, however, the officials of the Motor-Car Club seriously consider that such a contest can in any way beneficially assist in making motor-carriages popular, we would ask them to reconsider their position. The Club, with its resources, has the power of doing great good or harm—and we are certain that only the latter can result from the encouragement of speeds at any sacrifice—speeds, too, which can never be allowed, even if possible, on any road in the United Kingdom; while, if they devoted £2,000, or even a quarter of that sum, to a competition to be carried out on scientific lines they would accomplish more real good than by holding fifty Motor Derbies.

"ENGINEERING" AND MOTOR-CARRIAGES.

Our contemporary—*Engineering*—in the course of a well-reasoned article which appeared in its issue of the 27th ult., deals with the objections of those who held the opinion that the Editor of that journal was by no means favourably disposed towards the new industry. Referring to the remarks which appeared in our last issue on the subject, the Editor states: —

"Among the more gentle of our critics is The Automotor and Horseless Vehicle Journal, which thinks we have 'altogether failed to grasp the position taken up by those who are seeking to introduce the new industry into the country.' We trust not; but what we do fail to grasp is the utility of those who are seeking to trade on the credulity of the public, and extract money from the pockets of the ignorant under the pretence of establishing 'the new industry.' Every penny thus misdirected is a loss to 'the new industry,' and robs those who wish well of the motor-car of the sinews of war. It will take a very large sum yet to evolve a practical motor car, and there is no maxim which the average investor acts more strictly upon than 'once bit twice shy.'

"The company promoters—amongst whom we must not include our contemporary, to judge by his moderate and courteous language—are the chief enemy of 'the new industry,' but there is another serious foe, the reckless amateur or 'mechanical crank.' 'No one,' continues The Automotor and Horseless Vehicle Journal, 'wishes to place vehicles of from one to three tons in charge of incompetent men to drive through crowded streets at the rate of some 14 miles an hour. . . The keynote of the advice given by all concerned in automotor work is to go slowly at first.' How has this advice been followed? On the Brighton race, which was to have been the very first legal appearance of the new vehicles on the Queen's highway, the speed reached as high a rate as 30 miles an hour; and, again, we have complaints that motor-cars are restricted to the speed of the bicycle. 'What,' says one ingenious reasoner, 'is the use of going to all the expense of machinery when one is not allowed to travel at a greater speed than can be attained by the bicycle without machinery? Why should we be restricted any more than the bicycle?' The reason is obvious. The bicycle is a light machine. In a collision with a pedestrian the rider is in a more dangerous position than the person struck, whilst against other vehicles it is all but powerless to do damage. With the motor-car the opposite conditions prevail.

"The Automotor and Horseless Vehicle Journal concludes its courteously expressed article with an appeal to us. 'In all friendliness,' it says, 'we would ask *Engineering* to look a little more kindly towards the new industry.' In all friendliness we would assure our contemporary that we will look very kindly towards the new industry—when it arrives. Our friendliness is such that we are ready to do battle on behalf of the embryo industry against its arch enemies, the company-monger and the mechanical crank."

We have quoted this much from the article in order to take an opportunity of emphasising two sets of views which we have never failed to express. The first is that, like *Engineering*, we are prepared to denounce in the strongest terms any attempts which may be made to bring out companies with inflated capitals. The promoter is entitled to a fair profit, but his demands must be reasonable, while his statements should, before all things, be kept within the bounds of truth. The second postulate in which we concur is as to the paramount necessity which exists for all interested in the progress of road motors to rigorously keep within the limits of the law. There are enough natural difficulties in the way without creating fresh ones by a wilful infraction of regulations. If anyone infringes, there should be no hesitation in suing for and enforcing the penalties incurred. It is only fair, however, to add that those referred to in the article were doubtless fascinated by their new-found liberty, and indulged in spurts on clear roads which they are not likely to repeat.

WANTED—A WORD.

Under this title we, in the last issue, discussed the various phrases which have been used to describe motor-carriages, and invited correspondence from those who were of opinion that they could coin a better word than any generally in use. Letters have, in consequence, come to hand in large numbers—in fact, we regret that we have not, in consequence of the quantity, space to print them. We have summarised below the words submitted, but cannot express an unqualified approval for any of them, while some are extremely objectionable. They are as under (of course, many have been submitted by several correspondents) :—

Autokinous.	Automotives.	Go cars.
Automobiles.	Horseless.	Motes.
Moto.	Mobus.	Self-Propelled.
Movers.	Autos.	Mo's.

WHAT BETSY-ANN MAKES OF IT.

DEPARTING GUEST. "WILL YOU CALL ME A CAB?"
BETSY-ANN. "ANSOM, FOUR-WHEELER OR MOVER, SIR?"

(A TIMES CORRESPONDENT SUGGESTS THAT THE HORSELESS CARRIAGE BE CALLED AN "AUTO-MOVER")

PNEUMATIC TYRES FOR MOTOR-CARRIAGES.

An extremely interesting lecture on pneumatic tyres was delivered on Monday evening, the 1st instant, by Professor H. S. Hele-Shaw, M.I.C.E., M.I.M.E., &c., before the members of the Liverpool branch of the Self-Propelled Traffic Association. Mr. Alfred Holt, M.I.C.E., one of the vice-presidents, was in the chair, and there was a good attendance.

The Professor's paper, of which we give an abbreviated report, was exceedingly interesting, and we regret that pressure on our space prevents us from doing it full justice by illustrating it with the appropriate diagrams which were used. After exhaustively setting out the history of the wheel and explaining in full its mechanical action and theory, he said: No one would dispute that to walk upon a yielding surface, such as mud or sand, requires an appreciable effort, which is greater the softer the material, so that heavy snow may be toilsome beyond endurance. The same cause is at work in the case of the wheel rolling upon a soft road and (here, I imagine, I may again excite some possible disbelief) of a soft wheel rolling upon a hard road. To understand this we must study the actual motion of the parts of the wheel as they approach the ground, and we will first consider that of the spokes themselves. Let us follow the behaviour of a particular spoke, and we shall see that until it nearly reaches the ground it approaches it at an oblique angle. If it does not find an obstacle it will come down upon the ground and rest there. If it meets any yielding substance, which is raised above the point of support, it will not only compress it underneath, but push it before it, as shown in the diagram, and will therefore cause a corresponding effect backwards, which is greater the deeper the rut which it is making. This is seen to be true both for a soft wheel and hard road, as well as a hard wheel and soft road. This seems obvious where a permanent compression and distortion is taking place, as, for instance, in a rut in the road, but it does not appear so evident when the material is of an elastic nature, and returns to its original shape again after the compression has taken place. When the tyre is elastic the same thing occurs. If the elastic material is of a nature that requires a distortion at every point, it is clear that the work which is being done continuously to distort this material is an absolute loss of power and a cause of resistance to the motion of the vehicle. In considering the best form of tyre, it is clear that if the only resistance was rolling, a hard wheel would be better than a soft one. The reason of the success of the introduction of the railway is due to the principles I have now made clear. Hence those who only consider rolling, were very naturally sceptical of the earlier attempts to make soft tyres serve for any other purpose than to merely protect the road, for although the theory of rolling which I have explained has not been generally understood, still the mechanical intuition of many men would tell them the facts to be what they are without their understanding, perhaps, the true cause. Again I may remark that crowds of inventors in connection with the soft tyre of vehicles, particularly for bicycles, have often gone entirely on a wrong track, with the natural result of failure. We come now to the real cause of the benefit of the pneumatic tyre which requires preliminary explanation. Suppose a body to be in motion, as this pair of wheels and axle, and it meets any obstacle over which it has to rise and loses a portion of its energy. Suppose it meets the same obstacle but is not compelled to rise to the same extent, the loss of energy is not so great. This is exactly what happens in the case of a soft, yielding tyre. It meets an object which it may cause to sink into it, hence the body as a whole is not checked in its onward course. This behaviour on the part of the tyre is made obvious by some photographs which I have recently taken of the tyre in the various positions which I now show, and also some photographs of the tyre given by M. Michelin in a recent paper, and this effect he has shown by a series of curves which indicate the deflection in meeting obstacles under various conditions and circumstances. If the reasoning which I have given is true, then the remarkable fact will come out, that at very low speeds the resistance to soft tyres is actually greater than that to hard tyres, and this benefit is only apparent as speed is increased, the greater the speed the greater will be the benefit of soft-tyred vehicles. I made a series of experiments myself which must be regarded as supplementary to the experiments of M. Michelin in the paper I have already mentioned, and they were made by my assistant without any previous idea of what might be expected, so that his inclination was, if anything, to obtain a better result with the pneumatic tyre. Instead of this, the experiments came out exactly as theory would lead us to expect, and at first, I must confess, surprised me. The experiments were conducted at the works of Messrs. Lawton and Co., who kindly placed three broughams at my disposal with—(1) steel tyres, (2) rubber tyres, and (3) pneumatic tyres. These were drawn over the floor, and over a series of obstructions, drawings of which I have already shown. The following is a statement of the results :—

Three similar vehicles—whose exact weight was not known. The tests were made in the show room of Messrs. Lawton and Co.'s works, Hardman Street, and in each case the pull required to start the vehicle was measured by a spring balance. The mean effort required was estimated by the average reading of the balance, whilst the vehicle was pulled at a uniform speed over a track about 6 feet long. The results were as follows :—

The first track was across the floor, the second, with obstructions, 1 inch apart, the third, with an interval of 2 inches, and the fourth with 3 inches between the blocks.

Track.	Steel Tyre.		Solid Rubber Tyre.		Pneumatic Tyre.	
	Starting Effort.	Mean Pull.	Starting Effort.	Mean Pull.	Starting Effort.	Mean Pull.
Floor ..	31·2	21·4	24	17·0	30·25	22·0
Second ..	37·4	22·0	27·4	18·7	29·0.	22·25
Third ..	43·8	21·2	36·8	19·8	30·75	23·25
Fourth ..	?	21·0	36·8	20·2	40·5	25·5

It is extremely interesting to study the various views on the subject by those who have been interested in the adoption of the pneumatic tyre. Thus Mr. Dunlop, of Belfast, who is a comparatively recent patentee of pneumatic tyres, writes as follows :—

"My improvements are devised with a view to afford increased facilities for the passage of wheeled vehicles—chiefly of the lighter class, such, for instance, as velocipedes, invalid chairs, ambulances—over roadways and paths, especially when these latter are of a rough or uneven character, as also to avoid sinking of the wheels of vehicles into the ground when travelling over boggy soil or land, and likewise for the tyring of wheeled vehicles generally, in all cases where elasticity is requisite and immunity from vibration is desired to be secured, and at the same time ensuring increased speed in travelling owing to the resilient properties of wheel tyres according to my invention."

From these words it cannot be seen that Mr. Dunlop appreciates the direct connection between the saving of power and the pneumatic tyre, as he only talks about increased speed owing to the resilient properties of his wheel tyres. We must go back a good many years, when the pneumatic tyre was first invented by Mr. R. W. Thomson, who seems to be nearer the mark, and who says :—

"The nature of my invention consists in the application of elastic bearings round the tyres of the wheels of carriages, for the purpose of lessening the power to draw the carriages, rendering their motion easier, and diminishing the noise they make when in motion. I prefer employing for the purpose a hollow belt composed of some air and water-tight material, such as caoutchouc or gutta-percha, and inflating it with air, whereby the wheels will in every part of their revolution present a cushion of air to the ground or rail or track on which they run."

This invention was actually carried into operation, and led to a good deal of correspondence and interest at the time, a brougham fitted with pneumatic tyres by this inventor attracting considerable attention in the London Parks exactly 50 years ago. The views which were then held are well expressed in an article in the *Mechanics' Magazine*, which is as follows :—

"The most obvious advantage—indeed, the only one which at first sight would seem likely to result from the substitution of an elastic for a non-elastic tyre—is a diminution of noise, and hence it was that we were led, in our former notice of these wheels, to characterise them as 'silent,' rather than as being distinguished for any other property. It has been so long regarded as a settled thing that friction is least with hard substances and greatest with soft, that by a natural though not perhaps strictly logical course of induction, we inferred that, though in this case the noise might be less, the friction, and consequently the tractive power required, would be greater. We must candidly own that we little expected to find the very reverse of this to be the fact. Yet so it is. Experiments very carefully conducted, and which we have ourselves repeated and verified, prove incontestably that the friction and draught are diminished to a very great extent by the use of these elastic wheels."

This led to a letter by a Mr. Heather correcting the Editor in talking of the reduction of friction, and making a mis-statement himself, as follows :—

"Sir,—The importance of disseminating by means of your journal correct mechanical principles induces me to suggest to you that the traction of a carriage is independent of the friction of the tyre and the road, and is due to the friction between the wheel and the axle, and to what may be called the resistance to rolling at the circumference of the wheel, which resistance is in no way analogous to friction."

All these facts show that the matter is not an easy one to understand at first sight, and I will briefly sum up the matter by saying that soft tyres do involve more friction than hard ones, but that the loss of power on an ordinary hard road is due in a much greater degree to the loss from concussion than to actual friction, that the order in which the loss of power takes place in the cases respectively of the pneumatic, rubber, and iron tyres, is directly in the order of the hardness of the tyre.

Having studied the theory of the subject as fully as time permits, we now pass on to certain practical considerations in the construction of the pneumatic tyre. The pictures which I now throw upon the screen are those which were running in the year 1845, and the further views which are now shown you will, perhaps, be surprised to hear are those of the tyre mentioned in the specification of Mr. Thomson of the same date. It is interesting also to note that Mr. Thomson's patent included the inner tube as well as the outer protecting case, the inner tube being indiarubber, strengthened with folds of canvas, and the outer covering itself being of leather either riveted or sewn, so as to make it strong and durable. Mr. Thomson advocates the use of pneumatic tyres to the traction engines and autocar in the following words :—

"The comparatively small amount of power required to propel carriages, the wheels of which are fitted with these belts, the steadiness of their motion, the absence of all jolting and consequent security of the machinery from injury, the small damage the carriages will do to roads, the absence of nearly all noise, the high speed that may safely be attained, and the great gentleness of the motion will, I think, enable steam carriages to be run on common roads with great advantage both for carrying passengers and goods." We must all regret that Mr. Thomson's genius did not, as far as I ascertain, meet with a fitting reward which seems to have been in reserve, judging from the present scale of company promotion, for more fortunate individuals, who at any rate cannot claim more originality of mechanical insight than the original inventor. Other slides were then shown describing the modern development in the mechanical details of the pneumatic tyre. Improvements in the arrangement for inflation, and particularly devices for getting at the inner tube in case of repairs being required.

This portion was discussed under the following heads :—

(1) *Attachment.*—(*a*) The early system ; (*b*) the early Dunlop ; (*c*) other forms of attachment ; (*d*) Welsh wire rim ; (*e*) Fleuss tyres ; (*f*) vehicles—points of difference between vehicle tyres and bicycle tyres.

(2) *Wear.*—(*a*) Ordinary wear, material, tread ; (*b*) puncture, repairs ; (*c*) dirt and wet.

(3) *Inflation.*—Pressure used, valves.

I cannot conclude without saying how much pleasure the preparation of this lecture has given me, for I regard it as a slight acknowledgment of the enjoyment I have experienced in the use of the modern bicycle. But the services of the pneumatic tyre are not limited to cyclists, and we may safely look forward to its increasing introduction to vehicles of every kind, both for light and heavy traffic ; and lastly, not to leave the impression that I have forgotten the object of the Association before which I have lectured to-night, I venture to assert that if the autocar, which 50 years ago was running by scores over the country, and were afterwards discarded, are to become universal in their adoption, and are to attain any reasonable rates of speed, this development will depend upon, and be almost entirely owing to, the invention and perfection of the pneumatic tyre.

An animated discussion followed the paper, and in this Messrs. A. Bromley Holmes, John A. Brodie, E. Shrapnell Smith, and Mr. James took part. On the motion of the Chairman a hearty vote of thanks was accorded to Professor Hele-Shaw, who, after acknowledging it, replied to several questions which had been raised. Messrs. Dunlop and J. A. Lawton and Co. kindly lent materials for several of the experiments which were made.

An interesting syllabus in connection with the first session of the Liverpool and District centre of the Association has been issued. The programme drawn out is a most comprehensive one, extending from December 1st up to March 30th. Papers will be read by Mr. G. F. Thompson, Mr. W. W. Beaumont, Mr. H. Percy Boulnois, Mr. Rhys Jenkins, Mr. Dugald Clerk, and Mr. Legros. A meeting took place last evening when a paper was read by Mr. Wm. B. Cook and Mr. Fred. Willoughby, on "A New Method of utilising Canals for Traffic—with Special Reference to the Canals of Lancashire and Yorkshire." The authors are the joint patentees of the scheme discussed, which is one of great interest to the shipping interest of Liverpool. The next paper will be read on January 5th, 1897, by Mr. G. F. Thompson, consulting engineer, on "The Motor Wagon Scientifically Considered."

All who are interested in motor traffic and reside in the neighbourhood of Liverpool should write to Mr. Shrapnell Smith, the Hon. Secretary, for the full prospectus of the Association, and join the enterprising local centre.

A VERY satisfactory test was made last week with one of the carriage trucks of the London Electric Omnibus Company's new omnibuses, which are soon to be placed on the streets of London. The streets on which the trial was made were specially selected on account of their severe gradients. The carriage ran up Trafalgar Square opposite Morley's Hotel, and through Craven Street, with ease. Stoppages were made on the inclines for the purpose of testing the re-starting capacity of the motors, and in each instance the re-starts were made without apparent effort, though less than half the available power was used. The steering was also managed with ease.

A MOTOR-CARRIAGE WHEEL.

THE Coupé Company, carriage builders and wheel makers, of Britannia Road, Fulham Road, London, are the sole manufacturers of Harrington's patent steel carriage wheel. We venture to predict that these wheels will be very largely employed in automotor work—for which, in consequence of their strength, lightness, and elegant appearance, they are pre-eminently suited. From the illustrations which accompany this article it will be seen that, although somewhat similar in appearance to the familiar bicycle wheel, they differ from it radically in one important point, viz., that it is practically impossible to buckle them. By securing each couple of adjacent spokes together by a band of steel riveted over them, at a point near the periphery of the wheel, great strength is secured, while the elasticity inherent in this form of wheel is at the same time retained. The wheels have been subjected to rigorous and practical tests throughout a very long period, as the Coupé Company as a matter of economy have fitted them to all the varied forms of carriages which are turned out from their extensive establishments. They have found them as cheap to make in the first instance as good wooden wheels, while presenting a much more artistic appearance, and at the same time lasting for a considerably longer period, without any incidental outlays being required for repairs. We have examined very many of these wheels, which have for years past been subjected to the rough wear and tear of the London streets without renewal, and in no case could the slightest shake be observed in any of the spokes. In many cases the condition of the paint on the wheels showed that they had been in collision sideways with heavy vehicles, but that their elasticity had readily enabled them to resume and keep their original form unimpaired. The estimation in which the wheels are held by the carriage trade proper may be judged by the many repeat orders which are received from builders not only in this country but from the Colonies and India. Any form of tyre—pneumatic or solid—can be fitted to the wheels, and examples of all types in every-day use may be inspected at the works. To sum up, we may state that the wheels are stronger, more durable, and more sightly than others, while they weigh considerably less, and are subject to a minimum of windage and vibration. We may add that the managing director of this Company—Mr. Courtauld Thomson—is a son of the Mr. Thomson who, as fully described in the first issue of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL, invented and used the pneumatic tyre fifty years ago, and who was one of the most practical exponents of the utility of motor-carriages of his day. It is only fitting that a descendant of his should be numbered amongst the pioneers of the revived industry.

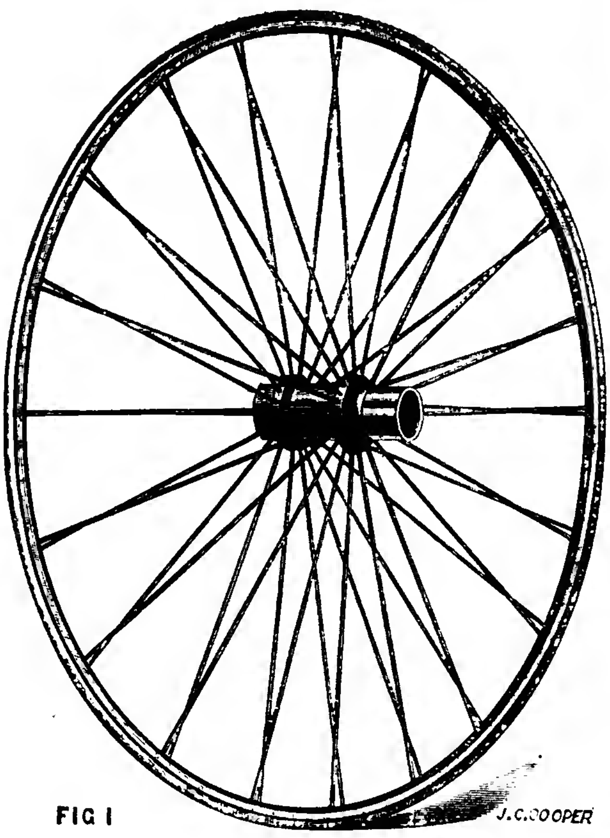


FIG I

J.C. COOPER

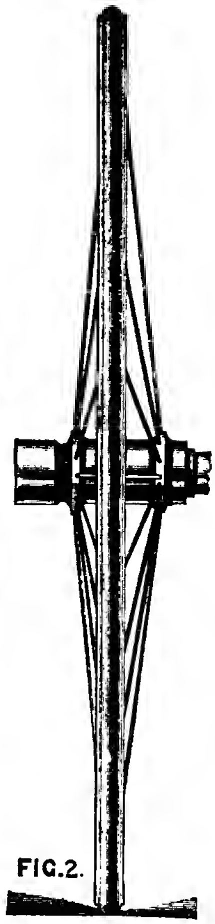


FIG. 2.

TAXES ON MOTOR-CARRIAGES.

THE regulations for the taxation of motor-cars have been issued. All weighing less than one ton will have to pay one guinea or 15s. annually, according as they are used for private purposes or as public conveyances. The same rule will apply to motor-cars over three tons in weight, but those between one and three tons will be charged heavily. All with four or more wheels, and weighing between one and two tons, will have to pay four guineas yearly unless they are used as hackney carriages or omnibuses, in which case the amount for each one will be £2 17s., while for those over two and under three tons the amounts will be five guineas and £3 18s. respectively. For cars of this class with less than four wheels and between one and two tons in weight the annual licence will cost £2 17s., whether used as private or public conveyances, and if they weigh over two and under three tons the amount will be £3 18s. The motor cabman of the future will have little to complain of if these charges are maintained. He will continue to pay 15s. so long as his cab is under one ton, while his rival, the omnibus proprietor, instead of, as now, paying the same amount for each self-propelling vehicle, will pay at least £2 17s. The proceeds of these licences will, as in the case of other carriages, be passed over to the local authorities. The new rules do not come into force until January 1st, when licences for the year ending December 31st will be issued. It is provided that in the case of a car not being used for the first time until October 1st in any year a reduction of a guinea if for private and of 7s. 6d. if for public use will be made. It will be understood that no charge of any kind is to be made for the expiring year. The regulations are vague as to the licence duty on private vehicles with four or more wheels and under one ton weight. They say they will be subject to the ordinary provisions as to carriage licence duty. The ordinary provisions are that the owner of a four-wheeled carriage, which is fitted to be drawn by one horse, pays one guinea, and if it is fitted to be drawn by two horses two guineas annually. The amount of duty, therefore, depends upon the "fittings." If a carriage has a socket in which a bar is or can be inserted for a second horse it is charged for at the two-guinea rate. How this rule can be applied to a motor-car is not obvious. Probably it is intended that only one guinea shall be charged. The self-propelled cycle will be subject to a duty regulated by the number of wheels, though this question also has not been grappled with.

EDINBURGH COACHMAKERS AND MOTOR-CARS.

The annual soirée and concert of the Edinburgh coachmakers was held on the 27th ult. in the Oddfellows' Hall, Forrest Road, when there was an attendance of over 700 people. Mr. Norman G. Croall occupied the chair, and amongst those present were Messrs. Stordy and J. Drew. In the course of the evening the latter, who is lecturer on carriage building in the Heriot-Watt College, gave an address on "Moto-Cars." He said that now that an Act had been passed permitting their use on the highways, under certain restrictions, they might confidently look forward to large and interesting developments before long. What was wanted, especially in their large cities, was not great speed, such as had been attained, but quick-stopping, turning, &c. The best claim for the electric motor was that it was noiseless. Electric omnibuses and carriages were excellently adapted for city use, and it was interesting to note that an electric cab company had recently been formed in London. He had had an opportunity of trying several oil-driven motors in London that season, and it was anything but pleasant. In time, no doubt, improvements would be carried out. With a motor-car the expense incidental to horses was avoided. There could be no rearing or kicking or running away. This new and great and important industry he looked upon not as enemy to their trade, but as an associate. (Hear, hear.) The cycle industry ought to have been in their hands. (Hear, hear, and applause.) By this time some of them might have been millionaires, instead of looking forward to spending their declining years within the cool portals of the workhouse. (Laughter.) It was both their interest and duty to keep in touch with a movement like that, so that if their services were required they would be able to use them most effectively. (Applause.)

PEUGEOT PHAETON (THE HON. C. S. ROLLS).

PEUGEOT PHAETON.

The phaeton illustrated on this page is one which its owner, the Hon. C. S. Rolls, had arranged to travel down to Brighton with on the 14th ult. We reproduce it for the purpose of illustrating our article describing the ride, but, along with a great deal of other matter, it was crowded out. The phaeton is a very comfortable vehicle for four persons, built by M. Peugeot, and fitted with an inverted Daimler motor developing about three and three-quarter horse-power. The wheels run very lightly, the spokes are of steel, and the rims are fitted with rubber tyres. The vehicle can run 15 miles an hour comfortably. Owing to inadvertence in starting from Cambridge, the Hon. C. S. Rolls did not arrive at the Hôtel Métropole in time to start.

SIR DAVID SALOMONS AND THE SELF-PROPELLED TRAFFIC ASSOCIATION.

In view of recent motor-carriage company developments, the secretary of the above Association has issued a statement setting out Sir David's connection with the matter. After giving particulars as to the Exhibition at Tunbridge Wells, he relates the history of the formation of the Self-Propelled Traffic Association, and in reference to it states:—

An attempt was made by many gentlemen to be placed upon the Council, to whom Sir David objected, on the ground that it was their wish to make the Association little more or less than a company-promoting concern. As he had no interest financially in the movement, nor any desire to take such a part in the future, Sir David resented such tactics, and the result was a division in the camp, the company-promotion section separating themselves from those who were anxious solely to forward the movement for the good of their countrymen and of English industry.

The Association was eventually formed with a very strong Council, consisting of gentlemen well-known in public life, science, and engineering.

Sir David Salomons was elected president, and such a strong support gave him great power to push the movement to a conclusion.

Then came the deputation to Mr. Chaplin, and to Sir David's astonishment, although the former gentleman had written to him previously, sympathising with the movement, it was the first occasion that Mr. Chaplin had stated publicly it was his intention to introduce a Bill.

Throughout this period Sir David Salomons travelled to and fro to Paris, and obtained information from all parts of the globe in order to be well posted in the new movement and further its objects, towards which he published various pamphlets and articles to show the advantages to be derived, and to meet various arguments which had been raised on the subject.

There was the difficulty also that, if the Bill became law, the Petroleum Acts would prevent benzine being carried when required for fuel.

In one of the pamphlets issued Sir David suggested the form of the Act of Parliament, which was eventually adopted to all intents and purposes. At an interview with Lord Harris the difficulty as to carriages to be drawn was raised, and he was present at the second reading of the Bill in the House of Lords, when great stress was laid on the wisdom of not permitting this point. Sir David did his best to get this reversed by showing that the danger alleged existed only in the minds of non-technical persons, and that heavy loads combined with great speeds were impossible under the limit of the weight of engine mentioned in the Bill. He also assisted to secure the raising of the two-ton limit to four tons, to meet the question of electric traction. This was supported by resolutions of the Self-Propelled Traffic Association, and the London and many other Chambers of Commerce.

In dealing with these questions Sir David had the advantage of having the results of a number of experiments which he had made many years ago on the subject, when he first took an interest in the improved means of locomotion on highways.

The Bill was amended in a few details in the House of Lords, which set up the control of many authorities, which would have been unworkable. No doubt when the amendments were accepted this point was not sufficiently considered.

Sir David Salomons then attended the second reading in the House of Commons, and was able to gauge the nature of any opposition from the discussion which took place. This enabled him to draw up a very careful Memorandum showing the various effects which would arise if certain proposals were adopted, and pointed out where modifications could be made with advantage to the Bill, and at the same time offering concessions to the opposite force. This Memorandum was sent into the Local Government Board and the Home Office (the two departments which have a voice in the matter under the Bill), and Sir David was requested to attend personally, which he did, and made a number of suggestions which he had the satisfaction of seeing adopted as amendments in Committee.

The point which there was the greatest difficulty in securing was that an unladen vehicle might be defined in the Bill as one without water, fuel, petroleum, or accumulators, as it was thought the words "unladen vehicle" met the point. Sir David's contention was that no Judge would hold that an unladen vehicle was otherwise than one ready to start to pick up its load. On this point he had not the slightest doubt. Sir David, therefore, suggested on his part, as a concession, to reduce the four ton maximum to three tons weight, providing an unladen vehicle was defined as one without fuel, water, or accumulators. Another point was the width of wheels, which so many members thought desirable to deal with in the Bill. Sir David preferred that all questions of construction be left to the Local Government Board, and this was eventually accepted.

He also obtained the concession to add to the words "no visible steam or smoke" the words "except from an exceptional or temporary cause." He obtained the further concession that if local authorities should stop any roads or bridges for this class of traffic, an appeal might be made to the Local Government Board.

Sir David sent a long Memorandum on the petroleum question, as it affects this class of traffic, to the Home Office, and was called to give evidence before the Petroleum Committee of the House of Commons, of which Mr. Mundella is the Chairman. The evidence appeared to be favourably received as far as he was able to judge, and he has reason to believe that the Rules which will be issued shortly will practically be based on the evidence given by him on that occasion.

No less than 50,000 letters have been written on the subject since last October, and possibly not less than 500 interviews, apart from meetings. A large number of articles and other publications to the Press and in other quarters have been sent out, which gives some idea of the labour expended by Sir David Salomons, to say nothing of an expenditure reaching many thousands of pounds.

The sum total of all this work has been, that there has hardly been an Act passed containing more liberal clauses, and with more unity of action, which is so desirable where the roads are continuous and local authorities so numerous.

The Act will secure complete control from a central point, the Local Government Board for rules and regulations as regards construction and use, while the Home Office controls all questions dealing with petroleum of low flash point, regardless of any Acts of Parliament which may exist.

No bridge can be closed without reasonable cause. The weight of three tons without fuel, water, petroleum, or accumulators renders it possible to construct a better class of carriage, and, above all things, it renders electrical traction on the roads an actual possibility. The exemption of the production of steam or smoke due to temporary and occasional causes will obviate vexatious prosecutions, and the regulations to be expected in regard to mineral spirits will be as liberal as is possible from the nature of the liquids.

The main object to be attained, by using every endeavour to transfer powers for regulating this class of traffic from Parliament to Government departments, was to enable amendments to be easily made to meet practical requirements, without the cumberous operation of appealing to Parliament. The system has worked well in the case of the electric light industry, and there is no reason why it should not prove as successful in the case of self-propelled traffic.

Sir David has sacrificed a considerable amount of time in assisting by every means in his power in framing the Local Government Board regulations

Sir David has already pointed out that it only remains for users of horseless traffic to do nothing on their part to destroy the confidence which the Legislature has placed in them, by committing any act likely to be of annoyance to others.

Throughout all the negotiations and communications between members of the Government and the officials of Government departments, Sir David Salomons bears witness to the fact that he was treated with every courtesy and consideration, which was, no doubt, due in a large measure to the circumstance that it was within their knowledge that the company promotion business had been completely separated from his side, and that the Self-Propelled Traffic Association was recognised by the Government as the official representative of the movement, so that it was felt that all he said was not in any way influenced by the slightest personal consideration or intention of extracting money from the pockets of the public.

"THE ENGINEER" 1,100 GUINEAS ROAD CARRIAGE COMPETITION.

CONDITIONS OF COMPETITION.

The proprietors of *The Engineer* have agreed with the Crystal Palace Company, who have offered facilities at the Crystal Palace for showing the carriages in work there, and for holding the subsidiary trials hereafter referred to.

Judges.

The following are the names of the judges :—

Sir Frederick Bramwell, Bart., F.R.S., M.Inst.C.E.

Mr. John Audley F. Aspinall, M.Inst.C.E., Chief Mechanical Engineer to the Lancashire and Yorkshire Railway.

Dr. John Hopkinson, F.R.S., M.Inst.C.E.

The competition is to be international.

Classes.

The vehicles will be divided into four classes, and one supplemental class, in each of which a prize will be given, as follows :—

(*a*) For the best mechanically propelled vehicle constructed to carry, including the driver, four or more persons, the total weight, when fully loaded, not exceeding two tons, a prize of 350 guineas will be given.

(*b*) For the best mechanically propelled vehicle constructed to carry either one or two or three persons, the total weight, when fully loaded, not exceeding one ton, a prize of 250 guineas will be given.

(*c*) For the best mechanically propelled vehicle constructed to carry, in addition to the driver, not more than one ton of goods or parcels, the total weight, when fully loaded, not exceeding two tons, a prize of 250 guineas will be given.

(*d*) For the best mechanically propelled vehicle constructed to carry, in addition to the driver, five hundredweight of goods or parcels, the weight, when fully loaded, not exceeding one ton, a prize of 150 guineas will be given.

Supplemental.—For the vehicle, whether passengers or goods, propelled solely by a motor actuated by the vapour of oil or spirit, having a lower specific gravity than 0·8, or a flashing point lower than 73° Fah., Abel's test, and constructed to satisfy the requirements of any Act of Parliament, and the rules to be made thereunder for the time being respectively in force, which, in the opinion of the judges, best satisfies the purpose for which it is built, a prize of 100 guineas will be given.

The judges are to have the power to divide any prize in case of vehicles proving of equal merit. At least two vehicles in a class must complete the whole journey, or no prize for that class will be given.

Propelling Power.

Any method of propulsion other than muscular power may be employed, provided it be contained in the vehicle.

Quality of Oil for Power Purposes.

Except in the supplemental class, no oil or other liquid used in any engine, whether for the production of an explosive mixture, vapour, or for fuel, shall have a lower specific gravity than 0·8, or a lower flashing point than 73° Fah., Abel's test.

Entries.

Entries are to be made on printed forms—to be obtained at the offices of *The Engineer*—at any time prior to 6 p.m. on the last day of March, 1897, being forwarded by registered letter, addressed to the Editor of *The Engineer*, 33, Norfolk Street, Strand, W.C., and accompanied by a deposit of £1 for each entry, this deposit to be forfeited if the vehicle entered is not submitted for competition.

Delivery.—Description and Descriptive Drawings.

The competing vehicles must be delivered at the Crystal Palace, Sydenham, between the hours of 10 a.m. and 6 p.m. on some day in the week prior the 24th of May next. Prior to the delivery of each of the vehicles, there must be forwarded to the Editor of *The Engineer*, 33, Norfolk Street, Strand, W.C., a docket showing the weight of the unloaded vehicle, in complete running order, with its store of fuel and water—if these are to be used—this docket being furnished by a weigh-master of some public weghing machine. At the same time there must be forwarded six, at least, type-written or printed descriptions of the machines, setting out, as briefly as possible, any peculiarities of construction or of working to which the competitors desire to draw the attention of the judges, and also six sets of clear blue-print drawings or sketch tracings, to a scale of not less than 1½ inch to the foot, illustrating the construction. These documents will not be returned, but on their receipt, a printed Form of Request to the Crystal Palace Company, to accept delivery of the vehicle, will be forwarded to each competitor by the Editor of *The Engineer*, and this Form of Request will have to be produced to the authorities at Sydenham when the vehicle is delivered.

Opening-up of Machines.

After delivery and before the practical working run, hereinafter referred to, each vehicle is to be opened up by a skilled attendant representing the competitor in the presence of one or more of the judges, or their representative, for their information.

Preliminary Runs.

Preliminary runs in the grounds of the Crystal Palace will be made with each of the vehicles in succession by the competitors in the presence of the judges or of someone representing them.

Practical Working Run.

This will consist of a run on the public roads of not less than 100 miles out and 100 miles home, or a total of not less than 200 miles, over a course to be announced three days prior to that fixed for the run. It is impossible at present to fix the exact date for this run, but it will probably be arranged for Monday, the 31st day of May next. On starting for this run from the Crystal Palace, each vehicle is to be fully loaded and is to have its full store of fuel and water, if these are used, and is also to carry the number of adult passengers for the class in which it is entered, one of whom is to be a representative of the judges, who will be counted as part of the load.

Route Map.

There will be provided for each competitor, on making application at the office of *The Engineer*, three days before the practical working run commences, a route map indicating the course which it is suggested the vehicles should take; but the competitors will be free to take any road they think proper between the Crystal Palace and their destination and back.

Order of Starting.

Lots will be drawn to determine the order in which the vehicles are to start. It is intended that the first shall leave at or about 10 a.m., and the remainder at intervals of 10 minutes. During the run the representative of the judges shall keep, on a printed form which he will have with him, a "log" of the run.

Change of Drivers.

Any competitor may change his driver at any place *en route*, if he should think proper.

Inspection of Vehicles on Return.

After the return of the vehicles to the Crystal Palace, it shall again be opened up by the competitor and submitted to the inspection of the judges, or their representatives, and this prior to anything being done to the vehicle in the way of repair or renewal, except such as may have been effected during the run.

Further Runs.

Should the judges so determine, further runs are to be made on subsequent days by all or any of the vehicles in the premises of the Crystal Palace Company or on the public roads.

Disqualification.

The judges reserve to themselves the right of absolutely disqualifying any vehicle or competitor from the competition for any infraction of these rules or for any cause whatsoever, and without in any way being bound to state the reason or reasons for which such disqualification is made.

Number of Vehicles to be Exhibited by each Competitor.

No competitor, either directly or by any agent or otherwise, is to enter for competition two similar vehicles in any one of the classes above referred to, and each vehicle is to be entered by not more than one person, that is to say, in the name of one individual or firm.

Responsibility.

While obeying in all respects the instructions of the judges, it is to be fully understood and agreed by every competitor that no responsibility, legal or otherwise, is to attach either to the judges, to the proprietors of *The Engineer*, or to the Crystal Palace Company in respect of anything or for any damage or injury caused to any person or thing, but all responsibility of every sort and kind, whether pecuniary or otherwise, is to attach to the competitor and is to be borne by him.

Length of Practical Working Run.

Any vehicle which does not complete the "practical working run" at a minimum average speed of five miles an hour, to include all stoppages, shall be disqualified. The distance upon which such time allowance will be computed will be fixed by the judges and stated on the route map.

Note.—As the attainment of high speeds is not one of the objects sought, it has been determined that nothing in speed over 10 miles an hour will be placed to the credit of any competitor, but, subject to this condition, and to any law or regulation made by any local or other competent authority, the competitors may go as they please, at any speed they think proper, running continuously day and night, or stopping as they think best. If at the date hereafter to be fixed for the trials the state of the law or of any local regulations should make it impossible, in the judgment of the proprietors of *The Engineer*, to hold the competition as at present contemplated, no blame or responsibility shall attach to them, or the judges, or to the Crystal Palace Company.

The following are the points which will be taken into consideration by the judges in awarding the prizes:—

(*a*) Distance run without taking or receiving supplies of fuel, oil, gas, electrical or chemical materials or electrical current, or of any agent employed for actuating the motor. Freedom from stoppages for repairs, adjustment, or for oiling, or any other purpose or cause.
(*b*) Suitability of design and excellence of workmanship, not only of the actuating machinery but of the carriage.
(*c*) Safety.
(*d*) Simplicity, durability, accessibility, and facilities for repairs, absence of offensive smells, and of excessive vibration.
(*e*) Time occupied in getting to work and ease of starting.
(*f*) Speed—up to ten miles per hour—and hill climbing.
(*g*) Completeness of control by, and certainty and decision of, steering and steering gear, and efficiency and durability of brakes and brake gear.
(*h*) Weight of carriage and motor machinery and appliances.
(*i*) First cost and—to a limited extent—the cost of working.
(*j*) General efficiency.

Note.—The quantity of fuel, oil, gas, or power-giving material or electricity used during the long duration run will not be specially taken into account, although observations will be made by the judges on this subject, but trials of short duration of the vehicles selected for further tests will be made if deemed necessary for the purpose of ascertaining the cost of working of the vehicles.

Judges' Decision to be Final.

The decision of the judges expressed in writing on any point shall be final and binding on all parties, and from such decision there shall be no appeal.

Copy of Rules to be Furnished to each Competitor, and Signed by Him.

Three printed copies of these rules will be supplied to each competitor or his accredited representative, and no competitor will be allowed to deliver his vehicle at the Crystal Palace until he has signed one of these copies, and it has been handed in to the Editor of *The Engineer* and formally acknowledged and accepted by him. In signing and forwarding this copy of these rules, the competitor shall accept all the conditions herein imposed upon him, and shall agree to be bound in all respects by them.

Official Number and Stamp on Vehicles.

Prior to the start for the long-distance competition, there will be attached to each vehicle, in some convenient place, a card stamped with the judges' seal and bearing upon it the number assigned to that particular vehicle for the purposes of the competition. The seal must not be broken, otherwise the vehicle will be disqualified.

Paragraph to be Signed by Competitors.

I agree to abide, and be bound, by the above rules and conditions, or any modifications of them which the judges may think desirable or necessary.

Signed ....

Address ....

....

Competitor in class ....

....

DOINGS OF PUBLIC COMPANIES.

New Beeston Cycle Co. (Limited).

The Future of the Motor-Cycle.

The first ordinary general meeting of the shareholders of the New Beeston Cycle Company (Limited) was held on the 18th ult. at the Institute of Chartered Accountants, Moorgate Place, E.C., under the presidency of Mr. Harry J. Lawson (the chairman of the Company).

The Chairman having explained that this was only the statutory meeting, stated that the amount subscribed by the public was about £180,000, out of which some £80,000 or £90,000 would form the nucleus of working capital. As they knew, the share capital was £1,000,000, and if at any future time further issues were made half of what would be raised would go to increase the working capital. After dealing with the ordinary cycle trade, with which we are not specially concerned, he said:—I am happy to be able to tell you that in that famous ride on Saturday, which will form one of the historic pages in the history of England (applause), we showed the world that we can go by ourselves unassisted, with self-acting carriages and cycles, from London to Brighton or anywhere we please. I am pleased to tell you that on that ride one of our motor-cycles was the only one of its class that got through. (Applause.) It was ridden by, I might almost say, a boy, and I believe he had never ridden in a race, and I do not believe he had had any experience whatever of a long journey. We saw him on the machine; we saw him get along without working, and he went up and down the hills with the greatest facility, beating all the trotting mares which were out to join in the procession. He arrived in Brighton, notwithstanding the thickness of the mud, a dead head wind, and a pelting rain, in a little over four hours, and the British Motor-Car Club awarded him a gold medal for his exploit. (Applause.) I go out before breakfast every morning when the weather is fine on one of these Beeston motor-cycles, and I can assure you it works wonderfully well. Now, in the matter of the sale of these machines we want you to assist us, and in connection with this there is one man who wants to be worried—I pity him more than anybody else—and that is our much respected manager. I am sure that if you had experience of them there is not one of you gentlemen who has £50 or £60 to spare who would not obtain one of these Beeston motor-cycles. In it you have a horse under you which will do whatever you wish, and you can regulate it very easily. It does not matter whether you are old or young, or male or female; you have a willing servant which will carry you anywhere. You can go to Scotland with it, and you are thoroughly independent of horses or vehicles if you possess one.

Dr. C. W. Iliffe followed, and in the course of his remarks said:—As to the motor-cycle, I may say that Mr. Lawson sent down a telegram to the works on Thursday, with regard to Saturday's tour to Brighton, desiring that a motor-cycle should take part in the journey. The result was that Mr. Gorton's son, who had not ridden the cycle more than four or five times, was selected to ride it, and it is now a matter of history how well the little machine came out. It started under the most unfavourable circumstances from the Hotel Métropole. It reached Reigate in the most respectable time, being fifth in the line of arrivals there. After a quarter of an hour's delay, it proceeded to Brighton, which it reached in the unprecedented time of four hours and three-quarters. (Applause.) At Reigate and Brighton electricians and engineers of very great competency examined the machine, and one and all pronounced this verdict: that it was the very best machine on the road. I may say it was the only one of British manufacture there. (Applause.)

A Shareholder: Do you make the motor-carriages?

Dr. Iliffe: No; only the motor-cycles. Our department is that of manufacturing ladies' and gentlemen's motor-cycles, together with the general cycle industry.

A vote of thanks was accorded the chairman and directors, and the proceedings closed. Shareholders afterwards inspected one of the motor-tricycles which had been brought into the room.

Anglo-French Motor-Carriage Co. (Limited).

THE statutory general meeting of the shareholders of the Anglo-French Motor-Carriage Company (Limited) was held on the 24th ult., at Winchester House, Old Broad Street, E.C., under the presidency of Mr. E. B. Ellis-Clark. The Secretary (Mr. F. H. Firth) having read the notice convening the meeting,

The CHAIRMAN said:—Gentlemen,—You know that the Company was formed to exploit the system of M. Roger, who had small works in France. These works, as was stated in the prospectus, were altogether inadequate for the carrying on of a large business, and one of the first things that the directorate did was to look about for fresh works in France. The French directors found very suitable premises, and Mr. Barrett and I were deputed to go over to see these works. We thought them admirably adapted for the purpose, but of course they were simply works without any of the necessary machinery to carry on our operations. While negotiations were in progress for these, the French directors saw that considerable delay would take place in equipping an empty factory, and although they continued negotiations for this factory, they immediately set to work to see if they could not find works completely equipped for our purpose; and in the course of some little time they were successful in putting their hands upon works which they thought were very suitable. Mr. Barrett and I went over to Paris again, and I must say that in the course of a long experience I do not think I ever saw a factory that was so suitable for the purposes of our business. Not only the machinery that was there, but the order and the planning of everything was modern and up-to-date. It is just a place that we ought to have to carry on our business in Paris; in fact, if it had been designed for our works, it could not have been better. A great deal of time, thought, and money has been spent upon the place. Negotiations are still proceeding for the acquisition of this factory. These negotiations in England are often very protracted, but my experience is that they are very much more protracted in France. The negotiations, however, are now being actively carried on by the members of the board in Paris, and I believe, from information which we only received this morning, they will be successful in their endeavours to obtain this factory for us. All I can say is that if they do we shall have one of the best factories in France for the purposes of our undertaking. Meantime, we have not been idle in England. Messrs. L'Hollier and Gascoine set to work to try and find us a factory in Birmingham, which we consider the most central neighbourhood for our business. We have taken premises occupying about 3,000 square yards, which we are now equipping in what I think I may call a modest manner. We are not going to spend so much money there, to begin with, as we had anticipated, owing to the proposal to acquire this factory in Paris. Mr. Gascoine is here to-day, and he will tell you that we are very nearly ready to commence work there, and I hope that within a few weeks we shall commence to make our carriages in England. A good many of you—in fact, I suppose all of you—have been interested in the accounts of the recent motor-car tour to Brighton, and I daresay some of you may have been rather disappointed at our not having occupied first, second, or third place in what finally, although it was called a tour, came with some to be absolutely a race. Well, the fact is, that the leading vehicles in this race were not the ordinary motor-cars of commerce, if I may say so; they were specially-constructed for the Marseilles race, and they had 10 horse-power, whereas ours only had 5. We put into that tour the ordinary vehicle such as we should sell every day to our customers, and therefore we did not occupy that position in the race which probably some of you thought we should have done. That race, however, has taught us a great many lessons, and has been very useful to us in every way. For my own part, I am very glad that it took place, because it will enable us, before we make any other stock, to effect certain modifications and additions to our motors which, I believe, will enable us to have the very best motor-car in the market. After dealing at some length with the prospective value of their patents, and to the fact that they intended at first to build carriages of utility instead of vehicles of luxury, he concluded by saying:—We have got a great many orders and inquiries coming in every day—I had forgotten to say that the Paris house is making motors for carriages for the distribution of goods for the Louvre. I think all this shows that we have got a first-rate carriage. I may also say that there is a cab company at Bordeaux which has investigated all the motor-carriages, and come to the conclusion that ours is the best, and they are forming a company to put our cabs on the streets of that city. I shall be very glad to answer any questions that may be put to me by the shareholders, and will say, in conclusion, that I believe we have got a first-rate future in front of us. (Applause.)

At the request of some of the shareholders, Mr. GASCOINE (the manager) said:—It seems to be the opinion of everybody in the Midlands that we have been exceedingly fortunate in securing such first-rate works there. The rent is low; we are nearly all on the ground floor; we are right in the centre of the city, and we shall be able to combine show-rooms with the factory. As far as the Birmingham part of the business is concerned, everything is looking exceedingly favourable. We have been getting 50, 60, and up to 80 letters every morning, and although we find our difficulty at present is to secure orders, owing to the fact that we have nothing to show as samples of English-made carriages, or even of foreign-made carriages, in the course of a few days we shall have English-made delivery vans which we can show customers, and directly we do this we shall be able to secure numbers of orders. The question has been mentioned about the suitability of electricity as compared with benzoline. I am sure it is very satisfactory for us to see in to-day's Press that Edison, the eminent electrician, gives it as his candid opinion, that at present electricity has not a chance with the motors in the market worked with steam or gas. Our motor is practically a gas-motor, only instead of using coal-produced gas, we use gas which is generated by benzoline. Of course, our business is not a speculative business. As our Chairman has said, we are not making any attempt to puff it; we want to go slowly but surely ahead, and produce something which is really practicable, and then I am sure we shall have a great success; there will be no lack of orders. (Applause.)

A vote of thanks was then passed to the chairman.

NEW COMPANIES REGISTERED.

[Under this heading we intend in future giving a full list of any new Companies registered which take power to make, deal, or become interested in any manner in automotor vehicles. Where detailed particulars are not given under this heading we shall be pleased to reply to inquiries through the "Answers to Correspondents'" column. All communications should be addressed to the Editor. The only stipulation which we make is that where the inquiry involves a search of the records at Somerset House—as in the case of information on the subject of the holdings of shareholders—a postal order must be enclosed to cover the Government stamp of one shilling which is charged before a search is allowed to be made.]

	Capital. £
Armstrong-Dove Motor Syndicate	6,000
Anglo-French Cycle Co.	30,000
Australian Cycle and Motor Co.	75,000
A. B. C. Cycle Fittings Co.	50,000
Auxiliary and Light Railways and Tramways Co.	10,000
British and Colonial Cycle and Components Syndicate	10,000
Birmingham Tubes (Limited)....	250,000
Brainard's Pneumatic Tyre Machine Syndicate	25,000
Birmingham Pneumatic Tyre Syndicate	25,000

	Capital. £
Coventry Machinists' Co.	10,000
Chorley Railway Wagon Co.	20,000
Casswell (Limited)	50,000
Chainless Gear Manufacturing Co.	8,000
Cycle and Motor Accessories Co.	10,000
Duthoit Brothers	2,000
Haddon Cycle Co.	60,000
Ibex Development Co.	25,000
International Communications (Limited)	10,000
Improved Cycle Saddle Syndicate	3,000
J. B. Dunlop Cycle Fittings and Engineering Co.	75,000
Kottin Gear Co.	60,000
London Electrical Cab Co.	15,000
Lillie Cycle Co.	10,000
London Motor-Car Works Co.	10,000
Laurie and Marner	60,000
Lonsdale Cycle Co.	2,000
Max-Saturn Electrical Syndicate	3,000
Miracle Cycle and Components Manufacturing Co.	2,500
North Worcestershire Cycle Manufacturing Co.	10,000
Non-Collapsible Tyre Co.	130,000
Newcastle Cycle and Engineering Works Co.	1,000
O'Brien's Patents	20,000
Player Brothers, Coventry (Limited)	2,000
Phœnix Accumulator Syndicate	2,500
Pioneer Motor-Car Syndicate	10,000
Puncture Locator Syndicate	10,000
Pneumatic Compensation Cycle Co.	15,000
Prince Motor Syndicate	50,000
Ramsay's Horse, Carriage, Cycle, and Auto-Car Repository	60,000
Stonehouse Works Co.	5,000
Sleaths (Limited)	25,000
Singer Cycle Co. (Russia)	40,000
Speed Manufacturing Co.	10,000
Starley Brothers and Westwood Manufacturing Co.	110,000
Sanspareil Cycle Co.	30,000
Self-Adjusting Bicycle Support Co.	25,000
Traffic Syndicate (Limited)	10,000
Whitehead's Auto-Cycle Co.	2,000
Windham Pneumatic Tyre Syndicate	5,000
Woodley Co. (Limited)	125,000
Yeovil Motor-Car and Cycle Co.	1,000
Zenith (Folding) Cycle Syndicate	6,000

Motor Development Corporation (Limited).

Registered November 24th, with a capital of £25,000 in £1 shares, to adopt an agreement with John V. Sherrin, to manufacture, sell, and deal in motors, rims, cycles, and other vehicles, and carriages, and to carry on the business of engineers, machinists, fitters, founders, &c. The number of directors is not to be less than three nor more than five; the subscribers are to appoint the first. Qualification, £1,000; remuneration, £150 each per annum. Registered by W. T. Hick, 2, Church Court, Clement's Lane, E.C.

Hastings and St. Leonards Engineering, Cycle, and Motor-Car Co. (Limited).

Registered November 18th, by C. Doubble and Co., Serjeants' Inn, E.C., with a capital of £2,500 in £1 shares. Object: to enter into agreements with N. Chennells and W. Wingfield, and to manufacture and deal in cycles, motors, carriages, carts, bath-chairs, wheels, tyres, machinery, &c. The directors are R. H. Gaby, L. O. Glenister, N. Chennells (managing director), J. C. Miller, and W. Slade, junior. Qualification, £25; remuneration, £80 per annum, divisible. Registered office: 37, Havelock Road, Hastings.

English Serpollet Motor Syndicate (Limited).

Registered on November 18th by Ashurst, Morris, Crisp, and Co., 17, Throgmorton Avenue, E.C., with a capital of £100,000 in £1 shares. Objects: To enter into an agreement with George Hopkins, Gustavus P. Harding, John T. B. Sewell, and Charles O. Maugham; to make, sell, let, exchange, deal in, and dispose of engines for motive or other power, motors, motor-cars, cabs, cycles, omnibuses, trams, carriages, and vehicles; and to carry on the business of mechanical, hydraulic, and electrical engineers, manufacturers, and contractors, machinists, smiths, engineering tool makers, boiler makers, &c. The first directors (to number not less than three nor more than seven) are to be nominated by the subscribers. Qualification, £200. Remuneration, £500 per annum and a percentage of the profits divided between them.

Westralian Motor-Carrying Co. (Limited).

Registered on November 24th, by J. A. Maxwell, 97 and 98, Bishopsgate Street, E.C., with a capital of £7 in £1 shares. Objects: To carry on the business of carriers, transport agents, coach and carriage builders, cycle, motor, carriage, and autocar manufacturers, dealers, and repairers, machinists, &c. Registered without articles of association.

New Issues.

The British Motor Syndicate (Limited).

The issue of this Company's shares at a premium is fully dealt with in an article which will be found on page 108. With reference to the result of the venture the following statement, made by Mr. Harry J. Lawson to an interviewer, is the only official intimation which has been made:—

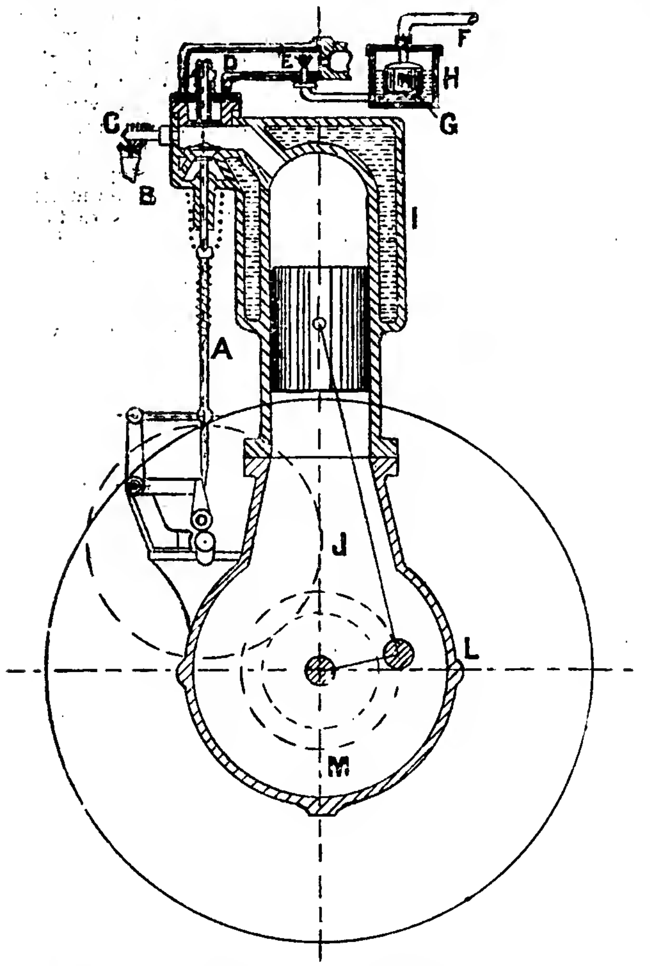
"The issue of the British Motor Syndicate was merely for a certain amount of increased capital. We didn't expect, nor do we need, the whole of the capital for which we asked the public to subscribe. The issue has been very successful indeed, and the most enthusiastic people in connection with it are the shareholders. As far as the position of the new shareholders is concerned, I am willing to make a public statement that, in my opinion, their shares will be, in a very short period, at a much higher price than £3. We have everything of the most improved character in electricity and steam, which we would not take anything for. My own belief in the system is shown by the fact that I have nearly all the money I have in the world—except some house and land property—invested in these motor patents and in the different companies owning them."

The Defiance Cycle and Motor-Car Company (Limited), Swansea, has been floated, with a capital of £10,000. It is understood that nearly all, if not all, the shares have been taken up by a few local gentlemen, and the manufacturing operations will commence at Swansea in January next. Suitable premises on the Strand are available.

A few days ago Sir David Salomons, the President of the Self-Propelled Traffic Association, was to be seen driving in the Park, in Fleet Street, and other crowded thoroughfares, in a new Serpollet carriage which he has just received. Considerable improvements have been made upon the original design, and an early opportunity will be given for inspection of the carriage in London.

THE DAIMLER MOTOR.

AT the request of several correspondents, and in pursuance of our arrangements to publish sectional views of typical motors, we illustrate the details of the celebrated Daimler engine. The patentee, Herr Gottleib Daimler, was for a considerable period associated with Dr. Otto in the work of perfecting the well-known gas engine which is identified with the name of the latter. Since Herr Daimler commenced business on his own account he has gained the unquestioned position of being the leading designer of oil-engines for motor-carriages on the Continent. His first application to a bicycle was made in 1886—and his then effort was illustrated in our last issue—while in the following year he applied the same principle to a motor-carriage.



His engine consists in its main essentials of two cylinders cast together, the operations involved, viz., the drawing in of the explosive mixture, its compression, explosion, and expulsion of the waste products, following exactly the "Otto cycle," which is so well-known to all interested in the matter.

The automatic system employed to supply the requisite charge of oil to form, in combination with air, the volatilised explosive charge is very neat and simple. The float chamber is connected with the reservoir containing the main supply of oil, the float H regulating the inlet of petroleum so that it cannot rise above the fixed level in G. The oil is in consequence conveyed to the jet E at a constant pressure, being vapourised at that point by the induced draught, caused by the suction of the piston. The carburetted air passes through the valve into the cylinder freely until the piston reaches the end of its stroke. The amount of compression to which the gas is subjected on the return stroke of the piston, can be regulated in accordance with the spring employed. It varies, as a rule, between 42 and 56 lbs.

The explosion takes place immediately after compression as the piston is starting on the second forward stroke. The firing is effected by means of the platinum tube C, heated to incandescence by a burner B, the contact being effected by means of an automatic movement actuated by a reciprocating member of the engine.

On the return stroke the burnt gases are discharged through the bottom valve, which is lifted by the rod A, raised by a cam working on a small shaft, which only rotates at half the speed of the main shaft, so that the rod A is only operated every other revolution.

The cylinder I is cooled by the water-jacket, while the disc M, and the rods are enclosed in air-tight casing L, to protect them from dust and dirt. The shell is partially filled with oil, so that the crank shaft, rods, and disc are perfectly lubricated. The ordinary rate of working is high, viz., 700 revolutions per minute, but in consequence of the efficient oiling arrangements, there are no difficulties in this respect.

"AUTOMOTIVE" VEHICLES.

AT a special meeting of the members of the London Chamber of Commerce, held on the 1st inst., in the Council Room, Botolph House, Major Flood Page delivered an address upon "Motor Vehicles."

Mr. W. H. WILLANS, Chairman of the Council, presided, and the large audience which assembled on the occasion included the Count de Torre Diaz, Baron G. de Reuter, Mr. John M'Call, Mr. Boverton Redwood, Mr. W. Mowat, Mr. Alexander Sclanders, Mr. J. Lulham Pound, Mr. A. R. Bennett, Mr. George J. Jacobs (President of the Institution of British Carriage Manufacturers), Mr. A. R. Sennett, Mr. J. H. Mace, Mr. L. Epstein, Mr. W. B. Leaf, Mr. C. J. Wharton, Mr. J. M'Andrew, Mr. F. S. Tomkins, Mr. Walter Hancock, and Mr. Kenrick B. Murray (Secretary).

The CHAIRMAN, in opening the proceedings, remarked that the attendance that afternoon was a clear indication of the interest taken in the subject of the lecture.

Major FLOOD PAGE, in the course of his address, stated that since the Act of Parliament relative to the subject of his address had referred to motor-cars as light locomotives, they would, so far as they were concerned, have to use that most unfortunate name. But they must have one word for everyday use, and since locomotive had been monopolised by steam he would suggest the word "automotive." He continued to give a history of the various means of locomotion, observing that the first omnibus appeared in Paris in 1828, and in London one year later. In 1823 there were only 12 cabs in London, and in 1886 there were 25,000 hackney carriages, while at the present time there were 115,000. France had ever been before England, and was now in advance of her in respect of the automotive. That was, he remarked, to a great extent due to the restrictions placed upon their use. Continuing, he dealt with the regulations laid down by the Local Government Board, the stringency of which was, to some extent, again due to the words "light locomotive." He believed that experience, however, would soon alter the present regulations, and he ventured to prophesy that before many years had passed there would hardly be any restrictions other than those at present in force with regard to horse traffic. They would find that but one of the rules drawn up by the Local Government Board would be sufficient, and that would be the one regulating the speed to a "reasonable" and "proper" rate, having due regard to the safety of foot passengers and other vehicles. The automotives would be found to be of great commercial value, and he firmly believed that in the near future quite different regulations would be in force. There was one very satisfactory feature in the regulations, and that was that they should only have effect for six months, and during that time he trusted they would be able to overcome the public nervousness, and that of the authorities. He would like, however, to protest against the action of the Chancellor of the Exchequer, who had caused to be inserted into the Act a clause which was iniquitous. It was to come into force on the 1st of January next, and stipulated that in Great Britain every automotive should be subject to an additional duty of Excise, in the case of an unloaded vehicle weighing under one ton to the amount of two guineas, and under two tons three guineas. They would thus have two classes of omnibuses in London, one paying a tax of 15*s.* and the other of £3 18*s.* With regard to the commercial results of the introduction of the automotive, he anticipated they would affect the petroleum trade, mechanical engineering, the carriage trade, railways, and by no means least of all, the war departments of every country in the world. The new industry would find work for thousands of men, though some, of course, would be displaced. Most of the automotives at present in this country were of French construction. He saw no reason why this should not be a purely British industry in every particular, for he believed it had come to stay. He continued to criticise the various methods at present employed in regard to the motive power used by the automotives, expressing the opinion that electrically-propelled vehicles would find favour in towns, inasmuch as the electricity could be easily supplied, while in the country districts he believed petroleum and steam would be more extensively used. He was of opinion that the automotive would in England supply the place of the canals of the Low Countries; and if the farmers did not, commercial men must organise the agricultural districts, so that they might, by the additional means of local communication afforded them, strive to retain within the United Kingdom a large proportion of that money now paid to the foreign farmer. There was plenty of room for improvement in the automotive, and he did not believe that the automotive of the future was yet built. They were at the beginning of a new era of internal communication, and he firmly believed that trade and commerce would benefit by it.

Mr. Sennett, in paying a compliment to the lecturer, said that he had clearly shown that there was much work before both engineers and carriage-builders of this country, and he thought it was quite useless for them or anybody else to waste time in the invention of a new name for self-propelling vehicles. If, however, they chose to do this, he thought the name should be one which carried its meaning on its face, which he certainly did not feel was the case in regard to the word suggested by Major Flood Page, namely, "Automotives"; for such a word could with equal appositiveness be applied to ordinary stationary motors, and also it would be necessary to tack on to this newly-invented word the name of the vehicle. If you called through your telephone, "George, bring the automotive," what could the groom do but "phone" back, "Which one, sir?" (Laughter.) Now, if you simply made use of the word "motor" in front of the vehicle you desired to refer to, all trouble was at an end. Thus you could call for your motor-Victoria, your motor-dog-cart, motor-van, motor-wagon, motor-omnibus, &c. Complaint had been made that the regulations of the Local Government Board were too stringent, and should be done away with to a very large extent. He thought that in introducing a new innovation it was better to err on the side of safety, at least until such time as it had been demonstrated that such stringency was unnecessary, when it could be with advantage removed. Mr. Sennett defended the employment of a double brake on self-propelling vehicles, pointing out that it was not only a means of increased safety but one of considerable convenience. He had driven various motor-carriages considerable distances, and, especially in the heavier types, he found it a great convenience to have two brakes, so that the wheel or hand-brake might be applied gently to take the weight off the carriage when descending a hill, and its speed and general control affected by the foot brake. If you had a simple brake so powerful as to comply with the regulations, you would find that brake a very inconvenient one for gently slowing up, and manipulating amongst traffic. What he thought was required, was a very handy brake for general use applied by the foot, and another and more powerful one for hill descending. Reference had been made to the difficulty of estimating speed. If this were necessary to be done, he did not see much difficulty in it; all you had to do was to take a measured distance, say, between one or more lamp-posts, and note the time occupied in the transit between them. It was certainly somewhat of an anomaly that Parliament should be practically unanimous in removing a burden from an industry, and then immediately go and tax it, but he thought, however, the immense economy which mechanical self-propelling traffic would shortly show over horse-drawn traffic, would not only neutralise the effect of the taxation, but would render it of small moment. One benefit to urban traffic should shortly be brought about, and that was the adoption of a sixpenny cab-fare system. This would probably be found of great advantage not only to the business man, but also to the proprietor and to the driver. One thing he would much like to draw the attention of the meeting to, and that was the reprehensible practice adopted in this country of leaving horses, from the mouths of which the bits had been removed, standing quite unattended outside wayside inns, and in other positions. This, he thought, amounted to culpable neglect, and should be dealt with by legislative enactment, if County Councils possess not the power to stop it. He had run a good many miles in France, and the petroleum motors certainly frightened country horses, although town horses took but little notice of them; accidents from this cause were there prevented by the prevailing practice of attaching all horses left by themselves to a ring in the ground by means of a rope. In the new Act provision, of course, had, very wisely, been made for the carrying of a light on motor vehicles; he was sorry that the word was used in the singular—which he understood was a slip on the part of the draughtsman—two lights should, undoubtedly, be provided for, for the use of a single lamp by cabmen and others without reference to the "near" or "off" side was decidedly a source of danger. He thought it would be a good thing for users of motor vehicles voluntarily to use *two* lights, and to put on the "off" side a small disc of green glass, about the size of a penny, in front of the flame, and another of red glass on the "near" side. By this means both the position and direction of going of the vehicles could at once be ascertained. This would obviate a vast amount of slowing-up in travelling on country highways, a thing which he hoped would shortly be practised to a very great extent for the transport of farm and market garden produce. The point, however, he wished to call attention to was, that if it were necessary on the part of motor vehicles to carry lights, it should also be made compulsory on the part of horse-drawn vehicles. (Hear, hear.) The latter were the most dangerous, from the fact that the animal's head projected some 10 feet beyond the point of support of the light, whereas with motor-vehicles these were almost invariably placed quite at the front of the vehicle. He regretted to learn that it was a moot point as to whether County Councils could enforce regulations for the universal exhibition of lights upon vehicles. Mr. Sennett thought this point should be cleared up without delay, and if any further legislation were necessary it should be entered upon at once. With regard to the best form of motor, he thought Major Flood Page had dealt with this matter with commendable impartiality. Undoubtedly, various forms of motors possessed advantages under various conditions, but with regard to electricity, it should be pointed out to the non-technical mind that electricity as used in modern motor-vehicle work was not a motive power at all; it was merely a vehicle for the reproduction of motive power which had previously been obtained from a steam-engine, therefore, if you could run, for example, an omnibus by means of steam power, without visible emission or noxious exhalations, it was clearly far more economical to use steam directly for that purpose than through the intervention of electricity. He felt, however, that there was a great future for electricity in urban traffic, and he hoped it might not be long before we had an efficient electrically propelled cab system. With regard to petroleum, undoubtedly there was a vast field open for this in the future, but at the present moment petroleum and gas motors had not been made sufficiently adaptable to motor vehicles, that it might be said their employment in this relation was an unqualified success. The shortcomings of steam-motors, indeed, were so much less important than those of petroleum-motors that it was more convenient to follow the unscientific course of using petroleum to raise steam and drive your vehicle by steam from petroleum than by petroleum direct by means of explosion or internal combustion; no doubt, however, developments would speedily take place now that our highways are open. With regard to the employment of motor vehicles in war, referred to by Major Flood Page, he thought there was a vast future open for them in regard to commissariat and transport work, but he begged leave to differ entirely from the Major in regard to horseless gunnery. The French Government had had transport vehicles built upon the Serpollet system, and these had been severely tested, and had fulfilled the requirements admirably, but the military authorities pointed out that, with regard to gunnery, if you had a gun drawn by half-a-dozen horses, and one were shot down, another could be quickly harnessed, whereas if you had a shot through your motor your gun was at once *hors de combat*. With regard to the formation of companies, he thought it was certainly necessary to form companies for the purpose of development, and although the lecturer had referred to the loss of millions in reference to the introduction of electrical lighting, Mr. Sennett pointed out, amid much laughter, that this money had not sunk either into the sea or the land, but had merely changed hands. The public must exercise discretion and look out for themselves, which he admitted was a very difficult thing, now that company-promoters were so much on evidence, and actually run their own newspapers.

Mr. G. J. Jacobs, Master of the Institute of Carriage Manufacturers, made some very amusing remarks, pointing out that constructors of petroleum motors should hasten to perfect them, because it would be decidedly *infra dig.* to see a coachman in his pig-skins, pink tops, and cockade, working away with hammer and chisel on his carriage by the roadside. He said coachbuilders of this country were waiting for the engineers to decide what motor was to be used, for they had to make the body, whilst the latter made the soul. They indeed were more concerned in the making of things of beauty, and they were quite prepared to make an elegant equipage when the matter of the motor had been settled, for it was that which determined the general design.

Baron de Reuter having spoken, and brought figures to show that in the running of automobiles in Paris the fact had been demonstrated that they were safer than horse-drawn vehicles in that city, in which he believed the driving on the part of the French coachman was the worst in the world.

Mr. Walter Hancock spoke as to what steam had done in this relation, and was likely to do, and gave some interesting particulars concerning the work of his uncle, the Mr. Walter Hancock who had been so very successful in regard to the running of steam omnibuses in London about 1830.

The proceedings terminated by a vote of thanks to Major Flood Page, proposed by Mr. W. H. Willans.

THE STANLEY AND NATIONAL CYCLE SHOWS.

These famous exhibitions of cycles and accessories which have just taken place have been greater successes than ever—whether judged from the standpoint of attendance or exhibits. It is out of our province to specially describe the exhibits, as they mostly consisted of pedalled machines, the merits of which have been fully discussed in the newspapers specially devoted to that ever-growing industry. The British Motor Carriage Syndicate (Limited) had a capital exhibit, which proved one of the principal attractions, consisting as it did of some of the leading types of vehicles which took part in the run to Brighton. It is not necessary to fully describe any of these, as they were illustrated in previous issues. The New Beeston Cycle Company and the motor-driven Olympia type of tricycle were also well to the fore. Amongst miscellaneous exhibits the Silvertown detachable tyre and the Fleurs tyre deservedly attracted a large share of attention; while the Dwarf Cycle Company showed a well-made chainless bicycle, which we understand they intend to adapt to motor purposes at no distant date. The National Cycle Motor-Car Insurance Company (Limited), of King William Street, London, did a thriving business at both the Agricultural Hall and the Crystal Palace—the secretary, Mr. Willson, informing us that he had booked several good lines.

A MOTOR RUN TO LIVERPOOL.

Mr. Wall, a stockbroker of Cork Street, Liverpool, contributes an interesting description of a journey which he recently undertook from London to Liverpool in an Arnold carriage. As the journey was primarily intended for pleasure purposes, no attempts at high speeds were made. The chief difficulty which was experienced was in obtaining supplies of oil of the requisite quantity to use in the engine; but this will doubtless soon be remedied by organisation. The following were the daily runs:—

			miles.	h. m.
Monday,	Nov. 23,	London to Barnet	11¼	1 30
Tuesday,	„ 24,	to Towcester	48¼	6 32*
Wednesday,	„ 25,	„ Drayton	52	8 29†
Friday,	„ 27,	„ Stafford	28¼	3 55
Saturday,	„ 28,	„ Whitchurch	34	6 50
Monday,	„ 30,	„ Birkenhead	34	4 15‡
			203¼	31 31
		Breakages	....	2 40
				28 51

* Hills and stones. † Hour lost in byroads in dark.
‡ Good road.
70 or 80 miles travelled in the dark.

PROPOSED MOTOR-CARRIAGE AND TRAMWAY COMBINATION.

The removal of the restrictions on the use of mechanically-propelled vehicles is likely to result in the motor-cars making their appearance in Dundee at an early date. When it became definitely understood that the cars were to be legalised the directors of the Dundee Tramway Company took up the question of making use of the new vehicles for the purpose of developing their traffic in the districts where at present there are no car lines; and it is now more than likely that the question of tramway extension in the city will be dealt with by means of the motor-cars. The only part of the present tramway system on which horse cars are run is the Perth Road line, and under the present regulations mechanically-driven cars cannot be run on that line. The intention is, however, to make use of them in the districts where there are no tramway lines, and which are at present entirely neglected by the Company or only served by 'buses. It has been suggested that motor 'buses might be put on the Downfield route, and that Birkhill and other country districts might have regular communication with the city. It is also proposed that Fairmuir and Lochee termini might be connected in the same way.

The *Daily Chronicle* of Saturday last has a wonderful reproduction of "a print on a silk handkerchief which has been in the possession of one family for 70 years." It is entitled "The Century of Invention, A.D. 2000," and some of the motor-carriages represented are very apposite to-day.

ELECTRIC TRAMWAYS ON HEAVY GRADIENTS.

The unsuitability of electric traction for tramways with heavy gradients has been so often urged that some details may be given of a line at Lausanne, newly opened and now working successfully, where the maximum gradient of 11·3 per cent. extends for 300 yards, probably the heaviest in Europe. Moreover, the line is hilly for its full length of 7½ miles. The cars weigh empty six tons, carrying 26 passengers, increasing the load to eight tons, and they have each two motors of 20 h.p. to give a speed of from 12 miles an hour to 7 miles on the heaviest gradient. The motors are of the four-pole type of 85 per cent. efficiency, and when developing 15 h.p. run at 540 revolutions. Emergency brakes are fitted to the cars, consisting of a piece of iron with sharp teeth, which may be lowered down and forced against a wooden rack rail, by which means the car can be stopped within two yards on the 11·3 per cent. gradient. The overhead system is adopted, and the six-pole dynamos at the central station are driven by two Crossley gas-engines, each of 130 effective horse-power when working at 160 revolutions. They have fly-wheels of six tons weight. The current produced can be varied from 100 ampères at 152 volts to 140 ampères at 50 volts, and accumulators are provided at the station.

AN ELECTRICAL STREET-CLEANING CAR.

A vehicle of this description has just been completed and will shortly be introduced to the various municipal authorities. It is 22 feet long, 8 feet wide, and 9½ feet high. Instead of being placed at the side the motors and brakes are above the wheels and axles, so as not to impede the action of the dust brushes. Three large rotary brushes, fixed on the centre of the car, do the sweeping and loading work on the same principle as a carpet sweeper, and are covered with steel casings, which have proper outlets for discharging the sweepings into the body of the car. As to the car itself, it can be worked either backward or forward without any change of machinery, the whole arrangement being reversed by the simple pressure of a lever. The brushes make five revolutions to each one made by the car wheel, and this high-brush speed forms a powerful suction which takes up all refuse matter and deposits it in the car. It is stated that the car has a loading capacity equal to 50 carts; can travel at the rate of nine miles per hour while performing its work; and that it can cleanse 45 miles of road in a day besides disposing of the refuse gathered, the cost per mile of working being about 12*s*.

CYCLES AND MOTOR-CARS IN PARIS.

The fourth Salon du Cycle was opened at 2 o'clock on Saturday afternoon in the Palais de l'Industrie. There was an immense number of visitors, and several slight accidents resulted from overcrowding. Many people found it impossible to gain admission. So great was the throng that when the Minister of Commerce arrived on a visit to the exhibition a way had to be made for him by a considerable body of police. At one time exit was a matter of great difficulty, and to make matters worse at dusk the electric light suddenly failed and people had to grope their way out into the Champs Elysées. There are altogether 550 exhibitors, and the stands occupy not only the entire ground-floor but also a portion of the first storey. France is represented by fully 450 exhibitors. Since the last show the number of motor-car exhibits has quadrupled. The leading English firms are well represented, and the excellence and finish of the work displayed on their stands receives general praise. American exhibits occupy a very prominent place this year.

THE DURYEA MOTOR.—A £5,000 CHALLENGE.

The Duryea Company—an illustration of one of whose carriages appears on this page—are fully confident that they have one of the best motors at present on the market. Mr. McKim, the owner of the patents, is, however, not for the moment inclined to sanction the publication of any details as to his special claims, as he prefers to wait until everything is, in his opinion, complete, instead of publishing points piecemeal. We hope, in an early issue, to be able to publish in a concise form all information which is likely to be required in respect to these patents. In the meantime we hear that Mr. McKim has demonstrated in a very practical way that he is not afraid to back his good opinion of his Duryea motor, by sending a challenge to the Secretary of the Motor-Car Club, suggesting, purely as a test of endurance and suitability for road traffic, that he should enter one or more of his carriages to compete (not for speed necessarily) against any other carriages that the Motor-Car Club may possess or control, the suggestion being that they should start from St. Martin's-le-Grand and travel to Glasgow and back. The stakes suggested were £5,000 a side, to be deposited with an official of one of the leading financial institutions. This test was to be entirely as to endurance and suitability for ordinary road traffic, and was in no way to be a race, but, of course, the limit allowed by law of 12 miles an hour would have been permissible in the ordinary way. The suggestion of Mr. McKim was, as we understand it, that the stakes were to go to the winner, and the loser was to hand over the losing vehicle for the winner to utilise in whatever manner he might think fit. We believe the Secretary of the Motor-Car Club has declined the challenge for several reasons; one being that the Club does not own any motor-cars, and another that the Club and its members, headed by its President, do not, in any way, countenance racing on the public highway. But, as we have pointed out, the question of speed beyond the legal limit was absolutely specified as not to have any bearing upon the issue, we hardly think the latter reply was necessary. We believe the challenge was specially extended to the President of the Club or any other members who might possess vehicles which claim to be superior to or as good as the Duryea. In reference to this latter extension of the challenge, we understand that the same was laid before the President, and also handed to Mr. Lawson, to deal with as representing the British Motor Syndicate, but so far, we believe, he has not taken up the gauntlet.

REVIEWS OF BOOKS.

"Phil May's Gutter Snipes." (London: Leadenhall Press.) Price 6*s.*

ON another page we reproduce, by permission of the publishers, an illustration from this book. It is, unfortunately, not one of the happiest of Mr. Phil May's endeavours, as the subject is not a very promising one. All who wish to see our great pictorial humorist at its best should get this book; the artist simply revels in the scope for his pencil which is afforded by the vicissitudes of life amongst street children. He is mostly amusing; but, when he chooses, his grim pathos brings the tear to the eye. The 6*s.* edition has been exhausted; but the publishers intend to make a popular edition at half-a-crown. As a Christmas work it should have an enormous sale.

"Carriages Without Horses Shall Go." By A. R. SENNETT, M.I.M.E., M.I.E.E., and M.I.C.E., &c. (London: Whittaker and Co.) Price 2*s.*

THIS is a marvellous cheap and able book. It has for its basis the paper which Mr. Sennett read before the British Association on "Horseless Road Locomotion"—a notice of which has already appeared in our columns; but Mr. Sennett, who is undisputably an authority on this subject, has elaborated upon the paper, and by the aid of some 40 admirable illustrations he traces the evolution of the motor-carriage from the types in vogue in the early days of the century; and while doing ample justice to the progress which has been made by our Continental friends, points out the lines on which future improvements are almost certain to proceed. The Locomotives on Highways Act, 1896, and the regulations which have been made under it, are fully set out and commented upon. The book cannot fail to be of service to all concerned in the manufacture and purchase of these vehicles; while all general readers who wish to be "up-to-date" in this matter will consult this most reliable guide.

"Auto-Cars." By D. FARMAN, M.I.E.E. Translated from the French of Lucien Serraillier. (London: Whittaker and Co.) Price 5*s.*

THIS is one of the most practical books yet written on automotor work, and, as might be expected, it is the production of a Frenchman. The author is well-known on the other side of the Channel as an expert on the matters of which he writes, and the Baron de Zuylen de Nyevelt, president of the Automobile Club of France, in writing the preface to the work has emphasised this fact. After an admirable chapter upon theoretical matters and formulæ, in which the theory of engines in general is sufficiently explained and investigated, the author describes in detail the whole of the leading motors and carriages. All necessary details are fully described and illustrated—the engravings, of which there are 112, being very clear. M. Farman, while being a keen advocate in favour of petroleum, is fair in his remarks; and his book should not only be perused—but studied—by all who wish to take up the subject at the point to which Continental engineers and carriage builders have carried it. A sufficient index is contained in the book, and tends considerably to its utility as a work of reference.

"The Law of the Motor-Car, with the Regulations of the Board of Trade." By GRIMWOOD MEARS, of the Inner Temple, Barrister-at-Law. (London: Messrs. Reeves and Turner.) Price 3*s.* 6*d.*

ALMOST coincidently with the coming into force of the Light Locomotives Act we have an able legal authority and an enterprising firm of publishers ready to hand to interpret it. All who use motor-cars or who contemplate employing them should obtain the book. In case anyone is inclined to underrate the pitfalls which may present themselves to the layman who attempts to interpret the law, we prefer to let Mr. Grimwood Mears speak for himself. In the course of an interview he said:—

"From a lawyer's point of view the accidents will group themselves mainly under three heads. There is, first, the inevitable accident; then that due solely to the negligence of the party causing the damage; and the third instance in which the party injured himself contributed by his negligence to the damage he sustained. This classification does not pretend to be either scientific or exhaustive, but it presents the familiar divisions usual to this class of work. In each of our three heads the principles of law are clear and well defined, the difficulties that arise are mainly on account of the facts being complex and controverted. A few simple illustrations will present the definite rules which tend to establish the liability or immunity of the parties. And, first, inevitable accident. Appropriately enough we may call our illustration a "hard case." A is crossing the road; a runaway horse belonging to B turns the corner rapidly and knocks A down. What is A's remedy? Briefly and bluntly he has none, providing the accident is not due to the negligence or lack of skill of B or his servants. At the time of the accident both were in possession of equal legal rights. B had as much right to ride or drive a horse along the highway as A had to traverse it on foot. The mere fact of a horse bolting is not, *per se*, evidence of negligence. Before A can recover he must show that B or his servants did some act inconsistent with the standard of prudence required from a reasonably competent and careful man. By thus showing that B might have avoided the accident had he used more care or been reasonably expert, the case is at once removed from the category of inevitable accidents, and, therefore, does not impair the general rule that for an inevitable accident there is no remedy.

"A plaintiff who is suing either for injuries to his property or to his person by reason of collision or running down must give evidence of negligence before his case can be submitted to the jury. This must, of course, be understood to be true of those cases only in which there is no contract between the parties. We are taking the ordinary instance where A collides with a vehicle belonging to B or runs over B, a person previously unknown to him. B then must, as we have said, prove that A was negligent, and he must further show that the negligence and resulting damage are clearly and uninterruptedly connected. The mere fact that an accident has happened is not enough. Occasionally there are presumptions raised by the law in a person's favour. One of the most important of these is that which in a sense protects the person crossing the road from the vehicle which knocks him down. The foot passenger needs less evidence of negligence to support his case than if he were a plaintiff seeking to recover damages by reason of a collision between vehicle and vehicle. We have, therefore, seen that when an accident takes place the person injured must prove that the defendant was guilty of negligence, and that it was from this negligence that the damage ensued."

Many warnings and admonitions are given in the volume, but our advice is buy the book and save money in litigation.

"Power Locomotion on the Highway." By RHYS JENKINS, M.I.M.E. (London: Wm. Cate, Limited.) Price 2*s.* 6*d.*, nett.

THIS is a practical bibliography of all matters pertaining to locomotion on common roads, with an interesting preface and sketch of historical matters. To the student it affords a ready means of finding the sources from which information can be obtained; but we expect that with the great increase in interest taken in the subject the author willl find it very difficult to keep it up to date. The motto of the book is very apt, viz., "Sir, mark me, ere long we shall see a pan of coals brought to use in place of a feed of oats."—Bishop Berkeley.

THE *Glasgow Herald* has recently published a very able series of articles on Mechanical Tramway Traction: and we hope that they intend to republish these in book form. The issue should be a very successful one.

¡"CUANDO escribe, refiérese Al "THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL."

CORRESPONDENCE

*** *We do not hold ourselves responsible for opinions expressed by our Correspondents.*

*** *The name and address of the writer (not necessarily for publication)* MUST *in all cases accompany letters intended for insertion, or containing queries.*

MOTOR-CARRIAGE CONTEST.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

SIR,—I am directed by Mr. Harry J. Lawson, the President, and by the Committee of the Moto-Car Club, to notify to you that it is the intention of the Club to hold a great motor-car competition some time in May next year. The tests will be given on the point of design of the motor-car, consumption and cost of fuel, and other points, but the principal point will be speed, which we are of opinion affords the most satisfactory test as to the excellence of construction of a mechanical vehicle.

It is proposed to offer for competition £2,000 in prizes. Notice of this competition is given thus early in order to enable English manufacturers to be prepared with their productions in good time. If sufficient entries are received, the Committee will confine the competition to British-made motor vehicles. In order to carry out this competition satisfactorily, the Committee will require special ground within easy access of London, and containing at least a full level and straight mile. A special prize will be offered to the first mechanically-propelled vehicle which accomplishes a mile in a minute.

Owners of race-courses and other large enclosed spaces are invited to communicate with me if they are prepared to co-operate in providing the necessary course. There is no doubt that this marvellous and novel competition will attract an immense concourse of people, and will excite an interest not less than that aroused by the classic races. All communications on this subject should be addressed to me, at the offices of the Motor-Car Club, 40, Holborn Viaduct, London, E.C.—I am, Sir, your obedient servant, C. HARRINGTON MOORE,

Nov. 21st. Hon. Sec.

THE PROPOSED MOTOR-CAR CLUB CONTEST.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

SIR,—I observe that it is proposed to have a Motor Derby. To this none can have any objection. It is merely a question for those who run in the race, to consider how far they care to risk their lives with no compensating advantage.

But in the announcement, the following words occur :—"The Committee will require a special ground . . . . at least a full, level, and straight mile." Elsewhere there appears the following—" but the principal point will be speed, which we are of opinion affords the most satisfactory test as to the excellence of construction of the mechanical vehicle."

In these two quotations lie the danger of the proposed race, so far as the public safety and the pockets of purchasers are concerned.

The Local Government Board, in order to meet the desire of the local authorities to limit the speed, have fixed 12 miles an hour for the maximum, and the Act itself permits no rate beyond 14 miles an hour, and no one can hold out the smallest probability that this rate of speed will be increased in any future Act.

Therefore, any attempt to place self-propelled vehicles on the market capable of making a pace much greater than that permitted by law, will simply act as an incentive to their owners to do that which is forbidden when hurrying to keep an appointment for which they are late.

But the worst feature in the announcement is the statement that speed is the best test for a carriage, because a level track is to be selected for the trial. Experts know perfectly well that the power required to propel a light motor-carriage on the level when the road is good, is exceedingly small, while such a carriage on an incline might be a complete failure for want of sufficient power.

No test could be more delusive than the one suggested. It would place the present petroleum motor-carriages on a par with steam, whereas, on meeting an incline, the steam carriage would in a few moments be out of sight, whilst the petroleum-driven one was struggling to climb the hill.

This I can vouch for from what I have seen in connection with motor-carriages and those in my possession, as well as from theory.

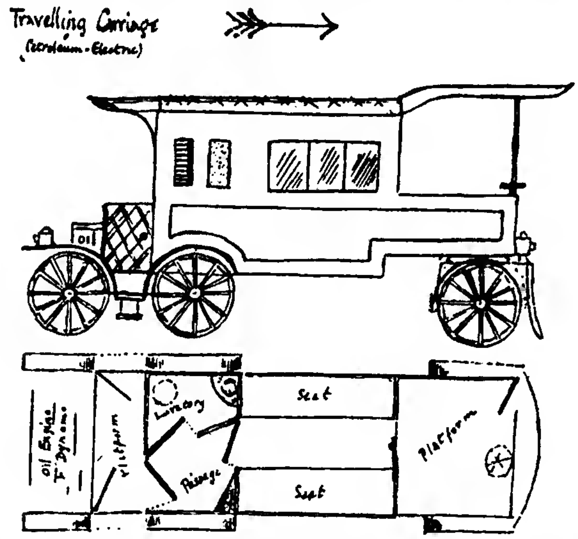
It is not fair that the public should be made to believe that the proposed test is likely in any way to produce a satisfactory vehicle. Anyone who purchased a carriage based on such a notion, would soon regret his bargain.—Yours ever faithfully,

DAVID L. SALOMONS.

DESIGN FOR MOTOR-CARRIAGES.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

SIR,—I venture to send you a rough sketch of a design for a motor-carriage, which is at least not on horse-drawn lines. As a member of the Self-Propelled Traffic Association I am much interested in the subject, and have gone so far as to advocate in the *Electrical Review* and other papers a combination of petroleum and electricity—an oil engine with a dynamo



being carried on a *separate* tender, and the current generated passing to the front of the vehicle and thence to an electric motor connected with the driving wheels. The tender is preferably two-wheeled, and attached to the driving axle of the vehicle by elastic shafts, so that the vibration of the engine is practically unfelt. At the same time the well marked advantages of an electric motor are obtained without the weight, cost, and trouble of storage batteries—though it may be desirable to have enough battery power to start the dynamo and engine without load.

(I enclose a rough sketch of a cab to show the arrangement and functions of the various wheels, the effect being that of *one* vehicle, though there are technically two.)

I should suggest four cylinders for the oil engine, giving an impulse every half revolution ; perhaps six if weight would allow.

Please note, wheels all same size.

So much for the "engining" of the carriage.

A plan is given of the "travelling carriage," showing deck arrangements, so to speak. A novel feature is the lavatory accommodation, the various doors being so arranged as to secure the greatest possible privacy.

Should you care to publish this as a crude design you are very welcome to it, as I am not competing for any of the prizes now being offered, and have no wish for copyright.—I am, &c.,

ALFRED J. ALLEN.

LONDON INSTITUTION, FINSBURY CIRCUS,
December 2nd, 1896.

P.S.—With regard to the sketch for a petroleum-electric carriage which I had the honour of sending you recently, it should, perhaps, have been mentioned that the oil used is supposed to be of the lighter variety, the heavier oils presenting (in spite of their greater safety) some serious disadvantages, notably a very pronounced odour. Another point with regard to the provision of an electric current as a means of transmiting the power of the engine, is the possibility of driving *all* the wheels supporting the carriage.—I am, &c.,

A. J. ALLEN.

December 5th, 1896.

MAPLE'S AND MOTORS.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

SIR,—The attention of my directors has been called to the fact that the name of Maple and Company, Limited, is being extensively used to advertise motor-cars. It is also stated that this company has placed large orders for motor delivery vans. I am requested to inform you that my company has not given any order for motor-cars, nor for any such description of vehicle.—I beg to remain, dear Sir, yours truly,

THOS. FINLAY, Secretary.

Maple and Co. (Limited), 149, Tottenham
Court Road, W., *Dec. 3rd.*

THE NEW PETROLEUM REGULATIONS.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

SIR,—We have pleasure in enclosing a copy of the letter we wrote to the Home Secretary on the subject of the new Petroleum Regulations, for publication in your colums.—Yours truly, CARELESS, CAPEL, AND LEONARD.

Hope Chemical Works, Hackney Wick, N.E.,
Dec. 2nd, 1896.

[COPY.]

Hope Chemical Works,
Hackney Wick, N.E.,
November 14th, 1896.

TO THE RIGHT HON. SIR MATTHEW WHITE RIDLEY, BART.

DEAR SIR,—We have just seen a copy of the new Petroleum Regulations for Autocars.

We are manufacturers of a doubly distilled mineral spirit called "petrol," which has been adopted by the Autocar Club as the best spirit for use in petroleum motors.

In the introductory statement referring to the regulations you state that "not only is the vapour from mineral spirit, which is given off at ordinary temperatures, capable of being easily ignited, but also when mixed with air of forming an explosive mixture."

We would respectfully suggest that these words as they stand do not fairly represent the facts of the case, and are calculated to create a wrong impression, and needlessly alarm the public.

Sir V. D. Majendie gave the Select Parliamentary Committee on Petroleum, which sat this year, an exact definition of the conditions which were essentially necessary to produce an explosive mixture of petroleum vapour and air (*see* p. 43 of No. 4 paper handed in by Sir V. D. Majendie) as follows :—

(*a*) A temperature sufficient to disengage from the petroleum appreciable amounts of inflammable vapours.

(*b*) The confinement of the vapour so disengaged in an unventilated or insufficiently ventilated space.

(*c*) The application of fire or a light, and he adds, "If any one of these conditions be absent an explosion is a physical impossibility."

We would submit, therefore, that the clause as it stands is calculated to make the public think that just in the same way as the mineral spirit gives off a vapour at ordinary temperatures which may be easily ignited, so the vapour given off may at any moment unite with air and form an explosive mixture which would be capable without any warning of causing a serious accident.

We think that such a statement, unqualified as it is, is likely very needlessly to prejudice the use of mineral spirit, and to inflict a serious injury on all those interested in motors, such as the Daimler motors, in which some form of light petroleum is employed.

As being manufacturers and distributors of this kind of spirit for over 25 years, since petroleum was first introduced into this country, we can speak positively as to the great ignorance and prejudice which exists amongst the public about it, and the very general confusion in the public mind between such explosives as gunpowder and the light petroleums, ignoring the fact that the latter are perfectly harmless, and cannot explode unless the three conditions mentioned by Sir V. D. Majendie are complied with.

Under the circumstances we hope you will be willing to amend the clause by adding the words "in a confined space," so that it will read thus: "Not only is the vapour therefrom which is given off at ordinary temperatures capable of being easily ignited, but also, when mixed with air 'in a confined space,' of forming an explosive mixture."

It is physically impossible for any explosive mixture to be formed in the open air; it could be produced only in a confined space.

All those interested in autocars feel that they owe a deep debt of gratitude to the Board of Trade for the liberal way in which they have modified the provisions of the existing Petroleum Acts so as to meet the changed conditions, and it is relying on your sympathy that we have ventured to make the above suggestion.—We are, dear Sir, yours faithfully,

CARLESS, CAPEL, AND LEONARD.

THE STUDY OF MOTOR TRAFFIC.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

SIR,—Judging by the frequent remarks and communications addressed to me during the last few weeks, and more particularly since the occasion of Sir David Salomons' visit, I fear that a wrong opinion has, in many instances, been formed regarding the scope and aim of this Association's work. It is to guard against the idea—apparently general—that commercial interests alone are to be provided for in our programme that I venture to claim a portion of your valuable space.

The specific object of this branch has been defined as "The scientific investigation of self-propelled vehicular and locomotive road traffic," and, in this city, circumstances have conspired to make it appear that the chief desire is to promote the circulation of heavy goods traffic by means of motor vehicles. Such priority has been considered expedient solely by reason of the pressing need for experiments and trials in this direction, and must not be taken as evidence that the papers, lectures, and discussions during our first session will be of limited interest and application. It seems to me that, since the successful "evolution" of a satisfactory vehicle for heavy work must embrace data suited to the construction of lighter types, no more inclusive method of treatment could be devised. This, therefore, may be looked upon as a fortunate development, seeing that the study of light conveyances only would be practically valueless when necessity arose to meet the exigencies of goods haulage.

In conclusion, I hope that all persons in this neighbourhood who intend to follow the movement in a scientific manner, whether they be interested from recreational or business motives, will communicate with me for particulars of the Association. On receiving a written application, I shall be most happy to send a copy of Sir David Salomons' inaugural address, together with our programme for the 1896-7 Session, to any of your readers.

E. Shrapnell Smith,
Hon. Local Secretary the Self-Propelled Traffic Association.

Royal Institution, Liverpool.

THE BRITISH MOTOR SYNDICATE (LIMITED).

Soon after the publication of the prospectus of the above Company we received several letters from those mentioned in it, or interested in its success. Some are published below, and we at the same time add one important communication which was not sent in direct, but which is of public interest :-

Sir,—I am directed by the proprietor of *The Engineer* to ask you to be good enough to allow me to state in your columns that the reference to this journal in the prospectus of the British Motor Syndicate (Limited) is entirely unauthorised by them, and that the gentleman named in such connection has resigned his post as their assistant editor.—I am, Sir, your obedient servant, S. White, publisher of *The Engineer*.

33, Norfolk Street, Strand, *Nov. 27th*.

Sir,—As statements having reference to this syndicate have been made by advertisement and otherwise which may do me considerable injury unless the obvious infereuces from them are contradicted, I beg that you will in fairness allow me to say that the reference to my name and to *The Engineer* in the prospectus of that syndicate was not only unauthorised by me, but was entirely without my knowledge. Further, that I have no interest of any kind whatever in the British Motor Syndicate or any other motor-carriage company or business. The reference to my editorial connection with *The Engineer* is also so made, I will admit inadvertently, as to do me harm by the inference that my resignation had some connection with this syndicate. I must therefore ask to be allowed to state that I resigned in July in consequence of pressure of private practice, and the announcement of this resignation has been made in the business columns of the principal technical journals in London.—I am, Sir, your obedient servant, W. Worby Beaumont.

Sir,—Will you be geod enough to allow us to state in your columns that the reference to Crossley Brothers (Limited) in the prospectus of the British Motor-Car Syndicate (Limited) is entirely unauthorised by us, and that the gentleman named in such connection is only acting as one of our consulting engineers, and the patent referred to in the prospectus must be his own, as it is in no way connected with this firm ?—Yours, &c.,

10, St. Bride Street, Robert Wilson.
Nov. 30th.

Sir,—A number of letters having appeared in certain journals on this subject, we trust you will afford us space to reply.

With reference to the names of two well-known patentees mentioned in our advertisements without, as it has been said, their first-obtained consent, we beg to state that our Syndicate actually paid to the said two patentees the very substantial sum of £12,000 a few weeks ago, and bought outright their patents with all future improvements they may make connected with this industry. We are advised that, having so purchased their inventions, we have a perfect right to advertise them as patentees in any manner we may desire.

As to the manner in which they are referred to, we have followed exact precedents, and described them in the same way as the public have hitherto been accustomed to see them styled. As to other statements, we are are quite prepared for, and, indeed, like some amount of opposition, for the whole subject is so entirely new and in advance of the times that it would indeed be singular if certain old-fashioned and undoubtedly respectable people, without a motor in their whole composition, were not to some extent shocked ; but it must be remembered that, rightly or wrongly, we believe we have in our hands a gigantic monopoly, nearly approaching in importance that of the railway companies of the United Kingdom.

Times and future events alone can prove how nearly accurate we are in our estimate, but in the meanwhile the public would do well to bear in mind that no successful monopoly has ever yet been established without similar opposition to that which is now manifested. We have only to refer to Crossley's themselves and their patent gas-engine, the Singer sewing machine, the Plimpton Skates, the Incandescent Light, and Dunlop Pneumatic Tyre, and other revolutionary inventions, which have now proved themselves, in spite of every scepticism, to be fully worth all the millions of money to the shareholders their founders once prophesied.—Yours faithfully,

Charles McRobie Turrell,
The British Motor Syndicate (Ltd.), Assist. Sec.
59, Holborn Viaduct, E.C., *Dec. 1st*, 1896.

[Among the many letters which are crowded out are communications from Sir David Salomons, Mr. A. R. Sennett, Mr. H. P. Holt, and Mr. Radcliffe Ward.]

Motor-Wagon Communication between Manchester and Liverpool.

As a forerunner to the adoption of this service between Liverpool and towns in the Manchester district, a complete survey of the roads has just been completed by Mr. Joseph Hawley, Assoc. M. Inst. C.E., acting under the instructions of Mr. Alfred A. Jones (Messrs. Elder, Dempster, and Co.), one of the vice-presidents of the local branch of the Self-Propelled Traffic Association. The report is most favourable, and may be regarded as the first step towards the accomplishment of this enterprising departure.

We hope, in an early issue, to be able to give full particulars of this important scheme. It is expected that by May next all will be in form for the beginning of operations. Mr. Shrapnell Smith (the hon. secretary) and Mr. Lawrence Jones (hon. solicitor), of the Liverpool branch of the Self-Propelled Traffic Association, are taking all necessary steps to further the movement.

Australia's Motor-Cars.—The Largest in the World.

Most of us no doubt thought that we were fairly early in the field over this motor-car business, but it turns out that Australia is well in advance of us. It already has the biggest one in the world.

The largest horseless carriage in the world has just been built in California. Some idea of its size may be gathered from the fact that it possesses 75 horse-power, an unheard-of amount for this new form of vehicle.

This particular car will travel between Coolgardie and the coast, and is intended merely for freight. It will pull over rough roads two other wagons. Coolgardie is 400 miles in the interior, and up to the present time all supplies for the men at the diggings have been transported by the old wagon system, a wearisome task. It was considered impracticable and too expensive to construct a railroad to Coolgardie, so the idea of a big motor-car was hit upon.

It was no small matter designing such a vehicle. For one thing water is scarce on the road to Coolgardie, and so the steam ought not to be exhausted upon the air, but saved, reconverted into water, and again used.

NEW INVENTIONS.

Compiled for "The Automotor and Horseless Vehicle Journal" by Herbert Haddan and Co., Registered Patent Agents, of 18, Buckingham Street, Strand, W.C., London.

Patents Applied For.

24,430. November 2nd, 1896. Sir C. S. Forbes. Improvements in or applicable to motor-cars, road-carriages, and the like.

24,526. November 3rd, 1896. W. A. P. Werner. Improvements in driving mechanism for self-propelled road vehicles.

24,699. November 4th, 1896. F. A. Sharratt and W. W. McLeod. Improvements in braking cycles, motor-cars, and like carriages.

24,848. November 6th, 1896. J. Birtwistle Improvements in and relating to power-driven vehicles for use on roads.

24,881. November 6th, 1896. J. B. Furneaux and E. Butler. Improvements in explosion engines, especially suitable for propelling vehicles, boats, and other bodies.

24,912. November 6th, 1896. V. E. Pretot. Improvements in and relating to speed and reversing gear for motor-carriages and other purposes.

24,953. November 7th, 1896. W. Rowbotham. Improvements in reversing and variable speed gear for vehicles, launches, and the like.

25,105. November 9th, 1896. H. Middleton. Improvements in steam propelled cycles and carriages.

25,140. November 10th, 1896. W. Rowbotham. Improvements in self-starting apparatus for explosion engines, in particular for those used in vehicles, launches, and the like.

25,202. November 10th, 1896. J. G. Stidder. Improvements in or relating to motor and other road cars or vehicles and cycles.

25,226. November 10th, 1896. J. Powell and H. Moore. An improved method of and apparatus for driving cycles and other road vehicles and machinery generally by the aid of liquids.

25,412. November 12th, 1896. W. Simpson, W. L. Bodman, and D. H. Simpson. Improvements in the construction of motor-driven vehicles.

25,480. November 12th, 1896. W. Banies, W. Norris, and J. Simkiss. Improvements in driving and reversing gear for oil and other engines, especially applicable to motors for common roads.

25,515. November 13th, 1896. L. S. Crandall and S. G. Mason. Improvements relating to the storage and utilisation of compressed air or gas on cycles and other vehicles.

25,516. November 13th, 1896. S. Gorton, W. Taylor, and The New Beeston Cycle Co., Ltd. Improvements in or relating to velocipedes, auto-cars, and the like.

25,628. November 14th, 1896. F. Parker. Improvements in motor and other road vehicles.

25,718. November 14th, 1896. F. K. Woodroffe. Improvements in and connected with road vehicles propelled by petroleum, and other motors.

25,735. November 16th, 1896. J. Marsden and M. Pearson. Certain improvements in and relating to the mechanism of locks for cycles, motor-cars, or for other suitable purposes.

25,844. November 17th, 1896. M. E. Thomas, W. F. Toops, J. M. Hulen, H. L Hendrick, E. L. R. Hendrick, and R. W. Hendrick. Means for storing up the electricity generated by the application of the brakes to the wheels of moto-cars or locomotives.

26,105. November 19th, 1896. R. J. Crowley and E. B. Payne. Improvements in or relating to the means for transmitting motive power applicable to motor-cars and other vehicles and the like, also for other suitable purposes.

26,114. November 19th, 1896. W. J. Wynn, A. E. Wynn, and W. J. Radford. Improvements in automotor vehicles.

26,180. November 19th, 1896. B. Coultas and J. V. Coultas. Improvements in and connected with mud-guards for cycles, motor-cars, and other vehicles.

26,232. November 20th, 1896. J. H. Ball. Improvements in automotive vehicles and in mechanism for the same.

26,302. November 20th, 1896. F. W. Greengrass. Improvements in and relating to self-propelling road vehicles.

26,316. November 21st, 1896. A. T. Ellis. Improvements in and appertaining to cycles and pneumatic tyred and such like vehicles.

26,362. November 21st, 1896. W. Gibson, W. H. Palmer, and A. J. P. Whitaker. An improved driving chain for cycles and other road vehicles.

26,415. November 21st, 1896. E. Pellas and S. Fossati. Improvements in and connected with steering gear for moto-cars.

26,563. November 24th, 1896. J. E. Wallis. Improvements in road locomotives, light road locomotives, or motor-cars.

26,595. November 24th, 1896. F. Smith. Improvements in motor road vehicles.

26,643. November 24th, 1896. H. S. Maxim. Improvements in motor carriages or vehicles.

26,688. November 25th, 1896. C. Willson. Guards for motor cars or locomotives.

26,721. November 25th, 1896. J. M. Starley. Improvements in driving chains, especially applicable to cycles, motor-cars, &c.

26,780. November 25th, 1896. F. K. Woodroffe. Improvements in or connected with motors for vehicles.

26,779. November 25th, 1896. B. M. Lindwall. A fender for motor cars.

26,850. November 26th, 1896. A. G. Melhuish. Improvements in and connected with gas or oil vapour motors, and their connection with motor vehicles.

26,886. November 26th, 1896. B. J. Jacobs and The Yeovil Motor Car and Cycle Company, Limited. A new or improved reversing apparatus for motor-driven vehicles.

26,907. November 26th, 1896. F. L. Merritt. Improvements in motor-cars.

26,956. November 26th, 1896. F. R. Frost. Improvements in connection with motor cars and like vehicles.

26,976. November 26th, 1896. C. M. Johnson. Improvements in and connected with motor vehicles.

27,054. November 28th, 1896. J. E. Dixon. Certain improvements in metallic tubes for the frames of bicycles and other velocipedes, motor carriages, and for other purposes.

27,104. November 28th, 1896. J. W. Davison. Improvements in or relating to the construction of wheels for carriages, motor cars, cycles, and other vehicles.

Specifications Published.

15,564. August 19th. Electro propulsion of vehicles or vessels. L. Epstein.

According to this invention the necessity of providing charging stations is obviated by providing means on the vehicle itself by which the secondary batteries can be recharged. For this purpose the motor is so arranged, which motor is driven by the electricity from the secondary batteries, that it can itself be used as a dynamo-machine, and means are also provided whereby the said motor can be easily uncoupled from the motor shaft and coupled to a small subsidiary engine, by which it can be worked as a dynamo to recharge the secondary batteries.

18,868. October 8th. Electric velocipedes. H. W. Libby.

Relates to a bicycle to be propelled by electricity, and consists of a frame with an electric battery and an electric motor secured to said frame, a longitudinal tube extending from the front to the rear fork for holding the exciting fluid for the battery, an electric controlling device, suitable connections between the battery, motor, and controlling device, and suitable mechanism for transmitting motion from the motor to the driving wheel.

Printed Copies of the above Specifications Published may be obtained by forwarding 1s. for cost of each copy and postage to Messrs. Herbert Haddan and Co. Applications not yet Published.

QUIPS AND CRANKS.

The British Flying Machine Syndicate.

Capital—Ten Millions. In Ten Million Shares of One Pound each.

Prospectuses of the above forwarded on application. You can only get the shares at a premium. The directors having acquired the rights in all the Flying Machines which have up to the present been invented, strongly recommend this enterprise to persons desirous of investing their capital in a highly prosperous undertaking.

The directors point with pride to the successful accomplishment of a public breakfast in London and the successful accomplishment of a public dinner in Timbuctoo, and rely upon these facts to convince the public that the suggestion which has been made by carping critics that the first necessity of a going concern is that it should be able to go is absolutely without foundation.

Pictures of Flying Machines earning a substantial dividend and travelling the skies in all directions have already appeared on the back pages of the daily and weekly papers.

Persons who desire more than this as a guarantee of the dividend-earning powers of the British Flying Machine Syndicate had better lock up their spare capital in the baby's money-box.—*The Referee.*

Prince Ranjitsinhji's name figures in the prospectus of the British Motor-Car Company as "owner of Indian patents." Can this (asks a curious correspondent) have reference to the Car of Juggernaut, which may be regarded as one of the earliest autocars ever patented?—*The Globe.*

SITUATIONS WANTED.

THE AUTOMOTOR

AND

HORSELESS VEHICLE JOURNAL

A RECORD AND REVIEW OF APPLIED AUTOMATIC LOCOMOTION.

Circulates amongst Makers and Users of Autocars, Cycles, etc., in the United Kingdom, the Colonies and the Continent.

VOL. I. No. 4. JANUARY 18TH, 1897. PRICE SIXPENCE.

CONTENTS.

THE KANE-PENNINGTON MOTOR.

IN compliance with the request of several correspondents, we give the following description of Mr. Pennington's Motor, taken from his Specification, numbered 23,771, and dated December 11th, 1895. As we have not had an opportunity of testing the efficiency and utility of this much-advertised motor, we at present withhold our opinion as to its merits, but hope to deal exhaustively with it in an early issue:—

Referring more especially to the invention with a motor having two cylinders, the bearing pieces, 35, for the axle of the propelling wheel are each provided with horns, 36 and 37, for the lower and back braces, which are of steel tubing. It is preferred to make these solid to fit into the hollow ends of the braces; but they could be made hollow to receive the braces. Further, each of said bearing pieces is provided with a seat, 38, for the front end of the engine cylinder, and the piece, 35, is also provided with a bearing, 39, for a valve gear to be described below. Each bearing piece could be provided with such bearings, but, as I find it advantageous to operate the valves of both engine cylinders from one gear, only the one piece is shown as so provided.

It is preferred to use a removable block, 40, under each end of the axle to allow this to be readily inserted and removed when desired.

In making bicycles and similar vehicles self-propelling, it is desirable to reduce the weight; and, in order to effect this, the hollow frame of the vehicle (or such portion or part thereof as may be thought available) is made to constitute or form part of the reservoir for the oil. As shown, the top braces, 41, 41ª, make part of such reservoir In order to carry a large supply of fluid, a can, 42, is mounted on the frame, and connected, by a nipple, with one of the fluid holding braces. A hollow cross piece, 43, forms a brace and also a pipe connection between the fluid holding braces at their lower ends. The couplings, 43ª, unite the cross pieces to the braces. At 44 is the filling opening of the can, 42.

In the cross piece, 43, is the conical orifice and threaded cylindrical opening for the needle valve, 45, which regulates the delivery of the oil. This needle valve has a threaded stem engaging the threaded opening and the tapering point within the conical orifice as is usual in needle valves, the turning of the stem inserting the point more or less deeply into the orifice to check or cut off, or to start or increase, the delivery from said orifice. The needle valve is formed at the end of a flexible valve rod, 47, which is extended forward and provided with a handle, or other operating means, within reach of the rider. Its forward end is upheld by the handle bar, the valve rod passing loosely through a loop, 46. The valve rod, therefore, does not interfere with the turning of the handle bar, nor with its vertical adjustment. Such a valve rod, as is described, might be used to operate any suitable form of fluid delivery valve, and the described arrangement of needle valve could be used with any suitable operating means; although it is an advantage and a special improvement to use the valve rod and the needle valve arrangement in connection with each other.

The oil drips from the orifice into the opening, 18, at the top of the arched pipe, 49, and is thence conveyed to the engine cylinders through the valve to be described below.

In order to reduce the weight of the engine and to favour the conduction of heat from the engine cylinders, 6 and 6ª, they are each made of a steel tube, cut away at one end to leave a projecting tongue, 7, for attachment to the bearing, 35, of the engine crank shaft, 10, which, as shown, is also the axle of the vehicle wheel, 2. The seats, 38, are curved (or concave on their faces) to fit the curvature, in cross section, of the tongues, 7. The curvature of the tongue increases its strength, as well as facilitates the manufacture of the tongued cylinder. The engine cylinder, being single acting, the front ends are left open. The rear ends are closed by the heads, 51, which carry the valves, 23, 23ª, 54, 54ª, and ignition tubes, 52, 52ª, and which also reinforce the steel tubes, at the explosive end, by means of a flange, 53, for each tube or cylinder. The ignition tubes are made of platinum, or other suitable material, each closed at its outer

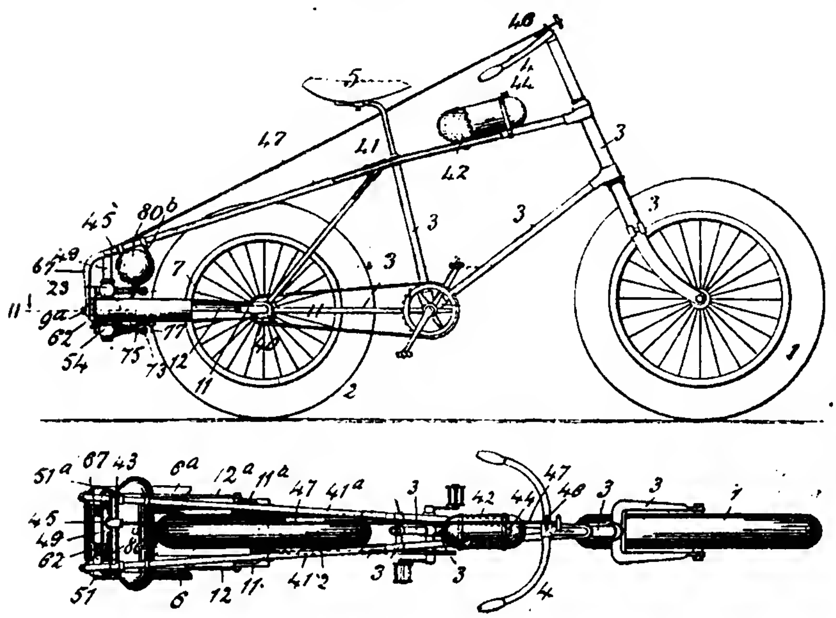


FIG. 1.

end and opening each into one cylinder at the inner end. They are kept hot at the proper point to insure ignition of the explosive mixture in the cylinders when fully compressed, as is well understood in the art.

In each cylinder moves a hollow piston, 13 or 13ª, which is connected by its pitman or connecting rod to the cranks, 11, 11ª, respectively at the corresponding end of the shaft or axle, 10. The pitmen are each best made of a small steel tube, 12 and 12ª respectively, with end pieces, 57 and 58, of a thicker material. The rear end piece, 58, fits between bosses, 59 and 60, on the inside of the hollow piston, with which it is connected by the journal-pin, 61. The front end piece is loosely connected with the pin of the crank, 11 or 11ª, a bushing being advantageously interposed. The bushing fits between the end piece and the crank pin with sufficient looseness to turn freely, and has inwardly and outwardly turned flanges which overlap the respective parts. A screw tapped into the crank pin holds all in place.

The rear ends of the cylinders, 6, 6ª, are connected with each other by means of the chambered cross piece, 62. This, as shown, has several functions; it forms a cross brace between the rear ends of the cylinders, and also between the rear ends of the top braces, 41, 41ª; it forms chambers for enclosing and protecting the ignition tubes, 52, 52ª; it forms supports and protectors for the burners, 63, 63ª; it forms a support for the rock bar, 64, pivoted at 65 to a boss on its under side, the said rock bar operating the exhaust valve mechanism, as explained below. On top, the middle portion of this cross piece is cut away so as to allow the escape of the products of combustion from the burners, 63, 63ª, if necessary, to supply air for their combustion. The burners, 63, 63ª, may take air from the outside through the burner tubes, as in the familiar Bunsen burners; and the orifices for the escape of the products of combustion need not be made just as shown. Ears, 66, on the piece, 62, fit over the projections, 68, between the bent pieces, 67, forming the lower ends of the top braces, 41, 41ª, and the heads 51.

The heads, 51, are each made double, the inner plate being integral with the projections, and also with the flange, 53, which enters the cylinder tube. The outer plate has projections, 69, which fit outside the cylinder. The inlet port and outlet port are each made through the flange, 53, the cylinder tube, and the corresponding projection; and so also is the hole for the ignition tube, 52 or 52ª; only there is, preferably, no outside projection corresponding to 69 for the ignition tube.

The inlet and outlet valves, 23, 23ª, 54, 54ª, are each screwed into threaded openings in the projections, 69. They each include a chambered body, with the opening and seat for the valve disc, 76, in the partition between the chambers, also with a lateral opening, 70, the full diameter of the valve disc, and in line with the valve stem, 75, and with an elongated hollow cylindrical extension, 71, also in line with the valve stem. The opening, 70, is provided with a closure, shown as a screw plug. A spiral compression spring, 72, surrounds the extension, 71, through which the valve stem, 75, passes and by which it is guided. It presses at its inner end against the body of the valve, and at its outer end against a disc, 73, on the end of the valve stem. In this disc is an annular groove, which receives the end coil of the spring.

The inlet valves, 23, 23ª, open inward (that is, toward the engine cylinder) and are opened by the atmospheric pressure when a sufficient vacuum is made in the corresponding engine cylinder, and closed by the spring when there is no such vacuum.

To the top of the valve one end of the arched pipe, 49, is secured by a union, 74, with a disc of gauze or perforated metal, 49ª, interposed. One end of the pipe, 49, is fastened to the top of the valve, 23, and the other end to the top of the valve, 23ª (*see* Fig. 3), so that the same fluid-delivery valve, 45, shall serve for both cylinders.

The exhaust valves, 54, 54ª, also open inward, and are opened by valve mechanism and closed by the springs. To open the valve, 54, there is a tappet, 77, on the valve rod, 78, whose rear end is jointed at 79 to the rock bar, 64, and which is guided by an eye of the guide piece, 83, fastened by a nut on the lower part of the valve.

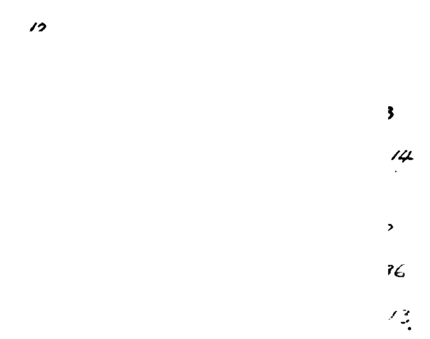


FIG. 2.

The tappet strikes the end of the valve stem and forces it and the valve disc inward against the pressure of the spring.

To open the valve, 54ª, a tappet, 80, is provided on the valve rod 81, whose rear end is jointed at 82 to the corresponding end of the rock bar, 64, and whose front end is loosely connected with the crank-pin, 73, of the valve gear, 15. This wheel is double the diameter of the pinion, 14, on the shaft, 10; so that the exhaust valves are opened once in every two reciprocations of the corresponding pistons, 13 or 13^a.

The gear as shown is provided with a boss, 76^b, to hold the valve rod, 81, away from the gear teeth, and to give a longer bearing in this gear to the crank pin. It is provided with an annular groove, 77^b, to receive the end of tubular bearing, 39, and with a pin, 78^b, to enter said bearing. A screw, 79^b, tapped into the pin, holds the gear in place, the under side of the screw-head bearing against the opposite end of the bearing. This special arrangement is advantageous, but it may be replaced

FIG. 3.

by another if its advantages are not desired, and the same remark applies to other particular constructions shown in the drawings and particularly described.

At 80^b is a can of oil for supplying the burners, 63, 63^a. It is upheld by straps from the top braces, 41, 41^a, and has a filling opening, 81^b. A feed pipe, 82^b, conducts the fluid to the branches, 83 and 84, which lead to the respective burners. Stop cocks, 85 and 86, in the branches control the supply to the burners.

The operation is as follows:—

The can, 80^b, being supplied with proper fluid, the burners, 63, 63^a, are lighted to heat the ignition tubes, 52, 52^a. Then the rider, adjusting the needle valve and mounting the machine, starts the wheel and shaft turning. Assuming that the parts are in the position shown, the pistons are both drawn forward

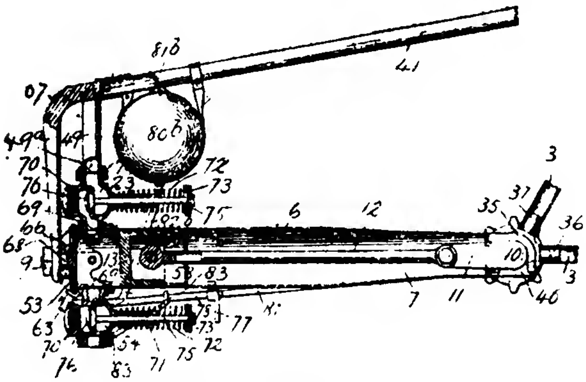


FIG. 4.

by the cranks, 11, 11^a, and pitmen, 12, 12^a. If both cylinders are empty, a mixture of air and oil is drawn into both cylinders through the arched pipe, 49, and the inlet valves, 23, 23^a. As the end of the forward stroke is reached, the springs close the inlet valves. During this movement, or half revolution, of the shaft, 10, the crank pin, 73^*, has made a quarter revolution, removing the tappet, 80, from the stem of the valve, 54^a, and so rocking the bar, 64, as to bring the tappet, 77, against the stem of the valve, 54.

The pistons, 13, 13^a, are moved back together, and the tappet, 77, forcing open the valve, 54, the contents of the cylinder, 6, are exhausted, while the contents of the cylinder, 6^a, are compressed because the valve, 54^a, is closed. The compression takes place also in the ignition tube, 52^a, and when it is complete the explosive mixture reaches the part of said tube which is sufficiently heated to ignite the mixture and to cause it to explode.

The pistons having now reached the inner (or rear end) of their stroke, the force of the exploded and expanded mixture in the cylinder, 6^a, forces the piston, 13^a, forward and turns the shaft, 10, propelling the vehicle. During this forward movement, the piston, 13, draws in from the arched pipe, 49, a charge of oil and air, its exhaust valve, 54, as well as the valve, 54^a, being closed during this movement.

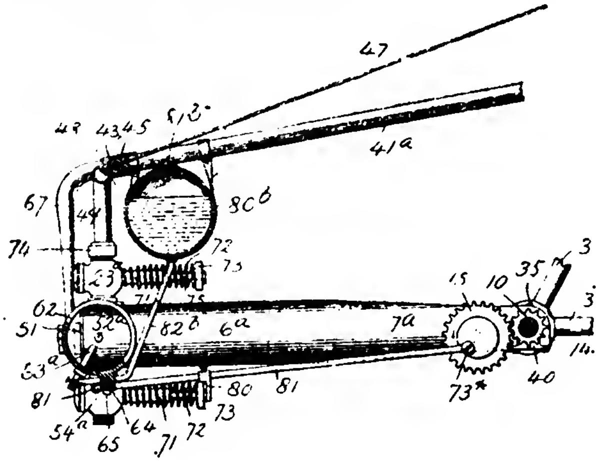


FIG. 5.

During the next inward movement of the pistons, 13, 13^a, the valve, 54^a, is opened and the valve, 54, closed, so that the contents of the cylinder, 6^a, are exhausted, and those of the cylinder, 6, compressed. The parts are now again in the position shown in the drawing. The compression of the explosive mixture in the cylinder, 6, forces it into the ignition tube, 52, until it catches fire and explodes, forcing the piston, 13, outward and through the shaft, 55, drawing the piston, 13^a, so as to draw an explosive charge into the cylinder, 6^a, to be in turn compressed and exploded.

In order to effect the compression of the explosive mixture in the cylinders, 6, 6^a, it is evident that some force is necessary. In ordinary gas engines, a heavy fly-wheel has been employed to store force for each explosion sufficient to effect the next

FIG. 6.

compression. Sometimes the force of an explosion has been made directly to effect the subsequent compressions. It is found unnecessary to use either of these expedients, and the vehicle may therefore be made lighter. The weight of the rider has been found available to store power for effecting the compression. This is an advantage, not only in saving weight, but it makes the vehicle self-stopping when the rider dismounts, the weight of the vehicle alone not being sufficient to effect the compression.

The illustrations accompanying the above article may be described as follows:—Fig. 1 is a side elevation of a vehicle having a two-cylinder motor, and a plan of the same; Fig. 2 is a view on the line 11—11 of Fig. 1; Fig. 3 is a cross-section on a line 12—12 of Fig. 2; Fig. 4 is a view on line 13—13 of Fig. 2; Fig. 5 is a view on line 14—14 of Fig. 2; and Fig. 6 is an enlarged view of a detail.

I 3

THE MECHANICAL PROPULSION OF TRAMWAY CARS.

Lecture at the Sheffield Technical School.

AT the Technical School, St. George's Square, Sheffield, on Saturday evening, the 19th ult., a lecture was given before a large number of the members of the Sheffield Society of Engineers and Metallurgists, by Mr. W. H. Watkinson, M.I.M.E., M.I.E.E., Professor of Prime Movers at the Glasgow and West of Scotland Technical College, on "The Mechanical Propulsion of Tramway Cars." The chair was taken by Mr. T. W. Sorby (president), and amongst the others present were Professor Ripper, Councillors G. Senior, W. F. Wardley, B. Chapman, J. C. Whiteley, Messrs. G. T. W. Newsholme, W. T. Beesley, and G. H. Mellor.

Professor WATKINSON, at the outset of his lecture, said it was not until comparatively recently in this country that there had been any great demand for rapid street transit, and on that account this branch of engineering had been too much neglected by engineers. In the United States the demand for rapid traction had been great, and engineers had risen to the occasion, and supplied the demand very effectively by means of the electric overhead system That night he purposed dealing with the relative merits of the various systems which at present seem most promising. The demand for rapid street transit had now become so pronounced, and the benefits which were to be derived from it were now recognised to be so great, and the loss to a city like Glasgow through the lack of it was so enormous, that the public would not long tolerate the present slow and cruel system of horse traction. Proceeding, he said steam, air, gas, and oil engines have the great merit that each car is independent, and therefore a general breakdown of the system is impossible. The underground cable and the electric (without storage batteries) depend for their success mainly to the fact that with them the prime movers at the central station can be very large and of the most economical type. This, however, is almost their only claim for supremacy. At present the electric battery system is not in a sufficiently advanced stage to prove commercially successful, and until recently steam cars had not been successful owing to problems involved in the design and construction of the boilers and engines. Now, however, they knew how to construct motors of that type, which for efficiency and lightness surpassed all others. It was now no longer necessary to provide a separate locomotive, as the whole of the apparatus can be placed on the passenger car itself. This possibility enables the total weight propelled to be enormously decreased. The great advantages of the steam-engine are due to its being able to exert great power with small loss of efficiency during the starting of the cars or on inclines, and also to it being able to work with maximum efficiency under the normal load and to the ease with which its direction of motion can be received. The principal drawbacks are the smell and dirt from the products of combustion when fitted with an ordinary boiler, but by the use of coke or oil these nuisances may be very greatly reduced, and by using forced draught and letting the chimney discharge downwards they may be almost annihilated. In connection with tramway cars these nuisances can be done away with altogether by dispensing with the furnace, the steam being generated by superheated water carried in suitable reservoirs beneath the car, they being replenished at a central boiler station. By means of the Serpollet boiler the condenser may be dispensed with, as the steam is still superheated, and, therefore, invisible on leaving the engine. When discharged beneath the car no nuisance is caused by the exhaust. Serpollet generators are now used of over 50 horse-power, and a number of cars in Paris are fitted with them. Compressed air, he further said, has long been used for the transmission of power, but the problems involved have, until recently, been far less appreciated than those connected with any other system. On this account the efficiency of the older compressing plant and motors was very low, and it is still generally believed by engineers that the system is necessarily inefficient; but a new era has commenced, and compressed air will probably play a most prominent part in the transmission and distribution of power. In this system there is no chance of smell or visible exhaust. The efficiency of an electric motor is higher than the air motor, but as the former runs at high speed gearing has to be used which reduces practical efficiency below that of an air motor. Mentioning here the McKarski system (used in Berne) and the Hughes and Lancaster system (tried experimentally at Chester), Professor Watkinson passed on to gas and oil engines, which, he said, at present seem to promise to become the most successful of all motors for tramcars and motor-carriages generally. Those in use have the great drawback that their direction of motion cannot be reversed, and, therefore, gearing has to be used for this purpose. In spite of this, however, gas-engine tramway cars are now working successfully at a lower cost than any other system. Most of the smell is due to lubricating oil sent out with the exhaust. The great drawback to the cable system is the initial cost, and the difficulty is in connection with the extensions. A disadvantage is that if the rope fails the whole system is thrown out of action, but an advantage is that it is practically impossible for a car to run away. He was of the opinion that the system has a considerable future before it. For hilly districts, he thought, it is better than the electric system, but he would not advise it to be laid in many cases. In the case of the overhead electric system, the wires do not annoy more than telephone wires, but if telegraph or telephone wires fell across them the user of the instruments might be injured. A fracture, too, might arise at any time by a slight accident, and whilst so far accidents have not been very great, frequent accidents have taken place. It is by far the most flexible system, and pays better than others, as the total cost of running cars is made up by a great many items. Although, however, these cars are such a great success in the United States, it does not follow that they will be so successful here, owing to the greatly reduced fares, and the distances passengers will travel. Recent changes in the system have made it far more efficient than it was a few years ago, and he did not think that Sheffield or Glasgow had lost anything by waiting. The Americans could not wait, and they had paid for the experience, which will be most valuable here. He did not think it wise to rush in for any of the systems, but rather advised one or two to be tried experimentally, so as to ascertain where a system is applicable to the requirements. The streets in Glasgow are narrow, and there are a great number of right-angled curves which absorb a great deal of power—far more than in the case of horse cars. The relative advantages and disadvantages of different types he summed up as follows:—Oil—Disadvantages: Vibration due to unsteady running, danger of fire or explosion, not self-starting, not reversible, easily damaged, complicated gearing. Advantages: No boiler required, automatic action, driver has not to look after coal or fire. In the case of steam, the disadvantages are: Stoking, water-level and pressure gauge to be attended to, weight of boiler and water; while the advantages are: Engine light, simple, and understood by most men, gearing simple, easily started and reversed, vibration less, no smell, danger less than with oil, inclines easily mounted. Gas shares all the advantages of oil and is less dangerous. It is more certain in action, but the disadvantage is the recharging of the reservoir. The advantages of electricity are, no vibration, no smell (except from acid fumes), and the disadvantages are heavy accumulators, rapid depreciation, costly, both initially and in working and the recharging of cells. The conclusions he had arrived at were that at present the steam-engine car is the best on the market so far as independent motors are concerned, because it is independent, and because there is no nuisance. It is the most reliable in every way, and until other oil engines are brought out it will continue to be the best one. The electric system possesses very great flexibility, and has the merit of novelty, and it has proved a financial success. He did not think, however, that they had arrived at a point at which definite steps should be taken which would involve a great outlay on any system. He believed they had pursued the wisest plan in waiting, and he thought they would continue to be wise in being patient in connection with the development of the various systems. The lecture, which was attentively listened to, was illustrated with lantern views showing the different machinery of the various cars which the Professor technically explained.

Professor Ripper proposed a vote of thanks to the lecturer. He said it would be nothing short of a great financial mistake at the present time to conclude from the observations of systems which already exist that one system is better than another, and he believed in Sheffield it would be a great mistake to think that what was best from Attercliffe to Lady's Bridge, would prove the best from the New Market to Broomhill. There were engineering matters which would require considerable working out, and it was important that they should not tie themselves to the system, so that when they had spent money on it they could not do anything else to carry it on. (Hear, hear.)

Councillor George Senior seconded the vote, expressing himself in favour of the overhead system or steam.

The vote was carried unanimously after a little discussion, and a similar compliment to the Chairman concluded the meeting.

SIR WILLIAM ARROL'S NEW MOTOR.

One of the most important proposals yet made with regard to tramway traction has been laid before the Glasgow Corporation. Sir William Arrol—the celebrated engineer—and Mr. George Johnstone, who are joint patentees of a new oil engine, have, through Messrs. Borland, King, and Shaw, writers, Glasgow, offered, within four months of acceptance, to equip any route in Glasgow with tramcars driven by mechanical power. This they are prepared to do at their own expense, on the express condition that, should the Corporation decide, at the end of two months' trial, that the cars are unsuitable for the purposes of the Corporation tramway system, they shall be withdrawn, and the community be in no way held responsible for the expenditure incurred, this being borne entirely by the promoters of the scheme. But the promoters anticipate an unequivocal success for their cars, and should their expectations be realised during the preliminary trials, they offer on behalf of their clients to equip every tramway route in Glasgow with cars driven by mechanical traction, and to run these for a period of seven years at a cost to the tramway department not exceeding what it at present pays for horse haulage. The cost of horse haulage is to be calculated on the basis of the past two years' working of the cars by the Corporation, which period admittedly was the cheapest on record for such a system. At the end of the seven years the promoters undertake to hand over to the Corporation as a free gift the whole of the cars, with their motors, in good working condition, and these latter to be held free of any charge for royalties which the patents owned by the promoters would entitle them to impose. As nearly as need be calculated for present purposes, horse haulage, without deducting anything for depreciation, costs the tramway department £100,000 per annum, so that, while Messrs. Borland, King, and Shaw's proposal practically amounts to offering to equip the city's tramway system with cars driven by a self-contained motor for nothing, the sum they would receive under the proposal would be in round figures something like £100,000 per annum for seven years.

Reporting on this offer, Mr. Young, the Corporation Tramway Manager, said :—"It is now about two years since we had communications from the same firm in connection with a forthcoming patent by the same inventor. These communications were quite as vague as the present one. Before the motor was produced or tested I was asked if I would entertain or recommend an agreement binding the Corporation to adopt the system, to some extent, in the event of a test being satisfactory. Of course, I did not see my way to do so. Facilities for testing the invention by conditionally using the rails were, however, frankly granted by the committee. The outcome was the Johnstone motor-car, which was, for a considerable time, tested in our Coplawhill Yard. It was afterwards tested on the city streets with members of the committee on board, and nothing has been said about it since. It is still standing in our premises at Dennistoun." In the present system the propelling power is kept secret, and one month's trial of the undivulged motor was to decide a contract for seven years. In his opinion the committee should not get mixed up in any speculative scheme of the kind, and more especially if it cannot be operated by men employed by themselves.

Acting on this report the Corporation declined to accede to the request made by Sir W. Arrol and his colleague.

THE SELF-PROPELLED TRAFFIC ASSOCIATION AND CANALS.

As briefly recorded in our last issue, an "extra session" of the Liverpool local branch of this Association was recently held under the presidency of Mr. H. P. Boulnois, the City engineer, when Mr. F. Willoughby read a paper entitled, "The Improved Method of utilising Canals for Traffic," with special reference to the canals of Lancashire and Yorkshire.

In the course of his remarks, Mr. Willoughby said it might appear out of place to introduce for consideration a subject so antiquated as canals, especially having regard to their financial condition and to the state of decay into which many of them appeared to be rapidly drifting, for, although some still yielded a dividend to their shareholders, others barely paid their management and working expenses, and some were actually derelict; but they must remember that before the railway era canals were very profitable undertakings and of great importance as a means of transport to the mercantile community, and the aim of his paper, he said, was to show how canals could now be so transformed and utilised as to meet the requirements of the age and to regain the popularity they formerly enjoyed. The cities and towns of Lancashire and Yorkshire were well supplied with transport accommodation by the several railways and canals passing through the district, and most of them had the advantages of both systems; but in consequence of the severe competition to which every trade and business in the country was now being subjected, a pressing demand had arisen for lower rates of carriage, which the railway companies appeared unwilling and the canal companies in their present state were quite unable to afford. He believed that one of the objects for which their association had been formed was to render some assistance in this direction, and he therefore ventured to bring to their notice the improved method of utilising canals for traffic, invented by Mr. Cook. He then enumerated the seven canals in direct communication between Liverpool and Manchester, and proceeded to point out the reasons for the failure of the present canal system, and afterwards explained the improved method of utilising canals for traffic. He said it was proposed to draw off the water from the long-distance canals, and lay down on the bed of them a standard main line of 4 feet 8½ inches gauge railway, constructed with stone foundations, timber sleepers, cast-iron chairs, and a single line of 90 lbs. to the yard steel rails, with gradients in the place of locks, retaining as waterways such portions as might be required to connect the rails with other canals which were not transformed, or with canalised or other rivers. A single line of rails, with sidings and turnouts, would be sufficient to transport ten times the amount of traffic at present carried over the canals, but there was ample room on all canals for a double line, which could be laid down when required. The essay also dealt exhaustively with the financial side of the question.

At the close of the address a discussion was carried on by Messrs. C. R. Dykes (Rochdale Canal Company), Maunsel C. Bannister, J. Walwyn White, A. Bromley Holmes, G. F. Ransome, A. Williams and E. Somerset (both of the Leeds and Liverpool Canal Company). The usual compliments to the reader of the address concluded the proceedings.

I 4

MR. J. E. TUKE ON OIL MOTORS.

MR. JAMES EDWARD TUKE, of Harrogate and Bradford, who has been recently exhibiting the Arnold motor-carriage in various parts of the country, last month delivered a lecture at the Keighley Drill Hall on horseless vehicles. Facilities were offered for a thorough inspection of the machine, and Mr. Tuke showed himself quite willing to explain the most minute details of construction and working. He also gave exhibitions of the car in motion, and negotiated the most difficult corners at a good speed without the slightest trouble. The front axle remains stationary and the steering wheels run on a pivot on the principle of the Olympia tricycle. The motor is driven by oil, and can be both started and stopped readily. It was remarked that the smell from oil so much complained of in connection with vehicles of this type was comparatively slight, notwithstanding the fact that the motor was running in a confined place. Mr. Tuke's lecture was given in a chatty style. He did not claim that the motor was perfect, not did he believe that it was a failure, but he pointed out that the vehicles were as yet in their infancy, just as bicycles were twenty years ago, only makers would have the not inconsiderable advantage of all those years of experience in the cycle trade. "Emancipation Day" had come before they were ready; makers had been caught napping, and the result was that at present they were not able to meet the demand which was springing up in various parts of the country. The lecturer traced, with the help of the lantern, the history of the motor from 1780, when a steam carriage plied about Paris, and he dwelt upon the barriers erected against its extension in this country by the law, owing partly to the antipathy of the railway companies and the ill-conceived objections of horse-breeders. He next discussed the relative advantages of steam and oil as a motive agency. He classed the principal advantages of steam as follows:—(1) Reduced vibration when the car was at a standstill; (2) the car was self-starting; and (3) elasticity of working. In regard to advantage No. 2, he said that to start the steam car they had simply to open the valve and the machine began, whereas with oil engines they had to set the fly-wheel and crank into swing position, with the cylinders filled with an explosive mixture of oil and air before they could secure the combustion necessary to get the first natural revolution of the fly-wheel. To set against the advantages of steam, they had the following advantages in the case of oil engines:—(1) Less mechanism and consequent less danger of the machine getting out of order; (2) less need of overhauling; (3) the simplicity of the oil engine would enable it to be driven by any person of ordinary intelligence, and would not require an engineer. Mr. Tuke dealt with several methods of ignition, and declared in favour of electricity, pointing out that the carriages would run 300 or 400 miles with one charge, and the cost of refilling the electric sparker would not be above 6*d*. Summing up, he said that for heavy work—such as vans carrying a couple of tons or omnibuses carrying 20 or 30 persons—he thought steam was desirable; but for light work—cars to carry 10 or 20 cwt., or to carry a small party—he had no doubt that the advantage was in favour of oil.

A COACHBUILDER ON THE FUTURE OF AUTOMOTORS.

A LARGELY-ATTENDED meeting of the Aberdeen Mechanical Society was held recently in Gordon's College, Aberdeen—Mr. Sproul, president, in the chair—when a paper on "Carriage Building" was given by Mr. Robert Shinnie, of Messrs. R. and J. Shinnie, coachbuilders.

MR. SHINNIE remarked that carriage-building included the construction of every kind of vehicle, from the luxurious Pullman car to the scarcely less important child's mail car, and had a passing glance at the motor-car movement. In dealing with carriage-building, he said they might well ask themselves where they stood. Were their past works about to become obsolete? Their present routine had received a sudden check, and large promises filled the air. If the eagerness with which the fulfilment of those promises was searched after, and if the anxious throb of expectancy raised with regard to gigantic horseless carriage and motor-car companies, with enormous wealth of money and possessions, were any true portents, the world was on the eve of changes vastly greater than occurred when railways were introduced. Meanwhile they might continue discussing the carriages with which they were familiar, and be ready to welcome the vehicles of the future—when they come (laughter and applause). Mr. Shinnie then noted that carriage-building grouped together a variety of diverse occupations or handicrafts, and these he enumerated in this order:—(1) Wood workers and "body" makers, (2) under-carriage makers, (3) wheelmakers, (4) blacksmiths, (5) trimmers, or workers in leather and cloth, (6) painters, (7) draughtsmen and designers. In addition to these, he observed that there are numerous auxiliary occupations concerned in the industry to meet the requirements of special makes of steel and iron, special timbers, fabrics in silk and cloth, fittings in silver, ivory, and other ornamental materials, colours, and varnishes, leathers of various kinds and colours, and he pointed out that the success of the finished article very largely depends on the skilful selection of the various materials of which the carriage is constructed. The lecturer proceeded to describe the various technical processes in carriage-building from the lithographed designs to the finished vehicle. After glancing briefly at the historical aspect of his subject, comparing the vehicles of the olden time with those of later days, Mr. Shinnie concluded with another reference to the motor-car, remarking that great improvements must necessarily take place in the present types, alike in the matters of gracefulness and weight, before they can become widely popular, but with development on these lines the carriage-building of the future may be conducted still more on the principles of true art and science.

In a discussion that followed the reading of the paper, the Chairman touched on these last points. It was his view that in seeking to attain the grace and lightness in the motor-carriage that were yet lacking, engineers and coachbuilders between them may effect such a structural change in the form of vehicles as to bring in a new type that shall be alike beautiful and useful. Very cordial thanks were awarded to Mr. Shinnie for his paper.

Tramway Motors for Light Railways.

THE Sydney Minister for Works has had a report from the Engineer-in-Chief for Railway Construction with regard to the utilisation of tram motors on light lines of railway. In view of the recent Light Railways Act the following *resumé* of that document will be of interest in this country:—It is intended to convert all the steam tramways to electric lines, and the use of the motors will of necessity be discontinued. It was Mr. Young's idea that the motors might afterwards be put on the pioneer railways. Mr. Deane points out that these tram engines have now to take in water every five or six miles. In the country, of course, such frequent stoppages would be an impossibility. To obviate the difficulty the motors would have to carry tenders holding a supply of water, and the weight of the tender with its burden would, as a consequence, have to be deducted from the haulage capacity of the motor. In a grade of 1 in 20 the motor carrying water enough for 10 miles and coke for 20 could haul 30 tons. With a tender carrying sufficient water and coke for a trip of 50 miles, the haulage would amount to 22 tons. For a grade of 1 in 50 the loads would be 85 tons and 77 tons respectively; for 1 in 80, 132 tons and 124 tons; for 1 in 100, 159 tons and 151 tons. While the motors can easily negotiate sharp curves, still, if curves such as there are about the city and suburbs were adopted in the country, the rolling stock, except the passenger carriages, would have to be specially built. Another drawback would be that a transfer of freight would be required when the main lines were reached.

MR. E. SHRAPNELL SMITH.

As hon. secretary of the Liverpool and District Centre of the Self-Propelled Traffic Association, Mr. Shrapnell Smith has been highly successful in his efforts to establish it on a firm basis. To quote Sir David Salomons on the occasion of his inaugural address at Liverpool, in October last:—"In Mr. Shrapnell Smith Lord Derby will find a clever, enthusiastic, and hard-working honorary secretary." He has been exceedingly energetic and tactful, while, judging only from the experienced manner in which he has worked, many who do not personally know him will be surprised to hear that he is not yet 22 years of age. Youth in his case has by no means been a disadvantage, and, judging from what he has done already at this early stage of his career, he should have a successful future in store for him.

Mr. Shrapnell Smith was educated at the Liverpool College (Modern School), St. John's College, near Preston, the Royal Institution School, and University College, Liverpool. When 16, as his father wished him to follow either electrical or chemical engineering, with a view to which he had been studying, he was apprenticed to the United Alkali Company (Ltd.), Liverpool, and has gone through their head offices and the Gaskell and Deacon's Works (Widnes) of this great Syndicate. At these works Mr. Smith is now stationed as assistant chemist and process manager.

The accounts of the Paris-Rouen race in 1894 led Mr. Smith to make an exhaustive examination of the early English records and exploits, which convinced him of the great possibilities of mechanical road-haulage, and when Sir David Salomons's now historic letter inviting communications appeared in the Press, he was one of the first to take advantage of this opportunity to join hands with those who were desirous of effecting the removal of the anomalous condition of things which then existed in this country. Attendance at the great meeting of December 10th, 1895, at the Cannon Street Hotel, when the Self-Propelled Traffic Association was formed, succeeded as a matter of course, and this was followed by an opportunity of enjoying Sir David's hospitality on the occasion of his entertaining the committees of the French and Belgian Automobile Clubs in July last.

On March the 2nd of last year Mr. Smith lectured in Liverpool on "Horseless Carriages and Motocycles; their History and Prospects," for which purpose he received much valuable help and the loan of slides from Sir David Salomons, Bart., Mr. W. Worby Beaumont, and Mr. J. H. Knight.

This lecture was the fourth or fifth out of London, but interest in Liverpool was so small that scarcely one hundred people were present, and the local Press allocated barely 20 lines to a report—a very different state of affairs to what obtained when he lectured at the Picton Lecture Hall eight months later.

The acceptance by Mr. Shrapnell Smith of the honorary local secretaryship of the Self-Propelled Traffic Association was delayed for some considerable time, on account of a projected visit to South America which was not concluded, and with the appointment his duties quickly increased. On September 9th of last year the first move of the Association was made in Liverpool, when Mr. Smith arranged for Mr. W. Worby Beaumont to go down there, under the auspices of the Self-Propelled Traffic Association, to address the Liverpool Incorporated Chamber of Commerce on the subject of "Motor Vehicles for Heavy Traffic." In taking steps to form a local council it was found that the objects of the Association readily commended themselves to all those who were invited to become members thereof, and, after several private interviews with the Right Hon. the Earl of Derby, on October 1st, 1896, a deputation formally waited upon the then Chief Magistrate of Liverpool and received his acceptance of the local presidentship.

Mr. Shrapnell Smith's idea of a programme for the local branch was to provide a series of papers on the various phases of the movement, and to arrange for an exhibition of modern self-propelled vehicles at the earliest date, when a variety of types might be hoped for. The former has been successfully carried out, and the latter rests with his Council. All the work, so far, has been carried on with encouraging signs of public interest.

In order to carry out the heavy detail work of his office Mr. Smith has had "to burn the midnight oil" by no means unfrequently, for all his secretarial duties have been discharged single-handed, and in no case has his "hobby" been allowed to interfere with the due performance of his engagements in the chemical trade. In the course of our interview with Mr. Shrapnell Smith, he said:—"At present, my interest in the matter is entirely scientific; from the first indication, the revival of road locomotion has exercised a peculiarly fascinating influence over me, and I was unable to refrain from identifying myself with the pioneer work in some capacity." We also gathered that the humanitarian aspect appeals very forcibly in Mr. Smith's case, and his sympathy in the matter is undoubtedly intensified by the exceptionally hilly nature of the Liverpool streets.

Mr. Shrapnell Smith is to be heartily congratulated on the excellent results which have attended his efforts; while the Council of the Association could hardly have found a gentleman more fitted in every way for the position which he so admirably occupies. Before accepting the post, we understand that he gave a written undertaking to the Association that he would not invest in or accept any commissions from motor-car companies. This is a very desirable guarantee, in that he is enabled to appear in public without fear or favour, but it need not preclude his one day becoming a leading spirit in some of the numerous large carrying undertakings that are likely to come into existence for the establishment of traffic routes between centres of commerce. We venture to assert that he would prove a great acquisition to any such enterprise.

MOTOR WATER-CARTS.

THE following notice of motion has been given by Mr. G. Yarrow Baldock for consideration at the next meeting of the Hackney Vestry:—"That, in consideration of the large and continually increasing amounts paid by this Vestry for horse-hire and cartage, and with a view to facilitate the work of 'slopping and dusting' being undertaken entirely by the Vestry without the intervention of a contractor, it be referred to the General Purposes Committee and to the Sanitary Committee jointly to report as early as may be:—(a) As to the practicability and possible economy of employing for the purposes of the Vestry carts and vans driven by electric or other automatic motors; (b) As to the advisability of fitting suitable motors to the water-carts and other vehicles at present the property of the Vestry; (c) As to the advisability of the purchase by the Vestry for experimental purposes of a motor-van or vans of the most approved pattern designed for the collection of refuse and scavenging. And further, that the said joint committee be and is hereby authorised to obtain all such necessary estimates, plans, drawings, and specifications as will enable the fullest possible information (specially as to the probable capital outlay and cost of maintenance) being embodied in the report for the guidance of the Vestry."

TRAMCAR PROPELLED BY HOT AIR.

IN view of the prominence which the question of street locomotion has assumed, a description of the motor-car which Mr. James Murrie, consulting engineer, 264, St. Vincent Street, Glasgow, has laid before the local Corporation Tramway Committee will be read with interest. The motive power is compressed hot air, which is compressed at a station by a gas-engine to a pressure of 2,000 lbs. per square inch. When heated it is stored in accumulators consisting of nests of solid drawn steel tubing, enveloped by a fluid maintained at a temperature of 800 degrees. Each station is placed as near a tramway terminus as possible, and the hot air is conveyed from the accumulators through small flexible metallic tubes to a pillar on the street. The car having been drawn up opposite this pillar, the end of the tube is attached to another coupling on the car, and the reservoir of the latter is charged, and the tube disconnected in less than half a minute. In cases where it is inconvenient to have fixed stations, the generating appliance may be erected on carriages which, having been charged, are run along the tramway rails to the motor-car into which the hot air is transmitted through coupled tubes resembling those used in connection with the Westinghouse brake on railway trains. The reservoir underneath the car consists of several solid drawn, mild steel tubes encased in asbestos with an outer metallic jacket. One of these reservoirs will store sufficient air to propel the car for eight miles, or, by adding to the weight, a reservoir can be made to contain enough to propel the car for 24 miles. The motor, which is fitted below the car, consists of six cylinders, each operating on an axle crank set at an angle of 60 degrees to its neighbour. It will propel the car in either direction, and works up to 25 indicated horse-power. The motor is arranged to act as an air compressor, and when the action is reversed it serves as a brake, energy being stored in descending a hill or in stopping. The car starts gently. A small independent motor coupled to a dynamo supplies the current to four 20-candle electric lights at an estimated total cost of a penny per hour. In front of the wheels at each end of the car is a revolving life guard. A dial in the interior of the car automatically shows the route and the streets that are being traversed. The tickets are stamped automatically with the names of the streets at which the passenger enters or leaves the car, so that the conductor does not require to leave the platform where he receives the fares from the passengers as they leave. Three brakes are attached to the car—the motor, a modified Westinghouse, and a lever brake. The weight of motors, reservoirs, &c., average 18 cwt. per car for a run of eight miles, or 28 cwt. for a run of 24 miles. Mr. Murrie estimates that the cost of running such a car will range from 1¼*d.* to 2*d.* per mile, according to the type of engine used at the station, these sums including all charges for energy, such as fuel, repairing of motors, depreciation, wages at stations and insurance, but making no allowance for management.

ROYALTY AND THE NEW INDUSTRY.

To Mr. Hugh Inglos, who is a son of General Inglos and a connection of Lord St. Oswald, is due the credit of introducing motor-carriages to Royalty. This event took place at a house party given by Lady Sheffield, when H.R.H. the Duke of Cambridge, K.G., availed himself of the opportunity of indulging in a drive in a carriage smartly driven by Mr. H. Inglos. The motor was an oil one of a modified Daimler type. Subsequently at Doncaster Mr. Hugh Inglos—who is interested in the Omnium Supply Company—gave a lecture on the horseless carriage, in the course of which he alluded to its many advantages, stating that it took up no stable room, and would run from 50 to 100 miles with one charge of fluid, and would attain a speed of from 12 to 30 miles an hour with ease, and continue it night and day. Motors could be made to any necessary horse-power, and could be fitted with specially constructed pneumatic tyres on the latest improved silencing systems; any part could be renewed at any time, and vehicles could be run either slow, half speed, or full speed, and could be replaced at once; and any youth could drive them with absolute safety. Compared with horses and carriages the motor-carriage was cheaper both in cost and maintenance, and he looked to the day when the farmer would have his own light railway, practically, and would go to market and back again, and send his produce with ease and economy. If wanted expeditiously, no time was lost in looking for the groom or harnessing the horse; a match was simply struck, and the auto-carriage began to move. To medical men he could conceive no greater boon, and how handy it was for running to and from the station with passengers and luggage? France and America had for some time been in the field in the making of these cars, but England was only just beginning to develop its strength. He further dwelt upon the various motive powers used—steam, oil, and electricity, and he said that he believed, and his own opinion was, that steam, notwithstanding its present disadvantages in the weight of machinery and so forth, would eventually hold its own, but, at present, steam was not nearly so suitable as oil or electricity. Electricity had the disadvantage of the weight of the accumulators, and oil practically was the best motor they possessed at the present moment. There was also compressed air, but this, so far, had proved unsuitable for the purpose. He remarked that there were various kinds of oil engines, and described the many valuable patents which were essential to the building of good oil engines, and, in conclusion, he expressed his strong conviction that English engineers, who could still build the best ships and the best locomotive engines, would hold their own in building the best and most economical motor-cars.

NOTES OF THE MONTH.

EXCITEMENT was recently caused in Oxford Street by tho taking fire of a motor-car which was proceeding along the street. The driver on discovering the mishap specdily brought the car to a standstill alongside the pavement. A cry of "Fire!" was raised, and a large crowd rapidly gathered ronnd the vehicle and assisted in extinguishing the flames.

QUEEN CHRISTINA of Spain is the only Sovereign who possesses an automotor. The carriage, which has been on view in London for some time, has now been forwarded to the Royal lady.

THE Tramway Committee of the Glasgow Corporation have agreed to postpone for a month consideration of the report by the general manager and his engineer in regard to the various tramway motors in use in American cities which they had visited.

THE Fifeshire County Council are not satisfied with the Scotch regulations for motor-carriages—although they are already more stringent than those in vogue in England. The alterations which they seek are as follows:—

Art II.—(2) That on roads under 16 feet wide, the width of light locomotives allowed to travel thereon be not above 4 feet 9 inches. That no light locomotive be allowed on any road under 13 feet in width. (3) That the width of tyre be made to correspond to the weight of a light locomotive when loaded. (6) That there be shown on each locomotive weighing 1½ tons or upwards, the weight of the locomotive unladen, and the maximum weight which it is to be allowed to carry or draw. (9) That there be two lamps, one on each side of each locomotive. Further, that provision be made that the person in charge of a light locomotive shall be not less than 18 years of age, and shall be certified as qualified to be in charge of light locomotives.

PARIS, like London, has been visited with a motor-carriage fire. It was five o'clock and just dark on a December night, when a sudden fire broke out in the middle of the street, flames shooting up to the second floor of the houses. People came running up from all sides, and a couple of minutes later the fire-engines appeared upon the scene and played their hoses on a burning motor-carriage. The reservoir, containing six gallons of oil, had caught fire, setting aflame the woodwork. The carriage, or rather van, belonged to a bootmaker of the Boulevard des Italiens, but the boots were cleared out in time.

THAT fearful and wonderful invention, the Keeley motor, is once more to the fore. Apergy is, we are told by an American correspondent, the name of the "force" claimed for the motor. It is thus defined:—"It is obtained by simply blending negative and positive electricity with electricity of the third element or state, and by charging a body sufficiently with this fluid, gravitation is partly reversed, and the earth repels the body with the same or greater power than that with which it formerly attracted it, so that it may be caused to move away into space." Tho beauty of the explanations as to the Keeley motor is that they are all so simple and so beautifully clear that anyone—even the most unscientific—can understand them at a glance. When will that motor work?

THE Hon. Chas. Rolls, youngest son of Lord Llangattock, the Hendre, Monmouth, has been perambulating the country during the holidays with his Peugeot motor-phaeton, which we illustrated in onr last issue. He made an exceptionally good journey from Gloucester to Ross, which compensated him for his disappointment in not being able to take part in the historical trip to Brighton.

M. LÉPINE, Prefect of Police, is a convert to the practical utility of the automobile. He has written to the Paris Municipal Council asking permission to take from the money at his disposal about £140 for the purchase of a machine worked by petroleum for the traction of a fire-engine, ladders, and so forth, and for the conveyance of the necessary staff of pompiers. If the experiment prove successful, as is anticipated, horses will eventually be entirely replaced by automobiles in the firo brigade. This is a very significant move, and it speaks volumes for the progress which is being achieved on the Continent.

ABOUT £100 damage was done by firo recently in the office of Mr. Georgo Johnstone, Hope Street, Glasgow. There were some patented drawings of motor-cars in the office which were, fortunately, saved from destruction.

THE new electrical system of tramways now in course of construction in Leeds is to be ready for the use of the public by Whitsuntide.

THE Corporation of Halifax have lodged a Private Bill empowering the authority to construct motor tramways. They ask for powers to work the system themselves, and to charge a passenger fare at the rate of a penny per mile or fraction of a mile. They also seek authority to use the tramways for sanitary purposes, "and for the conveyance of scavenging stuffs, road metal, and other materials required for the works of the Corporation free of all tolls and charges in respect of such use." Officers of the Corporation when on duty are to be carried free of charge, fares are not to be raised on Sundays and holidays, and borrowing powers for the purposes of the Act, to the extent of £20,000, are taken.

THE Neath Corporation seek Parliamentary powers to work all tramways within their jurisdiction.

THE Huddersfield Town Council have adopted similar resolutions—so that the day of the promoter in the provinces seems to be waning.

PERTH tramways have been a great success, and the directors have a substantial balance after allowing for dividend.

K 2

WE are very pleased to hear that the young girl Dyer, who was injured by being knocked down by a motor-car at Crawley during the motor-car parade last November, has been discharged from Crawley Hospital qnite recovered from the mishap.

IN a recent issne we commented upon Mrs. Wood's invention of a motor-horse. But as this idea comes from the opposite sex, we allow our contemporary, *Woman*, to supply a further commentary upon it :—

Women, it has often been said, seldom excel in the business of original creation or invention, for their faculties are chiefly imitative and not inventive, bnt the lady who will shortly exhibit a remarkable patent at the Crystal Palace proves that even a woman's brain is occasioually capable of flights of mechanical and inventive genius. The invention is a petroleum motor in the shape of a horse, which can be attached to any vehicle and be controlled by a driver from the box-seat of the carriage or ridden as an ordinary steed. A small waste-pipe is run under the carriage to the rear, where all the vapour and smoke is given off, thus saving all inconvenience to the passengers from that source. The inventor of this motor-horse is Mrs. Wood, of Mitcham, and she claims by it to have appropriated all the advautages of the motor-carriages, which will so soon be seen in our streets, without any of their numerous disadvantages. I shall be interested to seo this invention, but it is to be hoped that Mrs. Wood has not really attempted to imitate the outward form of the horse. The result of such a proceeding could only be comic.

Woman is, of course, illogioal. Take away tho "outward form of the horse" and what remains of the novelty? Surely onr friend from Mitcham conld not be expected to design an ordinary traction-engine!

THE members of the Cardiff Conuty Conncil have been for some time past almost equally divided in their opinion as to how the tramway lines should be owned. As a natural consequence, debates have been many while the decisions were bnt few. At last, however, they have come to a resolution, which runs as follows :—

That the Corporation buy the lines and depôts for £61,500; that they lease them to the Company for 15 years at a rental of 5½ per cent. of the purchase money; and that the existing lines be made equal to new at the cost of the Company, that the lines be doubled where necessary and convenient, that the fares be not raised, that the Company introduce electrical or any other mechanical traction when desired by the Corporation, and that all extensions and newly constructed lines be rented on the basis of 5½ per cent.

THERE have been somo convictions during the month for furious driving, more particularly in the Midlands. When, however, a policeman or anyone else swears that a speed of 20 miles an hour has been exceeded, it by no means follows that it has. We should like to take X 2410 along a country road on a frosty day at 10 miles an hour and ask him for his estimated rate of running—the probabilities are that he would state a record-breaking pace.

IN fact, there is nothing so hard to estimate as the speed of a passing vehicle when it travels at anything over nine miles an honr. Let half a dozen men, taken at haphazard, stand at a corner and see a carriage driven by at top speed, and we will venture a fairly heavy wager that if they state their honest opinions they shall differ in their opinions as to the rate of progress by nearly 25 per cent., while the lowest figure mentioned will in nearly every case be higher than that at which the vehicle is moving.

WHEN the time comes for revising the law, driving to the danger of the public mnst be the factor which is to determine a man's guilt or innocence and not any presumption as to the actual speed at which one progresses.

MENTION of the fact that motor-cars are prohibited from passing np or down the Long Walk in Windsor Park has already been made. A further notice has been posted to the following effect:—"Motor-carriages and other locomotives are not allowed on the private roads in the Park."

ANY Corporation which may contemplate taking over the undertaking of a tramway or other company, &c., within its borongh bonndaries, will do well to follow the prndent example of Sheffield. The Corporation of that town have managed to come to a private agreement with the Tramways Company to purchase the whole of their undertaking for £27,500, and when it is known that the original demand of the company was £31,000, and the original offer of the Council £27,000, it must be admitted that the latter have made a very good bargain. Speaking from the point of view of public bodies, and consequently of the ratepayers, we may say that it is decidedly the best policy in such matters to arrive at a compromise without arbitration.

THE Streets Committee of the Middlesborough Corporation have appointed a committee to meet and consult with their neighbours—the Councils of Thornaby and Stockton—as to the conditions npon which electric tramways are to be jointly allowed in the districts mentioned.

"ANECDOTES" is responsible for a statement that a qnick-firing gun which can discharge 700 rounds a minute and travel 45 miles an hour has been perfected, and is in truth a reality of war. The writer continues:—"The effect of 50 or 100 of these machines of war charging into a large body of troops, or run through a city at a high rate of speed, firing their deadly missiles on the inhabitants as they rushed through, can readily be imagined." Well, yes, Jules Verne has long ago imagined all this—bnt when will the reality come? It is easy to edit a newspaper of the popnlar *Bits* order. One has only to describe an absolnte achievement of the apparently impossible and the trick is done.

AS reported elsewhere, the Glasgow Corporation have considered the proposal of Sir William Arrol and Mr. George Johnstone to eqnip, free of cost, a section of their tramway system for the demonstration of the Johnstone motor-car. The proposal was rejected, and the Corporation adhered to their decision to give a fair trial to any motor which may be exhibited for inspection, and, generally, to give all inventors reasonable facilities to do so. It was also resolved that Mr. Young's report on his American investigations should be circulated.

ALTOGETHER 11 applications have been made to the Light Railway Commissioners from the promoters of light railway schemes throughout the country, and preparations will be at once made by the Commissioners for considering them.

IN order to carry out an improved system of electrical working, the South Staffordshire Tramways Company is to be reconstructed. A sum of £140,000 is to be raised on 4½ per cent. debentures, while the interest on the preference shares is to be reduced to five per cent. The charges thus created will amount to £10,600 per annum.

WE learn, on the authority of such a competent judge as Lord Lonsdale, that motor-cars are not likely to interfere with coaching as a form of sport. Some day, he says, motor-cars may replace omnibuses, vans, drays, and carts, though he holds the opinion that enormous improvements will have to be effected before the new vehicles can do that; but he confidently says that "they will never oust the carriages and traps in general, except in the way of night work in London, or heavy work in the country." Asked to give a reason for his confidence, Lord Lonsdale replied: "Well, just for the same reason that men do not go grouse-shooting with Maxim guns—because there is no sport in the other thing."

THE introduction of the motor-car into Wales was marked by an unfortunate but unavoidable accident. One of Thornycroft's horseless carriages had been purchased for conveying ship's stores, &c., from Cardiff to Barry Dock, and was brought by road from London. When near Cardiff Infirmary Mr. W. Duncan, the secretary to the purchasing company, in attempting to remount the car while in motion, slipped, and before the carriage could be stopped, had one of his big toes crushed, and amputation was necessary.

THE New York Post Office authorities believe that horseless wagons will prove cheaper and more expeditious than the vans at present in use. Their success in this respect has been demonstrated elsewhere, and it is expected that ere long the new vehicles will entirely displace the old-fashioned horse-drawn Post Office vans. The chief advantage claimed for the motor-car is that it runs so smoothly in the streets and roads that the letters and other mail matter can be sorted and stamped in transit, as in a travelling Post Office on the railway. In this way the mails can be taken from the points of collection direct to the train; and thus a considerable amount of time is saved. For parcel post purposes, in this country, horse vans, in some places around London especially, are utilised instead of the railway during the night. Should the American experiment of road and street sorting motor-carriages prove successful, we may by-and-bye see them introduced into England.

THE Bradford Corporation have deposited in the Private Bill Office of the House of Commons for consideration during the ensuing session a "Tramways and Improvement" Bill. The measure will give the Corporation power to raise money for the purpose of constructing tramways—£83,050—and will enable them to work the tramways themselves or by their lessees, and to use steam locomotive, cable, electric, or other mechanical power.

THE Company which has recently laid down in New York an improved underground trolley conduit for working their electrical tramway system is, as might be expected, in difficulties, owing to the cold weather and snowstorms which have recently prevailed in America. The engineers concerned, however, say they are confident that they can keep the conduits clear. It is well for us that the experiment should be tried in the States; for if they can ever, which is more than doubtful, get an underground system of electric mains for tramway purposes which will work satisfactorily in all weathers it would soon be universally adopted in this country. Of course, always premising that the cost is kept within reasonable limits.

THE Blackburn Corporation have agreed to renew the lease of the local Tramways Company on their substituting electric for horse traction on two of their three routes. The Corporation will supply the Company with electricity at the price of 2½*d.* per unit up to 140,000 units, and 2*d.* per unit above that quantity, and will provide overhead wires and poles, the Company to maintain their own motors and electrical plant.

AN ingenious excuse was recently made by a West Ham farrier for neglecting to maintain his wife and family. He said that since he saw a motor-car he had not the heart to shoe any more horses. The Bench thought he was suffering from that species of "motor-ataxy" which ordinary people call laziness, and sent him for a month to a place where exercise on the treadmill has usually an exhilarating effect.

THE Sale District Council have decided to oppose the tramway scheme of the Manchester Carriage and Tramways Company, solely on the ground that the proposed overhead electrical wire system is unsightly, and objectionable in many other respects.

THE officials of the London Road-Car Company enjoyed a very successful dinner on the 7th inst. Of course the subject of motor-carriages could not be kept out of the speeches, and while regretting the "loss of their fellow four-footed labourers"—as some present called them—they were all ready to welcome any improvements which might be brought forward.

OUR cab strike can hardly be said to have produced much of a revolution in London locomotion. But in New York they are just at the expectant stage at which we were some two or three months ago. The New Yorkers are also indulging in the luxury of a cab strike. It is a more formidable affair in the land of freedom than in London. There the striker pulls out his revolver and shoots at sight.

THE SERPOLLET STEAM SYSTEM OF MOTORS.

A DEPUTATION from the Aberdeen Town Council recently came to London for the purpose of inspecting motor-carriages, with the object of recommending to their colleagues which system would be most suitable for the purposes of the Board. As a powerful vehicle capable of carrying some 20 persons to and from the beach is required in Aberdeen, none of the oil motor-driven vehicles were in any way suited to their wants, but conducted by Mr. G. Hopkins, of Parliament Street, and Mr. Julius Harvey, of Queen Victoria Street, to the Serpollet depôt at Willesden, they there saw two diverse vehicles which enabled them to thoroughly test the merits of the steam-carriage. One was a small vehicle like a phaeton to hold four persons, and the other was a large tramcar to carry 50 passengers.

As it is understood that the members of the deputation reported favourably on steam, as represented by M. Serpollet's invention, we quote as follows from the statement of one of the representatives. He writes:—

"We had not many minutes to wait until Mr. Cust, the engineer, representing M. Serpollet, announced that he was ready to demonstrate the capabilities of the tramcar. In the rails leading out of the shed there is an awkward double curve like the letter 'S,' and it was a point of interest with the

FIG. 1.

deputation to observe how the car would negotiate the curve. As a matter of fact, it turned easily, if not elegantly, and was promptly switched on to a private line extending for about 200 yards along the side of the commodious premises. The visitors having entered the vehicle, it glided down a slight gradient to the end of the line at the rate of about five miles an hour. On reaching the bottom, the engines were immediately reversed, and the car made its way back again, climbing the hill with no apparent effort. The journey was repeated again and again, more power being applied at every fresh start until a speed of about 10 miles an hour was attained. There was very little noise, and no smell. The use of coke prevents smoke, and the steam escapes as if by stealth.

"The car, which was built a few months ago, was for some time in use on the streets of Paris before being taken to London for exhibition purposes. Although the vehicle we saw differs in many respects from the sort which would be suitable for traffic in Aberdeen, a brief description of it may be interesting. It is built to accommodate 20 persons inside, 24 on the top, and six on the front platform, the outside passengers being protected from rain by a roof. The front of the tram resembles an ordinary car, except that six seats are placed under a kind of verandah. At the back are the appliances for driving and regulating the car. Here may be seen the furnace, the automatic oil pump, the handles by which the motive power is applied, and, in short, all the paraphernalia of a locomotive on a small scale. There is room at the back for only one man to attend to all the functions of regulating and driving, while the conductor is placed on the front platform. The boiler consists of a group of tubes so arranged that the heat of the furnace can play freely round them. Water, injected by means of a powerful hand-pump, is immediately converted into steam, and it is one of the features of the Serpollet system that an increase of several horse-power can be obtained in an instant by one or two strokes of the hand-pump. The advantage of this is evident. When a vehicle reaches a hill or a road along which travelling is heavy, additional power is required, and the use of the hand-pump in the case of a Serpollet car has been described as analogous to an application of the whip in the case of horses.

FIG. 2.

Another material advantage claimed for the Serpollet boiler is that it cannot burst. The tubes are filled, not with water, but with steam merely, and, in the case of a negligent driver allowing the tubes to be overheated, all that can occur is an escape of steam and a stoppage of the car for the time being. The engine—a very powerful-looking little thing—is subtly concealed between the two pairs of wheels. Motive power is applied to the running wheels by a series of cogged wheels, the pistons and connecting-rods so conspicuous in a locomotive being absent here. Were it not for the compartment at the back of the car, and a suggestion of unusual solidarity, there would be difficulty in distinguishing it from the ordinary tramcars we see on the streets every day."

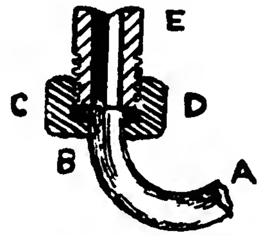


FIG. 3.

Apropos of this visit, and of the favourable comments made by Sir David Salomons as to the future prospects of steam as represented by the Serpollet boiler, we append a few illustrations showing the details of tubes and some views of carriages which have been recently constructed in France. We have received so many queries from correspondents on this subject that we are pleased to have an opportunity of affording the information which we have been repeatedly asked for.

Fig. 1 shows a section of the form of tube which has been adopted after several trials. It is made out of steel tube, the slit in the centre being all the water or steam space which is provided, so that it has an enormous reserve of strength. The boiler is, in fact, constructed on the principle of a practically instantaneous conversion of the water supply into steam of the pressure required—the supply of water being automatically supplied as steam is used in the cylinders. These tubes are coupled up as shown in Fig. 2, while Fig. 3 shows in detail the method in which the joints are made.

The combination of stamped sections of the shape shown in Fig. 1 and the drawn tubes of the joint marked A in Fig. 3 are arranged in the fire-box, so that only the stamped section is exposed to the full force of the hot gases; the tubes A are only subjected to much lower heat; while the threaded ends, E, are altogether outside of the fire-box. In this way great safety and strength-pressures of 1,500 lbs. and upwards have been frequently applied at very high temperatures without any distortion of the tubes. This has been demonstrated repeatedly, and an instance may be given: — One of the extremities of an element (an element being the group of tubes shown in Fig. 2) was closed, and the other was connected with a test pump. When the element had been heated in a forge fire to a temperature of from 780° F. to 900° F. water was injected into it at varying pressures up to 3,000 lbs. without any perceptible distortion. In practice the Controle des Mines of France certify these tubes as safe at 1,500 lbs., and this is done by virtue of a Ministerial order issued after an elaborate series of experiments in 1888. It will be readily seen that the tube elements, as they are called, can be readily grouped in prism arrangements, so that they can be used as horse-power varying between two horse-power and 50. One enormous advantage of the thickness of tubes used—besides that of safety—is that a considerable amount of heat is stored in the tubes, and this is taken up by the cold water as it is pumped in. If they were thin in section the great disparity in temperatures would soon lead to a disruption in shape from this cause alone, without any reference to the poor efficiency which would ensue. With regard to the general details of the Serpollet engine and carriage, we hold these over until we have an opportunity of illustrating and describing in detail a new carriage which is about to be placed on the market. In the meantime, however, we avail ourselves of the courtesy of Mr. A. R. Sennett, who has lent us blocks with which we illustrate, on this page, various forms of Serpollet steam carriages, which may be taken as types of those hitherto introduced by the maker. We may mention that these views will appear in a book which will be shortly published by Messrs. Whittaker and Co., entitled "Horseless Road Locomotion: its History and Modern Development." This work is from Mr. Sennett's pen, and from the advance proofs which we have had an opportunity of examining, we can safely state that this volume will become one of the standard authorities on motor matters.

COACHMAKERS and MOTOR-CARRIAGES.

The annual social gathering of Messrs. Atkinson and Philipson's *employés*, their wives and friends, to the number of nearly 200, took place at Newcastle-on-Tyne on New Year's Eve. At the concert which succeeded the tea, Mr. John Philipson presided, and presented the prizes to the deserving apprentices. He remarked that it was the 38th anniversary of the first presentation, and he believed his system had the desired effect, in encouraging improvement in work and the habit of punctuality. The motor-carriage would take a certain place on the roads which were now open to it, but he did not think it would interfere to any marked extent with the manufacture of English pleasure carriages and of harness. Motor-carriage building would be a distinct branch, and he hoped shortly to have a wing of their manufactory devoted to the purpose. The greatest caution was necessary in the selection of a motor, as, up to the present time, the engines were far from perfect; but he and his sons were working and watching carefully, so that they might, at the earliest possible moment, be able to offer something reliable to the public. This, he believed, was the best way to keep the industry in their hands, as the coachmaker, owing to his special knowledge of carriage construction and suspension, was the proper and most capable person to produce a carriage which would work without noise or vibration, and would run smoothly, and be comfortable and durable. The concert was followed by a dance, in which Messrs. William and John Philipson, junr., took part.

Motor Vehicles to Convey Produce in Queen's County.

Some further particulars are to hand as to a service of automotor vehicles which will be shortly established in the southern portion of Queen's County. It is proposed to run vehicles both for goods and passenger traffic from Johnstown, in the county Kilkenny, to Ballybrophy Station, calling at Rathdowney and continuing to Borris-in-Ossory. The district is an important one for grain and green crops, and there is almost a continual line of heavy vans on the roads in the harvest time conveying the produce to the Ballybrophy Station. It is also an important line for cattle conveyance. Nearly all the young cattle brought up to the Queen's County for fattening come from the south and west portions of Limerick County and from Kerry. They are nearly all discharged at the Ballybrophy Station, and after a large fair in either of these counties the roads round Ballybrophy are studded with lots of cattle for the different graziers living about. A great many of the cattle have from time to time to be brought from the station to their destination on cars and carts. The motor-cars will be fitted up for the purpose of taking over that traffic also as well as the conveyance of sheep and swine.

The country which the new service will open up is a rich and important one. There has been almost a continual movement amongst the people there for a railway line through it. The proposal to run motors for the light traffic of the district has given a great deal of satisfaction in the locality. The project originated with a wealthy resident in the neighbourhood of Johnstown, with whose name more than one enterprise in the district is associated.

The Fifth Avenue Stage Company has, says Dalziel, ordered one hundred motor 'buses, of 20 horse-power each, and expects to have them running in a few months.

BUSINESS NOTES.

Cardiff Adopts Motors.

The South Wales Motor-Car and Cycle Company (Limited), has been registered with a capital of £5,000 in 1,000 £5 shares, and the whole of the shares issued have been taken up by merchants, shippers, and traders connected with the Cardiff Docks. The directorate consists of Mr. E. L. Downing, Captain Hamilton Murrell, Mr. T. R. Thomas, Mr. R. T. Duncan, and Mr. H. Thomas. The headquarters of the Company will be 119, Bute Road, Cardiff. The premises are now undergoing extensive alteration, and will soon contain a varied assortment of motors and cycles. The Company's engineer submitted an exhaustive report on the different types of motors, and in the first instance recommended the purchase of a steam motor van, steam being the best and most easily managed motive power known up to date. The Company adopted the recommendation, and forthwith placed an order for a steam motor-van with the Steam Carriage and Wagon Company (Limited).

The type of van built at the Chiswick works is well known, as we have fully described and illustrated it in our columns, especially in our last issue. The van was run down to Cardiff by road, the distance traversed being 158 miles, while the total time under steam on the journey was 25 hours—the load carried being about half a ton. The roads between London and Oxford were in very bad condition, being up for at least one-third of the distance. From Oxford the second day's journey was on rather better roads, while the last run from Gloucester through Chepstow to Newport and Cardiff was over very hilly roads, but every acclivity was successfully climbed. Not the slightest stoppage was necessary on the way for either adjustment or repair, and the van arrived at Cardiff in as good a condition as it was in when it left Chiswick.

The new van will not be a mere advertisement, but will have to earn its own living. It will be a familiar object about the docks collecting and delivering, and when convenient making trips to Newport and Barry on the same mission. A large amount of work has already been promised for the van by shareholders, who calculate upon effecting a great saving over the present system in vogue. It will be decidedly interesting to watch the outcome of the experiment, which may lead to an extensive industrial development in the district.

We have recently had an opportunity of minutely inspecting and testing the driving chains manufactured by Messrs. Brampton Bros., of the Oliver Street Works, Birmingham. It is rather late in the day to testify to the excellence of finish which this firm have achieved in their products, but the exquisite finish of their manufactures and the consistent strength which is maintained by them in all their varied output are worthy of the highest praise which can be given. In their own speciality they are without rivals.

Motor-Cars in the Isle of Man.

In view of the fact that the Imperial Parliament has passed a Bill authorising the use upon certain roads of motor-cars, there has been introduced into the Manx Legislature, at the instance of Mr. James Mylchreest, who represents Castletown in the House of Keys, a Bill to legalise the use of light locomotives, not to exceed in weight four tons, and so constructed that no smoke or visible vapour is emitted therefrom. Fourteen miles is fixed as the maximum speed of travel along public highways. It is provided that yearly duties shall be charged. After some discussion the Bill was adopted by 14 votes to four.

AN INTERVIEW WITH MR. McKIM.

His £5,000 Challenge, and Opinions on Motor-Vehicle Matters generally.

In our last issue we announced the fact that Mr. J. L. McKim, of 81, Cannon Street, E.C., had challenged the Motor-Car Club generally, and its president particularly, to a contest, offering to back the Duryea Car, in which he is interested, against any other four-wheeled vehicle of equal horse-power for the sum of £5,000.

Nothing having come of this (as the authorities at Holborn Viaduct elected to stand down), a representative of ours recently waited on Mr. McKim to ascertain how matters stood, and to gather his opinions in general on motor affairs.

After some difficulty an appointment was obtained with Mr. McKim, in his handsome offices, which are noteworthy as an example of furnishing in the most tasteful of American styles—everything that can secure comfort to the visitor, and at the same time facilitate the rapid transaction of the work in hand, having been studied in the arrangements, which *en passant* are models of what the surroundings of a high-class business establishment should be to-day. The door having been locked to keep out for ten minutes the thousand and one applicants for admission to the presence of a successful organiser of commercial undertakings, our representative at once asked Mr. McKim whether he had heard anything more from the Motor-Car Club as to his challenge. To this he replied:—

"No; and the most peculiar part of the transaction is, that while the secretary of the Club tried to obscure the real issue by asserting that speed trials are not allowed in this country, he was at the same moment sending letters to the Press offering a prize of £2,000 for a Motor-Car Derby, and a special prize for the vehicle which could accomplish a mile in one minute. I cordially agree with The Automotor—the opinions of which I like as much as I dislike its title—that speed is by no means the only, or even the chief, test of a motor vehicle, and that such a competition as proposed by the Club could only, if carried out, bring the industry into contempt and discredit."

"Your aim then was?"

"Simply this. I believe—in fact, I know—that the Duryea, judged by all the practical points which will appeal to the engineer and the commercial man, is a long way ahead of any other motor-vehicle, and I wished to prove that by an open challenge to the President and all other members of the Motor-Car Club to run it against any other vehicle over a course sufficiently long and varied to settle the matter and for a stake large enough to make it worth the winning."

"Nothing has come of your offer?"

"No, and I do not think Mr. Lawson could take it up—if he did, defeat for him would be certain, and he is hardly likely to risk another Waterloo just at present. At any rate, I think the honours remain with me by forfeit."

"Well, as I cannot make 'copy' out of a contest which is not likely to take place, will you tell me something of your connection with the vehicles in which we are both concerned and of which my readers would learn all that can be known?"

"My interest in the motor-car industry first received birth during a conversation which I had many, many years ago—almost more than I care to remember—with the inventor of Perkins's steam boiler, which, by the way, was the father of all those made recently for very rapid evaporation, and the engineering world is to-day perhaps hardly aware how energetically Perkins followed out his system and how fully it has been copied by others. Since then, of course, the conditions of English law made it impossible for anyone to carry out very full experiments in public, and it was not until French and American engineers, being somewhat more free from grandmotherly legislation in this direction, turned their attention to applying mechanical motion to street traction that the matter became a fixed idea in my mind that the time would come when this country would have opportunities of handling motor-cars with freedom; hence, during the last five years, either personally or through my agents and correspondents, I have visited all the motor-engine works in Europe and America, where the power employed was either gas, oil, or electricity."

"And, as a result, what do you think is the most suitable type of motor for general highway work?"

"I scarcely know how to reply to your inquiry as to what I think the best motor for road traction purposes. There seems to be so many varying sets of conditions that one should feel nervous in expressing an opinion You must remember that I am merely an observer and not an inventor, but I may say I am impressed with the belief that a crude oil motor is an absolute impossibility, and that for several reasons, the principal one of which would be that perfect combustion cannot take place. Crude petroleum has for its constituent parts hydrocarbons of varying specific gravity and limits of boiling point, and when the conditions operating for the perfect combustion of any one of its several parts are put into operation, it follows that others must remain more or less outside the range of the combustion which operates successfully on one."

"As to the fully advertised claim *re* 'Master Patents,' so prominently brought before the notice of the public recently—are you not afraid of moving in the face of threats such as those made by Mr. Lawson?"

"I am somewhat reluctant to reply to this question. I do not believe that Mr. Lawson or any of his friends acting for the several Companies in which he is interested have possession of

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any 'Master Patents,' using that word in its correct sense—and if it is a fact that they have, I should not value the possession of them very much. I wish to examine the question from the very much broader standpoint of efficiency and economy. Curiously enough, the essential point towards the production of a successful motor-car has been altogether ignored by Mr. Lawson in all of his different prospectuses and all his different statements, but I consider that his great parade of claims for 'Master Patents' is merely the traditional 'red-herring' used to prevent people from inquiring too closely as to the more important points of the motors. Just think for a moment what effect would be produced on the minds of any Board of Directors of any Railway Company, if any Engineer were to tell them he held the Master Patent for Locomotives. They would merely smile, and continue to make their engines, or have them made, on lines which embodied the idea of economy of fuel; and these points, efficiency and economy, have been hidden away for very obvious reasons by Mr. Lawson and his friends when speaking of motor-cars. It would be a very easy matter for me to design a motor-car for travelling to the moon, and I might call it a 'Master Patent,' but I believe 'Old Mother Goose' went '20 times as high as the moon' on a broomstick, at least so I read in the nursery, years and years ago, and such baby stories as being the possessor of the Master Patents for motor-cars should be used for nursery purposes, and not for commercial enterprises such as this—babies might or might not believe, but the average commercial man cannot. No, Sir, a Master Patent motor-car or motor-engine of any sort is to-day impossible, although the details associated with such cars and engines may be patented with advantage—however, I believe that Mr. Lawson uses this question of Master Patents merely for 'red-herring' purposes, and I am satisfied that he and every one of his advisers or sympathisers are very well aware of the fact that the Duryea Motor has passed the stage when it is necessary to bolster it up with ridiculous nursery stories of the broomstick style. As sole owner of the Duryea Motor-Car European patents I claim that it is the most economical engine—it is of course known that it is the most reliable—and because of that knowledge I offered to run a Duryea Car against any other commercial four-wheeled car of equal horse-power belonging to any other owner, for stakes of £5,000 each side. The Duryea Motor has passed the experimental stage, and is established as a certainty, and the engineers associated with it are now devoting their attention to efficiency and economy rather than any other phase of the question—that is, their efforts are in the direction of reducing the amount of fuel necessary for doing a certain amount of work, and this in the end must be the measure of efficiency."

"But surely electricity will be an important factor in our future operations?"

"No, I do not believe much in electric motors for street traction purposes, principally because of the huge weight necessary for primary or secondary batteries. I have often been amused to notice the efforts of the owners of such batteries endeavouring to offer their wares to the public by calling very distinct and prominent attention to their weak points. You will see such expressions as 'Weight reduced by 40 per cent.,' 'Space reduced by 45 per cent.,' 'Plates enclosed in refractory envelope,' 'Free from risk of short circuit,' 'No loss of capacity with age,' 'Discharge rate for up-grade work almost unlimited.' Now these are really and truly the weak points in each cell, and when one or other inventor makes such claims as these, he points to the fact that they are merely comparative expressions. When the very best cell available cannot give rapid discharge without seriously spoiling the plate—when short circuiting is a constant and ever present danger, and when they become too old for use in a very short time—it is not, in my opinion, a thing possible that we, in the present generation at least, shall see commercially successful vehicles running by electric current. Please again remember that I speak as an observer and not as an inventor. But if at any moment it be found possible to produce a motor worked by electricity, without the weak points above referred to, I am prepared to buy it, and pay a very large price indeed for it."

"What will the future of the industry be, and will existing vehicles crystallise into shape, or are we likely to see some absolutely novel departures?"

"Speaking generally about the motor-carriage business, I am disposed to think that there is no motor-carriage existing to-day which in 10 years' time would be fathered by any prominent carriage builder. I am more disposed to look at this question from a commercial standpoint, and I feel satisfied that the motor-cars of the future will be the work—not of one man—but of several working in conjunction, and as far as I am able to see, the most prominent difficulty occurs by reason of the prejudices and jealousies of rival patentees—each one wanting to consider his own particular invention more prominent than any other. This is more particularly so in reference to English and French inventors; American engineers are willing to combine and 'do a deal,' pooling their ideas as it were, and making the best effect of a number of different plans, and I am quite satisfied that to secure such men as Mr. Hiram Maxim and Mr. Charles Duryea, with their store of possibilities, their trained mechanics, their educated engineers and assistants, who are fully familiar with every particular connected with high-class motors, is to have hold of everything which is worth having in this department of mechanics."

"Have you any opinions as to the British Motor Syndicate's attempt to get £3,000,000 for their patents?"

"I think it would be out of place for me to make any very free comment as to my opinion of the policy followed by Mr. Lawson recently. Generally speaking, one can be very wise after an event, and now that we know Mr. Lawson has failed so signally, nearly every one is disposed to say, 'I told you so.' I am quite sure that Mr. Lawson could not do better than he has done with the motors which he had at his disposal; you see he had no high-class oil or steam motor to commence with, he had only 'Master Patents,' and he was therefore compelled to expend a large quantity of 'gas' to 'puff' the car along. This, of course, accounts for many of the wild statements made by that gentleman, but although this is my opinion I cannot think it was either courteous or wise for the holders of rival projects to flood the papers with their own particular objections and theories at a time when Mr. Lawson was going to the public with his scheme. I am a great believer in the doctrine of fair play, and wish every man to have a full innings without let or hindrance—criticise him afterwards as much as you choose, but not at the moment when no good effect can be produced. I think every commercial man interested in motor-car business will recognise the difficulties which Mr. Lawson had to contend with, and whilst sympathetically smiling at many or all of his wild-cat ideas, yet I think he should get credit for anything which he has done well. He has most certainly amused the European and American engineers immensely, he has proved conclusively that the comic element is a mistake in company promoting, he has added to the picturesque appearance of your Lord Mayor's Show Day by appearing in a fantastic costume more usually associated with the Whitechapel holiday element at Margate during the summer season, he has driven a 'Pilot Car' (one of the Master Patents, I suppose) to Brighton on Motor Car Liberty Day (14th November last), and has succeeded in being 'all at sea' and in a village blacksmith's shop at the same time (a truly marvellous feat), and he has fully supported one of the traditions of this great city by providing a dinner at the Hôtel Métropole, Brighton, in celebration of that day's events, but (how sad it is to use 'but') he was evidently still 'at sea,' or suffering from the effects thereof, when he failed to recognise the presence of ladies in commencing his after-dinner speech on that occasion. With this reservation I think Mr. Harry J. Lawson has done well, and deserves to be thought better of than is the case, and I, for one, will always be glad to see his 'Yachting Costume,' his 'Pilot Car,' and his 'Master Patents,' in evidence, as long as they add to the pleasure and amusement of engineers generally, and to the profit of Mr. Lawson particularly." [At this point our representative thought it well to leave, as his Editor has resolved to consign the British Motor Syndicate prospectus, as far as possible, to the region which holds those things which should never have been.]

TRADE NOVELTIES.

An Electric Bath-Chair.

MR. JOHN WARD, invalid chair manufacturer, of 246 and 247, Tottenham Court Road, London, has made a speciality of a motor bath-chair suitable for sick persons, or those who for any reason are unable to take prolonged walking exercise. It will be seen from the illustration which we give that it is a handsome and commodious vehicle, and is constructed in accordance with J. V. Sherrin's patent, the motor being one of the Britannia type. We had an opportunity before the procession to Brighton on the 14th November last—in which, by the way, one of these chairs took part—of testing the ease with which they travel, and the small amount of trouble involved in their management. To those who cannot take outdoor exercise without mechanical assistance these chairs will be very welcome.

The "Damon" Tyre.

AT the recent National Cycle Exhibition held at the Crystal Palace we had an opportunity of examining and trying the new "Damon" tyre, which has been specially designed for automotor work. It is manufactured by L. Broughton Wood, of Stoke-on-Trent, and we illustrate it herewith. From the engraving it will be seen that many of the disadvantages of the ordinary pneumatic tyre are avoided by the extra strength which is provided. The actual construction can be readily seen from the detailed description which is attached to our illustration. The tyre is formed with two concentric rings with rubber inserted, the latter being secured and held together by screwed bolts or nuts. It is remarkable for the ease with which it may be manipulated, while users secure economy and strength. Makers of motor vehicles should communicate either directly with the patentee or with the London agents, at 10, Dashwood House, E.C.

SNOW IN THE STREETS.

IN our last issue we briefly reported the fact that the House of Lords had, in the course of an important decision, decided that tramway companies have no right to use salt for the purpose of clearing their lines of snow. The action was between the Aberdeen Town Council and the local tramway company. Being so far north, the question has of course become keen; snow has fallen, and in the face of the interdict the service of cars has been interfered with. Immediately after the decision, and with the advent of the white flakes of winter, the secretary of the Aberdeen District Tramways Company wrote a letter to the Council stating that the directors were of opinion that an arrangement should be come to between the Council and the Company as early as possible for having the tramway lines and streets cleared during snowstorms in such a manner as to obviate interruption to tramway traffic, and suggested that a conference should be held on the subject. The Council's committee accordingly received and conferred with a deputation from the directors, consisting of Messrs. Cook, Collie, Allan, and Couper along with the secretary and manager. The directors suggested that the Town Council should in times of frost or snow undertake the duty of clearing the tramway lines as well as the streets, making use of salt so far as necessary for the purpose, the Company, on the other hand, affording the assistance of their staff and plant, and possibly also making a contribution towards the cost. Under such an arrangement the responsibility of using salt would be thrown upon the Town Council, who—the directors contended—were, as a road authority, in a different position from the Tramways Company. The deputation having withdrawn, the committee resolved to recommend that a reply be returned to the Tramways Company to the effect that, while the Town Council are prepared to clear the streets for ordinary traffic as expeditiously as possible, they do not see their way to undertake the responsibility of clearing the lines or keeping them clear for the passage of tramway cars. So a deadlock continues. The parties have had the inestimable advantage of a legal decision by the highest tribunal in this country—but they are, if anything, farther off than ever from solving the problem involved in the demolition of the snow.

BRADFORD TECHNICAL COLLEGE.

AT the annual conversazione held on 18th and 19th ult., an extensive and interesting collection of photographs, drawings, and models of motor-carriages was shown by the head of the engineering department, Mr. G. F. Charnock, Assoc. M.I.C.E., who has devoted considerable attention to the subject. The total number of exhibits was something like 350, and included examples lent by the Daimler Motor Company (Limited), Mr. E. J. Pennington, Mr. W. C. Bersey, the Anglo-French Motor-Carriage Company (Limited), Messrs. Roots and Venables, the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL, and others. A four horse-power Pennington oil engine for a motor-carriage was loaned by the makers, T. Coulthard and Co., of Preston, and attracted considerable notice by reason of its lightness and the small space occupied. The exhibition proved so successful that it was decided to throw it open to the public on the following Monday after the conversazione.

NOTICES.

Contributions and articles likely to prove of interest to our readers will receive due attention, but in all cases the name and address of the writer must be given, not necessarily for publication.

All matter intended for publication should reach us not later than the 10th of each month. Stamped envelope must be sent if the manuscript is required to be returned.

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The Automotor and Horseless Vehicle Journal.

A RECORD AND REVIEW OF APPLIED AUTOMATIC LOCOMOTION.

JANUARY 18TH, 1897.

ANSWERS TO CORRESPONDENTS.

B. R. (Huddersfield).—Having secured a return of your money you are to be congratulated, but you have evidently no further *locus standi* in the matter.

J. THOMPSON (Maida Vale).—The stroke is six inches; the revolutions approximately 650; and the initial pressure 36 lbs. We cannot give an average diagram.

EGLANTINE (Broadway). They are perfectly reliable; but why not advertise your requirements!

ONE IN DOUBT (Cheshire). The number of volts cannot possibly exceed two; we have only had an opportunity of examining an experimental cell. We found that the internal resistance was very great.

BENZINE (Kington-on-Thames).—You cannot, without modification, use the heavier hydrocarbons. If you did you would be speedily stopped by a solid cake of carbon deposits.

J. WILLIAMSON (Manchester).—We cannot advise you to advance money for experimental purposes unless you are made a party to the application for provisional protection. An assignment of a share of a patent cannot be registered until the final has been sealed.

W. M. MCGREGOR (Elswick).—The arrangement is bad; there is not sufficient clearance in the combustion chamber. For your purpose a water jacket is essential; do not be led away by statements based on the results of brief and inconclusive trials.

CONSTANT SUBSCRIBER (Leicester).—Is it not rather too soon to adopt this *nom de plume?* Any way we regret that we cannot possibly comply with your modest request.

SERPOLLET (Bedford).—There was nothing exceptional about the accident. It was the result of an ordinary street collision, which happens every day to horse-drawn vehicles without any comment.

INVESTOR (South Shields).—You can purchase the shares at about £1 2s 6d. We do not know what you can sell them for.

NELL GWYNNE (Autwerp).—The carriage is driven by a modified form of the well-known Daimler motor.

AMATEUR (Godalming).—You must run the risk, which, in your case, is very great, as it looks like an infringement. The Dunlop Company oppose all new applications, in order to test the matter in the Courts.

J. JEFFRESON (York).—Your suggestion shall be carried out in our next issue; and in the meantime we thank you for it.

EMBLEMATIC (Doncaster).—At your request we have carefully tested the cells sent to us. It is perfectly correct that, in comparison with others, the weight of the "grid" has been reduced as stated, while the area has been increased, but all this has been obtained by a total neglect of all considerations as to stability. In a few minutes on a jolting road the plate would collapse and a short circuit would, of course, be the inevitable result.

ROTARY (Shepherd's Bush).—As an idea your suggestion is, of course, admirable, although old; but how can you possibly obtain compression?

F. HAYTER (Devon).—We can only regret that our advice by letter is not satisfactory. The best plan you can adopt is to try the experiment, and you will then find that by "totally setting aside the Otto cycle" you will only succeed in filling your cylinder with unconsumed carbon.

JAMES SCOTT (Liverpool).—There is not the slightest risk of explosion; while from the section of the tube you will see that there is but little chance of its being burned away. The bugbear of explosion arising from cold water coming into contact with hot surfaces has been demolished by the elaborate experiments undertaken by the Boiler Insurance Companies.

INDIGNANT (Aberdeen).—Let well alone; experience can only teach the public and ourselves where the happy mean can be obtained.

FRUGAL (Finsbury).—Wait; none of the makers who will eventually supply the market have yet issued a comprehensive price-list. In the meantime everything is a matter of negotiation and of opportunity.

INVENTOR (Hastings).—Thanks for drawing. We cannot accept your statements, although, of course, we do not doubt them. If you will give us an opportunity of testing your motor we shall be pleased to illustrate and describe it—but in our own way.

IMPATIENT (Coventry).—Put on the curb a bit. Do you imagine that within two months of the trial of the "Rocket" the kingdom was covered with a network of railways? Motor-carriages are not evolved instantaneously—they take time to build. "Make haste slowly," is in our case the best motto.

EXPERIMENTER (Thirsk).—If you wish to try oils of various density you had better fit an air valve capable of delicate adjustment to your vaporiser, and you can then secure by "trial and error" the proper admixture which will completely consume the various products. That is the only method we can recommend.

J. PERKINS (Swansea).—The secretary of the Club will, doubtless, give you all the information. Write to him at 40, Holborn Viaduct, London, E.C. We do not possess a copy of the rules.

W. LEBRUN (Jersey).—Our publishers will lend you a set for your purposes, if you forward them a stamped and addressed envelope.

A. M. B.—But why do you write your signature in such a way? We have looked up your letter, and submitted it to our printer, who has grown grey in the task of deciphering such riddles. He suggests that your name is Bowman, while we make it Bridghouse. As a compromise we have cut off the signature to your letter and pasted it on the wrapper. We trust it may reach you.

TYRO (Westminster).—Mere drawings will be of no use. The object of our contemporary is to obtain practical results.

SIMPLEX (Norwood).—"Molesworth's Pocket Book," published by Spon, will give you the information you desire.

R. V. (Dublin).—Thanks for your information, but we have no desire to reopen the matter. We expressed our opinions very fully in the last issue, and have no desire to "whip a dead horse." We would rather see those concerned using their undoubted ability in the direction of some project calculated to serve our common ends.

SPORTSMAN (Kempton).—We believe the Derby scheme has been dropped; at any rate, we fervently hope that it has.

T. MAY (Cardiff).—We wrote you that you could not do better than apply to the representative at Wembley Park.

GRADIENTS (Westmoreland).—We have not the necessary space to spare here to answer you in full; if, however, you will refer to our advertisement columns you will see that we publish a pocket-book which will give you all the data you require.

R. F. HERON (Hampstead).—We do not know anyone who will teach at all at the present time; write again some time hence and perhaps we may then be able to advise you.

THOS. GREENE (Mageney, Co. Kildare).—We wrote you as the subject matter of your letter was urgent, and you will now see from our columns that the money is being returned in cases where sufficient effort is made to secure it.

BRITANNIA COMPANY (Colchester).—We presume the list we sent you was adequate for your purpose, as we have not heard further from you on the subject.

J. MACKENZIE (Grange Road, Middlesborough).—We believe the Credenda Tube Company can supply you with what you want.

J. W. EAST (Louth).—We will publish an illustration with full particulars in our next issue.

J. A. BEAL (Cardiff).—Speaking generally, one which covered the materials and construction for a certain period, subject to fair wear and tear and a minimum speed at a given load when working at full power.

*** THE BRITISH MOTOR SYNDICATE (LIMITED).—To the very many correspondents who have written to congratulate us on the position taken up in our columns with reference to this Company we can merely express our thanks for their cordial approval and appreciation. We are very pleased to know that, owing to the efforts of the Press generally, the public have not been largely entangled in this dubious enterprise; and that, as a matter of fact, the promoters have practically been allowed to enjoy their monopoly of the "master patents" which they claim to possess. If ever they realise the mammoth profits which were shadowed forth in the prospectus, we shall be the first to congratulate them on their good fortune; and in that case they will bless the journalistic infidels who refused to believe the glowing statements which were set forth. The Syndicate have the patents; the shareholders have, on their own showing, the necessary confidence and capital to carry out their views; and it is for them in the course of the future to prove, by the payment of cash dividends, how wrong and blind we all were in not accepting the generous offer which they made to all and every one of us to share their good fortune on the terms of subscribing a mere three millions sterling of capital.

WHAT WILL THE NEW YEAR TEACH US?

1896—eventful as it was in history-making epochs and surprises of varied kinds—may, when the story of the century eventually comes to be written, be known as the year which was famous for a revival of the strangled industries connected with motor traffic on the highways. Even, however, if this does not ultimately prove to be its chief claim upon the attention of the historian of the future, it is at least certain that this all-important subject will be amongst its leading characteristics. This country, immersed in the task of spreading a network of unrivalled railway systems throughout the land, which have helped to place its commerce and enterprise in the forefront of the world's industry, has, under the repression of an absurdly construed law, utterly neglected the possibilities of cheap and rapid communication on the highways. In the task of displacing the horse for the heavy work of the land and in the rapid transit of passengers through long distances Great Britain has played the very foremost part; but in riveting our attention to the great problems involved in long-distance travelling, the scarcely less important factors concerned in the every-day traffic of our streets have been allowed to fall into a condition of absolute neglect. We have, through sheer apathy and want of organisation, allowed animal power to perform the work which, as a great mechanical and engineering race, we might easily enough have achieved by simpler and more economical means.

In the meantime our Continental and Transatlantic neighbours, unfettered by judicial restrictions and with a keen desire to secure cheap and ready transport, made stealthy but rapid progress in the perfection of a method of locomotion, the very alphabet of which had to be learned from the efforts of the English pioneers. The start which they then obtained might have been even more firmly established than it has been but for the wariness of a few of our countrymen who, at considerable trouble to themselves, and at no little expense, raised the danger signal and at last awakened our public men and the Legislative Assemblies to the realities of the situation. There is no need now to again trace the story which has been told in our recent issues, as to the means by which Sir David Salomons and those associated with him organised the agitation which culminated in the passage of the Light Locomotives Act, and the regulations which have been made in pursuance of its provisions. Suffice it that in spite of some drawbacks which time will modify, we have now a workable measure which, with patience and care on the part of those interested, should prove a sufficient charter to ensure the ultimate success of a great industry which, in the modern sense at least, may be fittingly described as new.

The advent of the enabling Act, which came into force on the 14th of November, has been celebrated by jubilation; the motors have been either eulogistically described or contemptuously abused, according to the tastes of the writers, while we have had at least one gigantic Company *fiasco*. The time has now come for real hard work and for looking the varied problems with which we have to deal squarely in the face. We have enjoyed a splendidly initiated Emancipation Day *fête* in the shape of a trip to Brighton; we have swallowed the bitter pill which its promoters subsequently administered to us by way of a corrective; and have listened to the croakers who spell defeat and disaster out of the fact that English manufacturers have not been able to crowd our streets at a moment's notice with motor-carriages constructed to meet the requirements of regulations, when the ink with which they were written is scarcely dry. Of course it would be open to English users to buy Continental patterns and makes for their use—but quite apart from their unsuitability for our requirements, what would our friends who are so fond of shouting in derision "Made in Germany," "Manufactured abroad," have to say if such a custom became by any means universal?

What, then, is the outlook for 1897? To answer this question dispassionately, and with any pretence to accuracy, involves a careful inquiry into the processes which are going on beneath the apparently motionless stream of British motor-carriage work. With a fairly complete knowledge of what is being done by engineers and inventors interested in this matter, we can confidently assert that the prospect is in every respect a favourable one. The number of leading firms who are endeavouring to add motor-carriage building to their other special features may be counted by the score, and in nearly every case the desire seems to be—we are pleased to note—to depart as far as possible from the types which have been formulated by our Continental and American friends. Months must elapse before practical trial on the highways can begin to eliminate the forms which are unsuitable for our roads and streets, and when these have gone out of sight—and perhaps mind—the natural principle of evolution will at length bring forth the vehicle which by its suitability shall prove by its fitness to be the one which shall survive all others. The story of the bicycle, although on a much more imposing scale, will, doubtless, be retold; first, the period of exaggeration, ridicule, and bluff through which we are now passing; then the stage of doubt, semi-oblivion, and earnest, but quiet, experiment which can only bring success; next will inevitably come the triumph of assured success which will only astonish those who forget the trite axiom that history has a knack of repeating itself.

ROAD TRACTION IN POPULOUS DISTRICTS.

THE admirable paper which was read by Mr. J. F. Thompson before the last meeting of the Liverpool branch of the Self-Propelled Traffic Association—and which is fully reported in another column—may be read with interest and profit by all concerned. Without going into the questions raised by the speaker, we may note the attention which is being rapidly given in the crowded districts which surround Manchester and Liverpool to the favourable prospects which are held out by motor vehicles as a means of solving the huge problem of bringing the producer into the cheapest communication with the buyer. Manchester has shown by the prompt, if reckless, manner in which it has poured millions of sovereigns into the construction of its none too successful Ship Canal, how keen the city is to obtain prominence, and if Liverpool can, by any reasonable scheme of motor transit for goods on roads, see a reasonable prospect of success, want of money, ingenuity, or enterprise will not stand in the way of its being carried out. The local branch is doing excellent service to the community by enabling these proposals to be thrashed out by practical men, and the whole country must benefit by the discussions which are taking place. We trust that London and other important centres will soon follow the example thus set. What is wanted more than anything else at the present juncture of affairs is a frank interchange of opinions between those entitled to speak with authority. The result cannot fail to be of benefit to all. Mere *ex cathedrâ* statements by those whose utterances are tainted with a suspicion of interested motives are of little value; but in the arena of free debate the truth has a habit of invariably getting uppermost at last and of remaining there. All that is wanted is a small amount of organisation, and the engineers and carriage builders of the metropolis will soon make their voices heard with at least as much effect as their colleagues residing in the chief provincial centres.

PENNY PARCEL DELIVERY BY MOTOR VEHICLES.

WE are told that what has been done for letters by Rowland Hill is to be achieved in London for parcels by a new enterprise called the London Penny Parcel Delivery and Automatic Advertising Company, which proposes to place on the streets of the metropolis 1,000 Tricycle Carriers of novel construction, and to open, in every district, offices for the receipt of parcels. Within a five-mile radius of Charing Cross parcels not exceeding 3 lbs. in weight will be delivered for one penny - an innovation that ought to prove a perfect god-send to the weary City man, who is expected to lug home parcels in the evening, and for ladies who have to burden themselves with ungainly packages in the course of their shopping. For parcels between 3 lbs. and 6 lbs. it is proposed to charge $1\frac{1}{2}d.$, and for those between 6 lbs. and 9 lbs. $2d.$—the latter weight being the maximum fixed for the moment, just as operations are at first to be confined to London. For any distance beyond the five-mile radius, but within the metropolitan area, an additional penny per parcel will be charged, but it is hoped that the public patronage will be so great that the Company will soon be able to carry for a penny a parcel up to 10 lbs. for any distance in London. A main source of the Company's revenue is expected to be found in the novel form of its advertisements. Each Tricycle Carrier will bear a box to hold the parcels, and on the glass sides of this box will be displayed a prominent advertisement, which will automatically change at regular intervals. These perambulating advertisements ought certainly to attract attention by their novelty, and we understand that already contracts have been given by a good many of the leading advertisers.

REVIEWS OF BOOKS.

"Steam Locomotion on Common Roads." By W. FLETCHER. (London: Messrs. E. and F. N. Spon.) Price 5s.

THE author of this ably compiled work has been a prolific writer on the subject of motor-carriages for the last 20 years. The innumerable papers which he has contributed to the technical journals have doubtless done much to help on the movement which led to the passage of the amending Act of last session. In this volume—which is admirably illustrated throughout—Mr. Fletcher treats exhaustively of the rise and progress of mechanical road vehicles until the days came when, by the working of the law, none but engines of the heavy traction type could be used on the highways. All the engines turned out in the early days of the century are fully described, while the details shown will be of service to the designers of to-day. Full justice is done to individual inventors and manufacturers, while the list of names is very accurate, and can be consulted with full confidence. We are pleased to hear that a second volume is in preparation with the object of bringing the matter up to date. The task could not be entrusted to better hands, and when this appears, the two volumes will prove to be perhaps the most comprehensive record on the subject to be found in our technical literature. In the meantime, all interested in the matter may be safely advised to invest in the book, the historical value of which it is difficult to over-estimate.

"Tramway Motors; Lessons from America." Reprinted from the *Glasgow Herald*. (Glasgow: George Outram and Company.) Price 1s.

THIS unpretentious pamphlet contains far more valuable matter than can be found in some costly and much-vaunted volumes on the same subject. It owes its origin to the enterprise of the proprietors of the *Glasgow Herald*, who, towards the end of last year, sent out one of their staff to America with instructions to visit the principal cities in the States and report as to the method of haulage adopted for the tramways in each place visited, with the view, if possible, of enabling the citizens of Glasgow to determine which of the rival schemes laid before them would best suit their local requirements. The letters—some twenty in all—appeared in the paper during the months of October and November, 1896, and have now been deservedly reprinted. The articles are carefully written, and are brimful of statistics and facts which will be found indispensable to all who wish to accurately study a matter which is every day growing to be of greater importance to the municipal authorities of this country. The writer evidently leans to the overhead electrical system—but, as the publishers are careful to point out in their preface, "the articles were written from the point of view of the present position in Glasgow," and local requirements must always prove powerful factors in coming to a decision as to the best system to be adopted. Without attempting to express any opinion as to conclusions arrived at by the writer, the solid facts and figures which the book contains renders it of the utmost value to all concerned.

THE Secretary of the Self-Propelled Traffic Association—Mr. Andrew W. Barr—has just issued a very neat pocket-book for the use of the members, containing a reprint of the Locomotives on Highways Act, 1896, and the various rules which have been made in accordance with its provisions.

MR. WALTER HORNCASTLE states, in his circular for January, that motor-car companies are responsible for a total capitalisation of something like £6,000,000 during the past year.

IN reference to our statement in December issue that Mr. McKim had purchased Messrs. Roots and Venables' motor patents we now understand that a sale was not concluded, the negotiations being broken off at the last moment. We regret the inadvertent admission of the paragraph.

THE "FACILE" PETROLEUM OIL-ENGINE.

THE Britannia Company, of Colchester, have for some time past given special attention to the development of the petroleum oil-engine, which they have succeeded in bringing into practical working shape. The "Facile" engine (Gibbons' patent) is the outcome of their labours, and a photograph of this was published in our second issue. Figs. 1 to 6, which we now give, show the details of this system. In the "Facile" engine one valve similar to a large safety-valve, with a piston body instead of wings, is employed as both main air-valve and exhaust-valve. The air, in passing into the cylinder, helps to keep this valve cool. The engine is of the internal vaporiser type, the vaporiser also forming the ignition tube, and being enclosed in a casing attached to an extension of the cylinder cover, which has cast in it a passage leading to the casing. This brings the combustion space from the back of the cylinder round to the side. The air supply passes round this casing on its way to the cylinder, through the double-purpose valve. The oil is injected into the bulbous end of the vaporiser by a rod working in an oil-box, and receiving a longer or shorter stroke controlled by the governor. The governor acts on a cam, which leaves a trip finger more or less time in contact with the rod it pushes. Referring to our engravings, *a* is the framing of the engine, and *b* is the power cylinder, which is provided with a water-jacket, *c*, in the usual manner; *d* is the combustion-chamber, which is connected to the cylinder, *b*, by a short neck or passage, *e*, and which is of much smaller diameter than the cylinder, and placed parallel thereto, as shown in Fig. 2; *f* is the jacket surrounding the combustion chamber, *g* the valve-box, and *h* the valve working therein, and serving both as an air-inlet valve and an exhaust valve, the space, *i*, above the valve communicating by the passage, i^1, seen at the bottom of the vaporiser, u^1, in Fig. 2, directly with the interior of the combustion chamber, *d*, whilst the space beneath the valve is in communication through the ports, *j*, *j*, and the pipe, *k*, with the jacket, *f*, and by the ports, *l*, *l*, with the atmosphere, according to the position of the valve, *h*; *m*, *m*, are holes in the jacket, *f*, for admitting air for the formation of the explosive charges. The valve, *h*—which, as shown in Fig. 3, is a mitre valve—is provided on its under side with a hollow cylindrical extension, which fits within the valve-box, *g*, and is provided with a series of circumferential apertures or openings, *n*, n^1, n^2, n^3, n^4, communicating with the ports, *j*, *j*, *l*, *l*.

During the compression and combustion stroke of the piston, the valve, *i*, is in the position shown in Fig. 4. When the exhaust stroke of the piston commences, the cam, p^2, lifts the valve, *h*, from its seat, and places the apertures, n^3, n^4, opposite to the ports, *l*, *l*, so that the gases from the cylinder, *b*, can pass under the valve, *h*, into its cylindrical extension, and thence escape through the apertures, n^3, n^4, and the ports, *l*, *l*, to the atmosphere. During the time that the ports, *l*, *l*, are open, the air inlet ports, *j*, *j*, are closed by the rings, *o*, o^1. On the completion of the exhaust stroke the lift, p^3, of the cam raises the valve still further, the ports, *l*, *l*, are closed, the apertures, n^1, n^2, brought opposite the ports, *j*, *j*, and on the outgoing stroke of the piston air is drawn through the holes, *m*, *m*, into the jacket, *f*, and thence through the pipe, *k*, and the ports, *j*, *j*, into the valve box, whence it passes into the cylinder, *b*, through the aperture, i^1. In Figs. 2 and 4 *u* is the vaporising chamber and igniter, which is arranged partly within the combustion chamber, *d*, and partly outside it, the part outside being provided with internal ribs, u^1, u^1, and being heated for starting the engine by the flame of a lamp. After the engine has been running for a short time the part of the chamber, *u*, within the combustion chamber, *d*, will, it is said, be sufficiently heated to serve as the igniter.

A shield is placed around the portion of the vaporising chamber and igniter, *u*, within the combustion chamber, *d*, but with an intervening annular space, for the purpose of preventing the air entering the combustion chamber from impinging against the walls of the chamber, *u*, and cooling it. The shield,

v, is placed at a slight distance from the chamber, u, in order to afford a space into which the gases can penetrate.

In Figs 4 and 6, w, w^1 are the barrel and plunger of the pump for injecting the oil into the vaporising chamber, u. This pump is constructed as shown in Fig. 4. In the end of the plunger is formed a passage, x, which terminates in a cross passage, x^1, shown clearly in Fig. 6. Around the barrel, w, of the pump is a chamber, y, and around a portion of the plunger of the pump is a space, y^1, which communicates with the chamber, y, through a passage, y^1, the space being kept constantly filled with oil under a slight pressure. When the plunger is full out, the cross passage, x^1, is in the space y^1, so that the oil can flow from the latter into the passage, x, and fill the space above the plunger. Immediately the upward movement of the plunger commences, the passage, x^1, is moved into the part of the pump barrel which the plunger fits, so that the return of oil through the passage, x^1, is prevented—the result being that the oil in front of the plunger is injected into the vaporiser, u. The engine is well mounted on a strong wrought-iron frame and four wheels, and is fitted with a water-cooler.

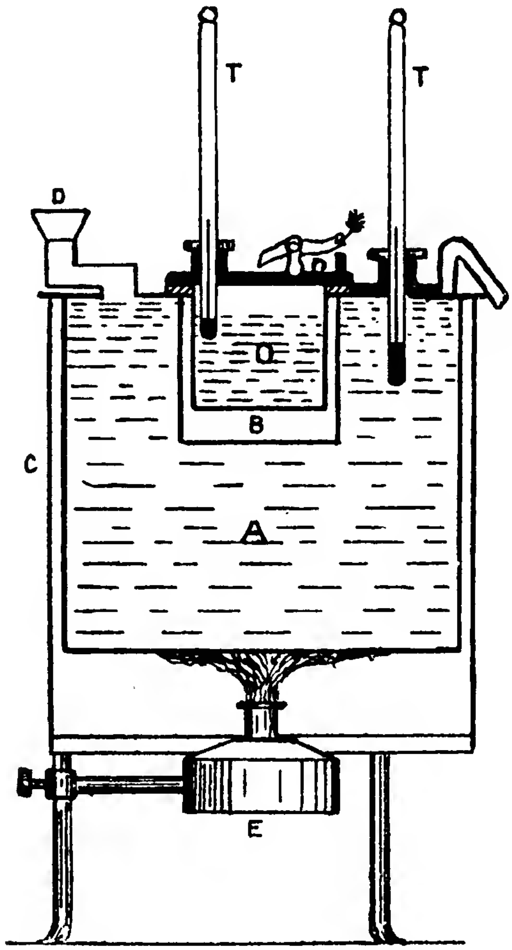
BY MOTOR-BUS AT MIDNIGHT.

EARLY on Sunday morning, the 20th ult., the Strand, the Embankment, and the adjoining thoroughfares were the scene of what may be correctly termed the first completely successful trial of one of the new electric omnibuses which are to be shortly placed on the streets of the metropolis by the London Electric Omnibus Company. The vehicle, which is constructed on Mr. Radcliffe Ward's system of electrical traction, left the Horse Guards' Avenue shortly after midnight. Travelling through Whitehall at the rate of between seven and eight miles an hour, it glided smoothly down Victoria Street on to the Embankment, where it attained a speed of eight and a half miles an hour. After running the whole length of the Embankment and up Whitehall into the Strand, a test of the capacities of the omnibus in climbing was made. The steep incline running up towards St. Martin's Lane past Trafalgar Square was mounted with ease. Throughout the whole run the motion caused was slight, and no throbbing or jolting was felt. As might have been expected, the bus was greeted in a not too kindly way by the cab-drivers about the streets.

ABEL'S FLASH-TEST APPARATUS.

UNDER the Petroleum Acts it is provided that oils sold for the purposes of illumination shall not have a flashing point of less than 73° F., which shall be determined by a special apparatus invented by Sir Frederic Abel for the purpose. A section of this bath and lamp is shown in the accompanying illustration, in which C is a copper bath, containing water A. This forms the water bath, within which there is an air chamber B, which carries a gun-metal oil cup D. This cup rests upon an ebonite ring, and over the air chamber B, and has a tight-fitting lid on which is fixed a gas-burner. The oil cup carries a thermometer T, and above the cover is fixed a slide, which is caused to uncover three holes. This gas-jet swivels on a lever, and, moving with the slide, carries a small flame, while the movement is so combined that, as the lever tilts, the flame is passed through one of the openings in the slide and reaches the top of the oil in the cup. The right hand thermometer T is intended to take the temperature, while the spirit lamp E supplies the necessary heat.

A pendulum 24 inches in length is employed in order to time the operations involved in the test of the flash. At the commencement of the experiment the temperature of the water in the bath is brought to exactly 130° F., while the oil is cooled to 60° F., and then poured carefully into the oil cup D. The lid is then put on, the rise of temperature being noted on the thermometer in the oil cup. When a temperature of 66° F. is reached, the testing is started by setting the pendulum in motion, and its operation is as follows:—The first three oscillations draws the slide slowly open, while the fourth closes it rapidly. At the same time the test flame is gently tilted through a hole in the slide to the space above the oil. This is repeated once for every increase of a temperature of 1° F., until the vapour of the oil ignites within the oil cup, giving a pale blue flash. The temperature of the oil at which this occurs is called the flashing point; *i.e.*, the flashing point is that temperature at which the oil gives off a sufficient vapour to be ignited by a



flame. As we have stated above, the lowest point legally allowed for petroleum intended for burning in lamps in this country is 73° F., or 22·8° C.

AT a meeting of the Belfast Corporation in committee recently, the Tramway Company's renewed offer to introduce electric traction on getting a seven years' extension of the present lease (of which ten are yet to run), was again considered, and the Corporation decided not to grant any extension of lease, but the Company would be allowed to introduce electricity and double their lines without any additional payment for the unexpired term.

CONTINENTAL NOTES.

Motor and Cycle Exhibition in Paris.

As briefly recorded in our last issue, the fourth "Salon du Cycle," or rather International Exhibition of Cycles and Motor-Carriages, opened on the 13th ult., at the Palais de l'Industrie in the Champs Elysées. It may be said, perhaps, that new features, new inventions, and new applications of mechanical conception were somewhat conspicuous by their absence this time, and there is truth in the comment of critical observers that the principal characteristic of the exhibition was the development and perfection of ideas already adopted. The show, however, was a good one of its kind, and certainly deserved the enormous interest which was taken in it by the ever-increasing crowd of devotees of the wheel.

With regard to the bicycle portion of the exhibition, it was noticeable that the prices of machines remain about the same as last, despite the announcement that there was to be a fall in them, brought about by competition. There appears to be a growing demand for bicyles of larger frames and higher development; the seat, it is remarked by the initiated in such matters, is placed more forward than in previous years, whilst the gear case, to protect the chain from mud and dust, is getting more and more popular. As for the motor-carriages, they presented a magnificent show at the Palais de l'Industrie—their number and variety would have been deemed really incredible.

Aluminium bicycles seem to be gaining a little in public favour, although opinions differ very much touching their advantages and usefulness. But they look bright and pretty, which with many persons is a consideration.

By far, however, the most striking part of this year's exhibition concerns automobilism. Among the automobiles on view that turned out by M. Léon Bollée was as much admired as any. These machines, which we have already illustrated, are two-seated and single-seated. That exhibited by M. Bollée under the name of "Voiturette" is pronounced by certain expert judges to embody the best idea at the present day in the horseless carriage line.

Those who followed the Paris-Marseilles race recollect very well how bravely these little machines held their way through all the stormy weather which had to be faced during that memorable race. The machine, light though it is, is no "fancy" one. In fact, its lightness is precisely, it is remarked, its power, and allows of a person going about town making calls at the rate of five miles an hour if desired, or taking a spin in the country at a brisk racing speed. M. Bollée's "Voiturette" has three wheels, and though but a trifle higher than an ordinary tricycle, two persons can be quite comfortably seated on it. It weighs about 300 lbs., and is best described as a cross between an automobile carriage and a motocycle. The back wheel alone is worked by the motor, the other two in front having the steering gear attached. The inventor holds that by this arrangement much stability is ensured for his machine on turning, stability being further guaranteed on the fact that the centre of gravity is very low.

Automobiles, such as the Dion et Boutin, were well to the fore, and there was a large display at the Palais de l'Industrie of automobile vehicles as delivery vans and carts, which are more and more used and approved by tradesmen and the commercial world.

In connection with horseless carriages, mention may be made of a new electric *coupé*, invented by M. Darracq. This *coupé*, hung upon *huit ressorts*, resembles from every point of view the fashionable *coupés* turned out by the best Parisian makers. There is a seat at the back for the engineer, so that those seated inside the carriage have an entirely free view. The motor is supplied with current from a conveniently situated battery of accumulators. The steering is managed by the front wheels, moved by a wheel at the engineer's seat. In the same manner the brake is applied. The *huit ressorts* and the inflated india-rubber tyres make the *coupé* run as smoothly as possible.

This vehicle, in the opinion of the inventor, is especially suitable for use in the crowded Paris streets. It is affirmed that this electric *coupé* can be steered with the greatest facility, and presents the advantage that on going down hill the movement of the wheels recharges the accumulators, the motor becoming a dynamo and acting as a recipient of power instead of a distributor.

With regard to the question of economy, it is claimed that the electric *coupé* for use in Paris realises a saving of 40 per cent. when compared with the use of a *coupé* drawn by a horse. This electric carriage was not at the Cycle Exhibition, but was inspected at the workshops of the inventor by a number of well-known amateurs of automobile carriages.

M. Dalifol showed a new vehicle propelled by a horizontal motor, as is the case with all the motor cycles and light vehicles, with the single exception of the Dion tricycles, and the gas mixture is exploded by electricity, a practice which is being employed to an increasingly large extent in the new motor vehicles. In fact, manufacturers and users can no longer ignore the fact that with the liability of the petroleum spirit to overflow from the reservoir or the carburator the use of the firing tube is attended with a certain danger, as is illustrated by the burning of at least three or four vehicles during the past three years, and of the total destruction of a goods delivery van from this cause in the streets of Paris a few weeks ago. With the improvements being made in the electric firing of the gas mixture, makers claim that the possibility of premature explosions has been overcome, and if this be true there is no reason why the firing tubes should continue to be employed. Moreover, electricity is almost a necessity in up-to-date vehicles, in which the engine can be started from the driver's seat, so that there will be no necessity for the machinery to run while the carriage is at a standstill. This is one of the principal improvements that will have to be made in all the new self-propelled carriages, and there is every promise that before long the work of starting the motor by turning a handle will be a thing of the past. But for this, electrical firing is indispensable.

A carriage possessing these advantages was shown for the first time by MM. Kellner et ses Fils, 125, Avenue Malakoff, and if the vehicle is all that is claimed by the makers, it is perfect of its kind. It is constructed for three persons, and is propelled by a two-cylinder horizontal motor of $3\frac{1}{2}$ horse-power. The gearing is accomplished by the aid of leather belting and wood pulleys. The forepart of the vehicle carries the water reservoir and the electric battery, and behind the cushions of the seat is the reservoir for the petroleum spirit. The driver pushes forward a starting lever which admits the gas mixture into the cylinders, the electrical communication is established, and it is claimed that the carriage starts without further trouble. The only thing to be regretted is that no opportunity is afforded of seeing the vehicle at work. A carriage that can be started with so much facility, and only requires the motor to work when running, must represent relative perfection in the construction of self-propelled vehicles if, as is claimed, there is an entire absence of vibration, and noise, and smell. Practical experience, however, can alone show whether these claims are justified.

The system of friction gearing employed by M. H. Tenting is not new, but it continues to hold its own among all the new methods of power transmission being brought out, as is proved by the fact that it has been adopted to a more or less extent by two or three other firms. The motor used is a two-cylinder one, placed nearly horizontally in the same plane and working on a common crank. The crank axle carries a large friction wheel, upon the periphery of which run two small friction cones held in position by springs so that they may be drawn away from the wheel or pressed upon it to graduate the friction. Between these cones is a loose friction wheel carrying the pinion for gearing on to the driving wheels. The loose wheel may be drawn backwards and forwards between the centre of the cones and their circumference to regulate the speed of running, or it may be drawn clear altogether to put the machinery out of gear. The pinion is geared on to the driving wheels by a system of cogs. The petroleum spirit is pumped into the cylinders where it is vaporised and exploded. By this means it is claimed that considerable economy is effected.

A new system of carriage propulsion was shown by M. Emile Mors, in which the motor is placed vertically, the two cylinders being inclined at angles of about 45°, and the crank shaft is geared on to the intermediate axle by leather belting. The special feature of this system is the electrical firing, which is

FIG. 1.

accomplished by means of a small dynamo driven by a friction wheel running on the fly-wheel.

Steam was represented in the carriage of MM. N. Nègre et Ruffin, and though the engine may be efficient enough to propel the vehicle it is doubtful whether the system is all that is required by buyers. A multitubular boiler is carried in the forepart of the carriage, and is heated by petroleum. The engine is called a rotary, from the fact that the four cylinders are placed at angles of 45°, and work on one crank. It is fitted just behind the boiler in front of the driver, and the whole mechanism is too much exposed and too prominent to give a satisfactory appearance to the vehicle. It was shown at work, and, in fact, was the only mechanism in the exhibition that did run, and the exhaust steam being visible was not calculated to convey a favourable impression to visitors. It is evident that steam is yet far from taking the place which it ought to occupy in the propulsion of road vehicles.

FIG. 2.

In the carriages of M. P. Cusset, of Levallois-Perret, the power of the single cylinder horizontal motor is increased by the employment of a compressing cylinder, in which a valve to admit the gas mixture is opened by the explosion in the motor cylinder, so that this latter is always full at the moment of the explosion. It is a very quick-running motor, and the gas mixture is exploded at each revolution.

The only electrical carriage in the show is that of M. Darracq, and propelled by a dynamo on the rear axle and fed by Fulmen accumulators, weighing about 400 kilos., that are stowed away in the front and rear of the vehicle. It is claimed that once charged these accumulators will drive the carriage 120 kiloms. The cost of these electrical carriages is, however, excessive.

One of the chief novelties was the petroleum fore-carriage constructed by M. Prétot, 42, Avenue Philippe-Auguste, and intended to be fitted to any type of carriage. It consists of a sort of bogie frame carrying all the mechanism comprising a two-cylinder horizontal motor of five horse-power, which works on an intermediate axle placed in front of the fore wheels, to which it is geared by a chain. It is claimed that by this means the mechanism has more of the hauling than propelling action, and that consequently the power is utilised with much better effect. The attachment to the carriage is extremely simple, consisting, as it does, merely of bolting the bogie to the fore axle and cutting two holes in the front part of the vehicle, one for the levers, and the other for the spindle which serves for steering.

The Société des Automobiles Peugeot, three of whose exhibits are illustrated on this page, for instance, showed a carriage propelled by their new horizontal motor, in which the gearing

FIG. 3.

is effected partly by friction cones and partly by leather belting, but it was impossible at the show to get any particulars about the details of the mechanism. One feature, however, worth notice is the use of an intermediate shaft carrying the driving chain, instead of coupling the crank shaft directly to the driving wheels themselves, as is the case with all the other chain-geared motor vehicles. The appearance of the carriage is thus much improved, and the gear is not so liable to be clogged with mud thrown up by the wheels. In this, as in nearly all the new motor-cars, a reversing gear is employed. To sum up the show, it may be said that much more attention has been given than hitherto to the body of the self-propelled carriages, especially with regard to the finish of the vehicles, though it would appear that their construction is still far from being sufficiently robust to withstand the strain that is put upon them by the motors; the motors employed are mostly of the horizontal type, geared with leather belting; electrical firing is coming moro and more into vogue; little or nothing has been done to prevent any overflow of petroleum spirit from the carburator or the reservoir; the burnt gases are usually sent into a chamber to expand before escaping into the air, but beyond this nothing practical seems to have been done in the way of suppressing the noise and vibration of the vehicles, at least to the extent represented by the makers themselves.

President	Sir David Salomons, Bart.
Secretary	Andrew W. Barr, Esq.
President of the Liverpool Centre	The Earl of Derby, G.C.B.
Hon. Local Secretary	E. Shrapnell Smith, Esq.
Semi-Official Journal of the Association	The Automotor and Horseless Vehicle Journal.

Notice of Forthcoming Meeting.

Tuesday, January 19th.—At the Royal Institution, Colquitt Street, Liverpool, "Mechanical Haulage on Common Roads," by W. Worby Beaumont, M.I.C.E., M.I.M.E.

Proposed Exhibition of Motor Vehicles in Liverpool.

At a Council meeting of the Self-Propelled Traffic Association (Liverpool Branch) the question of holding a parade or exhibition of motor vehicles was discussed at length. The general opinion seemed to be that there was no need to arrange for a display of light carriages since numerous other opportunities would arise, but it is within the bounds of possibility that a display may be organised for May 1st. Ultimately the following gentlemen were elected to form a sub-committee for the purpose of drawing up the regulations and conditions to govern a prize scheme and competition for motor-wagons suitable for heavy goods traffic:—Messrs. A. Bromley Holmes, M.I.C.E., Alfred Holt, M.I.C.E., Alfred L. Jones, J.P., A. G. Lyster, M.I.C.E., and Henry H. West, M.I.C.E., with Mr. E. Shrapnell Smith as honorary secretary.

"THE MOTOR-WAGON SCIENTIFICALLY CONSIDERED."

At the fourth ordinary meeting of the Liverpool Branch of the Self-Propelled Traffic Association, held at the Royal Institution, Liverpool, on the 5th inst., under the presidency of Mr. A. L. Jones, a lecture was delivered by Mr. G. F. Thompson, consulting engineer, Liverpool, the subject being:—"The Motor-Wagon Scientifically Considered." Amongst those present were Messrs. Alfred Holt, Maunsell C. Bannister, John A. Brodie, Everard R. Calthrop, A. Bromley Holmes, A. G. Lyster, Arthur Musker, G. F. Ransome, Henry H. West, John Wilson, Lawrence Jones, Chas. Burrell (of Thetford), and E. Shrapnell Smith.

The Chairman, in introducing the lecturer, said that he hoped they would that night see some practical use in the Association. (Hear, hear.) Most commercial men in Liverpool knew the extreme hardships Liverpool shipowners and shippers had to put up with from the railway companies. (Applause.) They had appealed to the railway companies time after time for some consideration, but they had never been able to get the slightest concession. They had heard a good deal about motor-cars, and that night they were to hear a paper from Mr. Thompson about what might be considered a good and useful convenient motor-wagon. What they wanted was a good and cheap means of carrying cargo from Liverpool to Manchester, or to any place within 20 or 30 miles from Manchester. He did not know what Mr. Thompson had to say, but he did know that it was possible for them to take cargo from Liverpool at one-third of the charge now made by the railway companies. In adopting any new system such as was now being brought forward they had this advantage, that they would not have that double or treble handling of cargo which was so damaging to fragile packages. Even if the railway companies carried cargo free, it would be better for the owners to send their goods by motor-wagons, because they would carry the cargo from the ship's side to the consumer. There was no difficulty in a car leaving Liverpool at night and getting to Manchester in the morning, and this was where a motor-car traction-engine would have a great advantage over the railway companies, besides which, this traffic would have a great tendency to increase the value of land within a certain distance on either side. All this would tend to put them in a better position to meet the continued and increasing competition of foreign countries, such as Germany. The Dock Board had shown every desire to maintain Liverpool as one of the first ports of the kingdom. (Hear, hear.) The Board had met them very fairly, and they had not much to complain of at present, but the railway companies absolutely would not move, so that if Liverpool was to go ahead, as he had no doubt it would—for he had no doubt that Liverpool would hold her own as a great port—but if the city was to go ahead Liverpool men must work in the interests of the port with a determination to bring about a better state of things (hear, hear) than existed at the present time. For his own part he was quite willing to give time or money to bring about that state of things. Motor-cars would use the highways, and, therefore, no land need be bought, and there would be no rails to lay or bridges to make. He was not quite sure that Liverpool was right—in fact he was inclined to think that Liverpool was wrong—in not taking in hand Mr. Alfred Holt's plateway scheme when it was put forward. (Applause.) There was no doubt that had Liverpool taken it up Manchester would have been saved a good deal of money (laughter), and Liverpool would have benefited greatly. But they were there to take things as they were, and under the present circumstances to do what they could for the best interests of the port. He had great pleasure in calling upon Mr. Thompson, who said:—

Mr. Chairman and Gentlemen,—The history of road locomotion, owing to its wealth of incident, forms, perhaps, one of the most interesting pages in the annals of industrial progress, and, from its first inception, mechanical locomotion appears to have had a peculiar fascination for ingenious minds, all sorts and conditions of men having endeavoured, more or less successfully, to make it a *fait accompli*. It will have been noted by all who have studied the history of the subject, that the annals record more failures than successes, which fact may be said to be the natural consequence of treading upon practically unknown ground, or of dealing with unsolved mechanical problems; but there is, I think, a further and more conclusive reason for so many failures in the past, and which a closer scrutiny of the history discloses, and it is that comparatively few of the inventors or designers in the past were engineers or men having any scientific or mechanical training, but were, on the contrary, as regards applied mechanics, merely enthusiastic amateurs, following vocations remote from engineering. All were, doubtless, skilled in their own professions or trades, but were unlikely to be equally proficient in the science of engineering. I do not, of course, suggest that there were no real successes in past years, as in point of fact there were many, and it will be found that with few exceptions the vehicles were the productions of engineers, and were designed upon more or less scientific principles, and that little or no experimenting was required to complete their success. In reviewing the past history of road locomotion, we are, of course, dealing with a period when the "rule o' thumb" was to a large extent the standard measure, and the value of theory and scientific principle was not appreciated to the extent that it is at the present time. The reason, therefore, as to why the endeavours of so many enthusiastic experimenters were frequently attended with failure is not far to seek, as they were all more or less guilty of one fault of omission which was, in almost every case, the cause of failure, that was, they approached their subject without due consideration of the scientific principles involved in the problem of mechanical locomotion; and, as the untrained mind is apt to err in almost every case where physical laws or scientific principles are concerned, many of those worthy men, in spite of their energy and persistence, met with repeated failures, but when occasionally something practical was evolved from the chaos of experiment, it was not so much due to consideration of the underlying principles, as to the mere avoidance of the errors which had contributed to previous failure.

It has been truly said, that we sometimes benefit more by our failures than by our successes. A peculiarity of the unscientific mind is, that it either ignores, or fails to appreciate, the unalterable character of the passive and active forces of nature, and frequently seeks, by elaborately devised contrivances, either to circumvent natural laws, or to defy physical forces. The unscientific mind usually sees in complication and elaboration, imaginary improvement in mechanism, and the solution of problems, which, on the other hand, the scientific mind knows to be impossible. The history of road locomotion teaches us that little of real practical value is evolved by blind experiment in the field of mechanism, but that, on the other hand, by building up a structure upon a sound scientific basis, success may be practically insured before the field of experiment is entered upon. Guided by this principle, let us study the problem of road locomotion upon a scientific basis, and to do so the fundamental principles to be observed in the design of mechanical apparatus generally must be considered; as to those, let us hear what one of the greatest mechanicians who ever lived said, more than a hundred years ago—I refer to James Watt, whom I will take the liberty of terming the "Shakespeare of Engineering," inasmuch as he formulated principles, evolved truths, and established axioms, which live to-day, as do the wise sayings of the "Bard of Avon." Perhaps the greatest axiom established by Watt was that "the supreme excellence in mechanism is simplicity," the scientific truth of this has been established by the test of experience, and its import is perhaps more fully appreciated to-day than at the time it was uttered. We might perhaps amplify what we may term "Watt's Law," by adding "and simplicity in mechanism is the secret of success." Any complication of apparatus or the employment of superfluous material merely entails expenditure of motive power to no useful purpose, but, on the other hand, creates undue friction, and energy is further wasted in the setting up and retarding useless momentum.

Correctness or soundness of principle is of first importance as a factor in successful engineering, but there is another point almost equally vital, and that is perfection of detail; doubtless many more failures could be traced to defective detail than to fault of principle.

The first principles, therefore, to be observed in the design of mechanical apparatus generally, and self-propelling vehicles in particular, are:—

1. Soundness of principle.
2. Simplicity of design.
3. Correct proportioning of material to power.
4. Perfection of detail.

And these may truly be said to be the elements of success. Before considering the design and construction of the vehicle it is necessary that we should investigate the elements of road locomotion, and the first matter, therefore, to which our attention must be directed is the consideration of the physical conditions involved in the rolling contact of wheels with various surfaces, and this is, after the question of propulsive power, the most important factor in the problem of successful mechanical traction. The conditions of surface presenting the greater difficulties to be overcome in mechanical or other traction are:—

1. Unevenness.
2. Yielding, or soft.
3. Inclined.

Taking these conditions in order we will first consider unevenness, this being, in more or less degree, the condition of all road surfaces. Unevenness, however small, comparatively, necessitates a continual lifting of the vehicle, whether drawn or self-propelling, and which lifting is not in any way assisted by the descent of the wheels into the hollows of the surface, except when travelling at a high rate of speed, then the slight momentum due to the descent of the wheel does in some measure assist its ascent up the following rise, but this is only the case when the unevenness consists of rounded hollows and mounds. When the unevenness is due to stones projecting above a fairly level surface, each one becomes a species of stop and, according to its size, acts with greater or less degree as a check to the progress of the wheel, and the effect of that check varies according to the diameter of the wheel and the point in its periphery which strikes the obstruction. The diagrams A and B illustrate this point. (Diagrams drawn upon a blackboard were here referred to.) In the case of A, the wheel is 30 inches diameter, and the obstruction equal in height to one-tenth the diameter of the wheel, or an angle of inclination of 18°, whereas in the case of B, with a wheel 45 inches diameter, or 50 per cent. larger than A, the height of the obstruction becomes now only one-fifteenth of the diameter, and the angle of inclination is reduced to 15°. Further, in the case of A, the effective leverage of tractive pull is only 80 per cent., whereas in the case of B it has increased to 86·7 per cent. This reasoning practically proves the case in favour of comparatively large wheels. If the obstruction becomes crushed or forced down into the road surface by the weight coming upon it, then the amount of lift of the wheel is proportionately reduced, but it does not follow that any power is saved, as power has been expended in depressing or crushing the obstruction.

Upon hard and fairly smooth surfaces, the tractive force necessary is always proportionate to the weight of the vehicle and its load, other factors such as friction and method of propulsion being equal. But by increasing the diameter of the wheels, the tractive force required is diminished, the rule being that the force is reduced as the diameter of the wheel is increased. It is said that within certain limits the tractive force required to draw or propel a vehicle of a given weight does not vary as the number of wheels, and theoretically it would appear reasonable, assuming that proportion of bearing surfaces and treads of tyres were correct. Traction upon soft or yielding surfaces increases as the width of the tread. On hard surfaces increase of width of tread makes little or no appreciable difference in the resistance, except perhaps by covering a larger number of irregularities to actually reduce the tractive force, unless the weight of the wheel has been increased by the widening of the tread, then the advantage of the greater width of tread is lost in the increased inertia and friction. When the surface is yielding and the wheels depress it, it becomes equivalent to ascending a continuous incline, and the resistance of such incline will vary according to the nature of the surface, and the depth to which the wheels sink into it. The power absorbed in the compression of a soft yielding surface or what is equivalent thereto, ascending an incline equal to the depth of the depression, is illustrated by diagrams C and D. C represents a wheel rolling upon an unyielding surface and requires a pull of only 25 lbs. to move it. D shows a wheel of similar diameter upon a yielding surface, and the depth of depression is equal to an angle of say 10°. To move this wheel now requires a pull of 136·1 lbs. In the calculation the extra friction due to increased pressure upon the axle bearing and the contact of the wheel rim with the sides of the rut formed by the depression of the road surface are not estimated, but it would be safe to add at least another two per cent. or 20 lbs., thus increasing the pull necessary to 156·1 lbs. But there is yet another factor which must not be omitted in estimating the tractive pull, that is, the loss of effective leverage, which is as the depth of depression to the radius of the wheel, owing to the fact that the line of pull is parallel with the normal surface and not with the angle of inclination.

Power Required for Self-propulsion as Compared with Traction.

It is a fact, now generally recognised, that in the case of self-propelling vehicles to do work equal to the average horse by mechanical means, requires from two to three mechanical horse-power, and the question is often raised as to the theoretical explanation of this apparent paradox. The reason is not far to seek. It is not because a horse under ordinary circumstances exerts a force greater than the mechanical unit, as, on the contrary, it is the fact that under normal conditions the animal exerts a force of only about 65 to 70 per cent. of the mechanical horse-power, and this fact would appear to emphasise the anomaly. But although the animal, in the ordinary way of working, only exerts a force of, say, two-thirds the mechanical unit, he can, on occasion, for periods of short duration, exert a force of as much as 10 mechanical horse-power, and which reserve power he brings into action when starting a vehicle or ascending a gradient; therefore a motor to do the same work as a horse must be of, say, three mechanical horse-power, if not more. But there is actually more power required to move a given load when the vehicle is self-propelling than when drawn by horse or other means, and the reason is, that in the one case the power is applied to the mass and the wheels are merely the rolling media supporting the weight, and the best possible mechanical effect is thereby attained; whereas, in the other case, when power is applied to the wheels in the form of turning effort, intermediate mechanism between power and load is brought into action, with a consequent loss of effect represented by the extra amount of friction set up. The wheels have now become levers, acting as between the ground and mass to be moved, and the force is now practically applied at the fulcrum or at a point between the periphery and the centre of rotation, and according as that point is brought nearer the centre of rotation, so must the force there applied increase to develop a certain power at the periphery, and the friction at the axle increases in like ratio. This resistance becomes more pronounced upon gradients and increases as the angle of inclination.

A natural deduction from the foregoing theory would be that to obtain the best effect all the wheels of a self-propelling vehicle should be driven; this would be theoretically correct, as there would then be no power expended in merely pushing forward idle wheels, but practically this is objectionable, inasmuch as any driving mechanism upon the steering wheels would interfere with their free movement and, further, would necessitate complication besides. There would be considerable difficulty in devising such compensating gear as would insure both leading and rear wheels doing equal work; we will, therefore, dismiss the point as being an unnecessary complication. We will now consider the question as to whether the leading or rear wheels should be the propelling wheels, and I may say that opinion is somewhat divided on this point, some makers having adopted the front-driving system, but the majority have decided in favour of the rear wheels being the drivers, which is undoubtedly the most practical method and, further, is theoretically the most correct system, as I think will readily be seen from the diagram shown. The first figure represents a front-driven vehicle ascending a gradient of 10 per cent. inclination, and it will be observed that the gravitation of the mass of the load tends to relieve the leading or driving wheels of about 10 per cent. of the weight borne when on the level and, at the same time, to increase the weight upon the rear, which in this case are the steering wheels; the objections to this arrangement are self-evident, and I do not think I need enlarge thereon. A rear-driven vehicle is represented upon a similar gradient, and it will be seen that in this case the gravitation of the mass tends to increase the weight on the driving wheels and, at the same time, to reduce the pressure upon the leading or steering wheels; this arrangement is both theoretically and practically correct for the following reasons:—First, the additional weight upon the driving wheels increases their adhesion but does not at same time increase the work to be done, as the actual weight of the mass, whether on level or on incline, always remains constant. Secondly, by relieving the leading wheels of a portion of the weight carried, they are thereby more free to rise and travel over the irregularities of the road surface which, when met with on an incline, tend to increase the resistance of that incline. There is also another point, and that is the leading wheels can, when comparatively lightly loaded, be the more readily and easily swivelled for steering purposes.

The next point to be considered is the construction of the vehicle and its weight in relation to the load carried. I might say that in railway practice in this country the weight of the vehicle in comparison with the load designed to carry generally exceeds the weights in vogue in the United States, where rolling stock for both passenger and goods traffic has certainly been brought to a higher degree of perfection than in any other country of the world. In this country the "tare" or dead weight of railway wagons averages 60 per cent. of the full load, whereas in America, where very large bogie-cars are employed for freight purposes, the weight of the vehicle seldom exceeds 40 per cent. of the load carried. This is much more rational when we consider the possibilities of scientific construction. Taking a modern bicycle as an example, we have in it a vehicle designed to carry from 100 to 200 lbs. and seldom weighing more than 20 per cent. of the load designed to carry. From actual tests made it was found that a bicycle frame of sound ordinary construction would sustain a weight equal to 10 men before showing signs of failure, thus proving that no vehicle, if scientifically designed and carefully constructed, need be more than 25 per cent. to 30 per cent. of the weight designed to carry, and, at that, to have a factor of safety of about 10. Of all systems of construction of framing for road or railway vehicles, the tubular is at once the most scientific, being the strongest for a given weight of material employed. The tube or cylinder being theoretically the form in which material can most resist not only compressive but also torsional and bending stresses. Where tensile strain is concerned, it is practically immaterial what the form may be, provided the sectional area is sufficient. The tubular system of construction for the framing of freight-cars has been employed for some time past in the States and has been adopted, to a small extent, in this country, but owing to the inherent conservatism of railway companies and wagon builders I am afraid it will be yet a considerable time before the system is more generally adopted in England.

With regard to vehicles for traffic on roads, the lighter the construction consistent with adequate strength the better, for two reasons:—(1) The lighter the vehicle the smaller will be the dead load; (2) A light framework possesses more elasticity or flexibility and its moment of inertia is less than one of rigid and heavy construction, and it is, therefore, less liable to injury from vibration due to unevenness of road surface.

Framing and Wheels.

This reasoning clearly emphasises the desirability of reasonably light and somewhat flexible framing for all vehicles intended for road traffic, as such are more subject to vibration and torsional strains than are vehicles running upon prepared tracks, and the design of such vehicles when self-propelling should be even more carefully considered than the construction of a locomotive for railway purposes, for the reason that the conditions under which it must work are more exacting, and its range of adaptability must be greater than that necessary in an engine intended to run on a prepared track. Reverting to the question of vibration, its effect can, of course, be practically nullified by interposing elastic media between the road surface and framing in one or another of two forms. First, in the form of springs, and, secondly, in the form of elastic treads to the wheels; but a still better effect is obtained by a judicious combination of the two forms. First, springs are better calculated to dissipate the effects of severe shocks than are elastic treads to the wheels, but, on the other hand, the elastic tyre possesses an attribute of which no other expedient is an equivalent, and that is in its keeping the inflexible rim of the wheel off the smaller inequalities of the surface, which are really the cause of jar or vibration, when the tyre is of metal, or any hard, non-elastic material. Regarding springs, it has been ascertained, by actual experiment, that with properly proportioned springs, the tractive force when travelling at moderate speeds over rough surfaces is thereby reduced to about half what it would be were no springs employed. As to the construction of wheels, there is only one perfect wheel suitable for light, or moderately heavy road vehicles, and that is the one built upon a truly scientific principle, the suspension system, which means, in other words, that the spokes are in tension instead of being in compression as in common wheels, and the knave or boss hangs as it were within the rim, instead of thrusting outwardly in all directions. This is the only system upon which a perfectly sound yet light wheel can be constructed, and when the spokes are arranged tangentially and interlaced it becomes a perfect driving wheel, inasmuch as the turning effort applied to the centre is communicated to the periphery by a practically direct pull, instead of by a bending strain upon the spokes as is the case in ordinary wheels having radial spokes in compression.

A wheel on the suspension system with pneumatic tyre is the scientific as well as the mechanical ideal, and, I might add, the commercial ideal, as I believe, made in a comprehensive and systematic manner as they are at the large manufactories in Coventry; wheels on this system can be produced at a cheaper rate than could wheels of equal strength on any other system. Many devices have been brought forward as equivalent of the pneumatic tyre for affording an elastic connection between the centre of the wheel and the part in contact with the road surface, but although successful as far as they go, they do not meet the case. Elasticity in a wheel is practically useless unless it be at the tread, as it is at that point where the shock is received, and if it be not at once absorbed by some elastic medium, it is, as a consequence, communicated to the whole of the rim and any other parts which are rigidly connected thereto, so that elasticity in the vicinity of the boss of the wheel in no way saves the rim from injurious shock, and is at best but a bad substitute for springs employed in the usual manner. Further, elasticity within a wheel in no way increases its adhesive or tractive power, and, considering the complication it entails in the construction of a wheel, it is, as a mechanical expedient, worse than useless. The great advantage and value of elasticity at the tread of a wheel is that it serves the double purpose, of first absorbing all jar due to rolling contact with an uneven surface, and, secondly, it intensifies the adhesion of the wheel to the road surface. Respecting wheels having plain unyielding treads, it has been found in practice that such wheels offer greater resistance to traction than when they have diagonal or transverse ribs or plates upon their peripheries; this is accounted for by the fact that many of the loose stones, &c., met with on road surfaces find their way into the spaces between the ribs, and consequently no power is expended in either forcing them into the surface or crushing them, as would be the case were the wheel rims plain.

STEERING.

The best method of steering self-propelling vehicles is undoubtedly that known as "Ackerman's system," which consists in swivelling the leading wheels independently instead of together, as is the case when a fore-carriage is employed. In Ackerman's system the leading axle is a fixture, and the wheels are mounted upon short pivots jointed to the ends of the fixed axle. These pivots have short levers attached to them at angles slightly out of square to which the steering handle is connected by suitable rods and levers. This system of steering possesses three distinct features of advantage. First, the body of the vehicle is supported at the sides, instead of at the centre—as is the case with a swivelling carriage—thus insuring greater stability. Secondly, the wheels being mounted on the ends of short levers instead of long levers, their movement is much easier, and they are further not affected to the same extent by unevenness of surface or obstructions, as when held at the ends of a long swivelling axle. The third advantage is that owing to the levers upon the wheel pivots being set out of square and their consequent movement through arcs of circles not coincident, there is a resulting variation of relative angle of the two wheels, and which, if the levers are set at the proper degree of inclination, insures each wheel being set approximately square to the radii of the circles of their paths. This is an important point, as if the wheels be parallel to one another there is a screwing or twisting of the wheel traversing the minor or inner curve.

THE ROD OF PROPULSION.

The most important element in successful road locomotion is adequate propulsive power, and from the data given it will be an easy matter to determine what power may be necessary to propel a given weight under various conditions; the next point, therefore, to consider is the system of propulsion. For freight purposes over long distances, there are, in my opinion, only two systems admissible, they are steam and oil, or explosion motor. Practical opinion is strongly in favour of steam, but I am inclined to the belief that in oil it has a very formidable rival, therefore, let us for a moment glance at the relative merits and drawbacks of steam and oil.

One great advantage which steam possesses is that it is generally understood, it is easily generated, and the materials necessary thereto can be obtained almost everywhere. But to enable this class of power to be held in reserve energy must be stored either in the form of pressure or of heat, and in any case the container must be necessarily strong and heavy. The latter form of storage is the more desirable as the element of danger created by the storage of pressure is not present in the storage of heat under proper conditions. A steam-engine can be readily started, stopped, and reversed, and its range of power and variation of speed are practically unlimited, and when duplex cylinders are employed, perfect balance may be insured. Regarding the oil or explosion-engine, its principal attribute is that only the motor and fuel are necessary for the development of power, there is no medium or third element required as in the case of steam or electricity. The heat-producing material is in a highly concentrated and portable form, is an article easily procurable, cheap and safe, when its flash point is above 80° F. The principal objections to the oil-engine are that it is not a self-starter and it has practically no flexibility in the matter of speed or power, and must be kept running even while the vehicle is stopped so as to be ready for re-starting. Further, its action is somewhat jerky, owing to the thrust-effort being only at intervals and always in the one direction; this is perhaps the most serious objection to the explosion-engine, but when it is considered that pulsation or vibration in a motor is only the evidence of unbalanced thrust-effort or the momentum of matter in motion, I think ingenuity should be able to cope with this element and so remove a stigma from an otherwise admirable apparatus.

Referring now to the more commercial aspect of the matter, the best and most economical working conditions would appear to be fulfilled by employing one motor freight-wagon drawing a simple freight-wagon. The weight limit fixed by the Local Government Board in this case being:—Motor and follower-wagon together, unladen, four tons, and speed limit, six miles per hour. To take full advantage of the weight limit the motor-wagon, together with engine and fuel, might weigh, say, 2¼ tons, and the follower-wagon, say, 1¾ tons. The motor-wagon might then be designed to carry from five to six tons and the follower a similar load; only one-half of the load would then be self-propelling, the other half would be drawn, and, therefore, moved under more economical conditions. The horse-power required for such vehicles and loads on the level would be about 17 mechanical units, but the motor should have a margin of power for starting the load and ascending gradients of, say, 50 per cent., that is, 8½ horse-power, which added to 17 makes the total power of the motor for such work, say, 25 effective horse-power. I say effective as meaning over and above the power necessary to overcome inertia and friction of engine and machinery. Every motor-wagon should have two men in charge, an engine-driver and stoker, and be the motor of very small power the same attendants would be necessary, whereas the same two men could manage equally well a motor-wagon drawing even 10 wagons after it, and little, if any, more work would be entailed than if it had no follower.

The only remaining matter of importance is the question of cost of working, and as that is as yet a matter of speculation and estimation rather than fact, I would prefer not to commit myself to any definite statement, but I am of opinion that upon fairly good roads, having no gradients above 10 per cent. inclination, with either steam or oil it might be readily possible to convey goods at a cost of 1⅛*d.* per ton per mile, and in arriving at this amount I have taken into consideration cost of fuel and engine sundries; wages for two attendants; interest on capital outlay; repairs, depreciation; insurance of motor and load, and rent of shedding for accommodation of motors when not in use. But I have not included cost of loading and unloading, and, further, I have based my calculations upon the assumption that the wagons be fully loaded; allowing for the light load contingency it might be advisable to increase our figures to 1¼*d.* or 1⅜*d.* per ton per mile.

In conclusion, I would say that the natural tendency of human inclination is to select the best, and the ultimate success of the mechanically-propelled vehicle is a question of the "survival of the fittest," and this is the underlying principle of all real progress, and he whose endeavours are directed towards the attainment of perfection, whether it be in mechanism or other useful art, will surely reap his reward in due season: but no endeavour in the direction of the attainment of supreme excellence in mechanism can be really profitable unless our efforts are guided by the light of science. (Loud applause.)

The Chairman, in commenting upon the lecturer's remarks, said he was gratified to find that Mr. Thompson's calculation as to cost of running exactly agreed with his own estimate, and with a guarantee as to cost actually given him by an eminent firm of traction-engine builders, and he thought that if goods could be carried, say, from Liverpool to Manchester, or similar distances, at the cost estimated, there was a good field for an economical motor-wagon.

A discussion followed, in which several gentlemen connected with shipping and engineering interests took part. After the lecturer replied to the several points raised during the discussion, the proceedings terminated with the usual votes of thanks.

THE BLOT ACCUMULATOR.

In common with all interested in the adoption of secondary batteries for use in traction work, we have long taken an interest in the system of Mr. G. R. Blot—as we have been acquainted for some time with the marvellously good results which Mr. Preece had obtained in the course of a series of elaborate experiments, carried out with the assistance of the Post Office experts. In addition to that testimony we had, too, the favourable opinions of some scores of Continental and English electricians, as well as the outcome of our own knowledge of the accumulator. We were therefore much pleased at the successful gathering which took place on Tuesday last at the Hotel Cecil, London, when, under the presidency of the Hon. R. R. Dobell, Mr. H. Tyrer Cheswright gave a lecture, illustrated with models and diagrams, on the principles and construction of the battery. The speaker said:—

The "Blot" Accumulator is of the "Planté," or pure lead type, containing no pasted oxide whatever; its construction is based upon the suspension of alternately corrugated and embossed ribbons wound round a "shuttle," such ribbons and shuttles varying in thickness in accordance with the electrical capacity and rate of charge and discharge required, and being fixed free to expand in an unoxidisable form.

Of these accumulators we have several samples before us—most of which are illustrated in this article—with which we propose to show very briefly the special features and advantages of the "Blot" system, by demonstrating to you the rapidity with which these accumulators can be practically charged for traction purposes, also for motor-car work, a subject which is now engrossing the attention of the entire world; and, secondly, by explaining to you the exceedingly simple and mechanical construction of the plates, the manner of their erection in cells, &c.

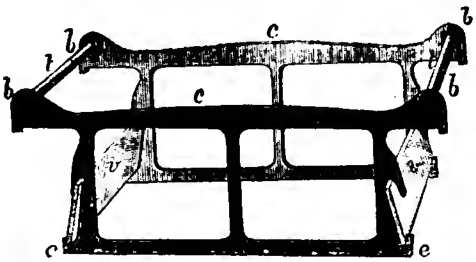
Whilst the "traction cell" is being charged in the short space of 15 minutes, if you will allow me I will call your special attention to the advantages referred to with regard to this system, which may be summed up as follows:—(1) Maximum electrical surface obtainable; (2) high rate of capacity and efficiency; (3) rapid charge and discharge; (4) immunity from buckling; (5) absolute and efficient conductivity between active material and the frame; (6) durability; (7) low cost of production.

With regard to the maximum electrical surface which is the largest obtainable, I think you will easily understand that this is arrived at by the fact of using alternately corrugated and embossed ribbons. This ingenious arrangement gives a great active surface with a small amount of lead (·333 m^2 per kg. of plate) as well as great porosity, due to the layers of ribbon being kept apart by the corrugation.

High rates of capacity and efficiency are attained and assured by the large and exceptional surface of active material exposed to the electrical action.

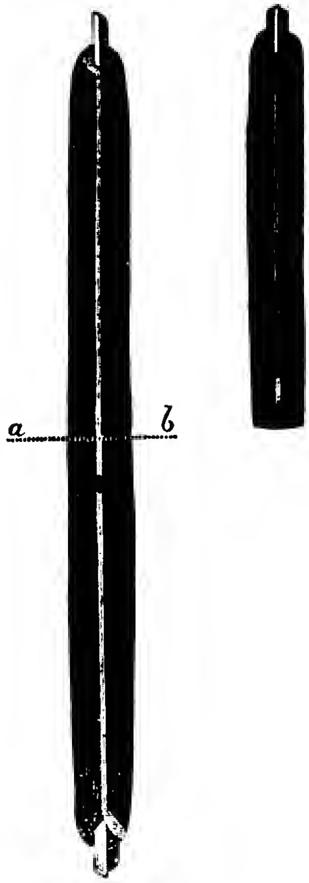
It is well known amongst electricians that the time required for charging and discharging an accumulator is in absolute proportion to its surface for a given weight, hence it has been the object of manufacturers to make the plates as *thin* as possible, but in the case of all oxide accumulators that have pasted plates it has been materially impossible to go beyond a certain point, as they otherwise disintegrated or fell to pieces, which limits for all practical purposes the rate of charge and discharge (as also their electrical capacity) to a very low regime. With the very largely increased surface of the "Blot" Accumulator this essential difficulty is entirely overcome, and in proof of which I would refer any gentleman to the curves on the wall, demonstrating both the electrical capacity and efficiency at high rates of charge and discharge; the charge varying from, say, one quarter of an hour, and discharge up to ten hours, which latter for ordinary stationary purposes is the usual rate. I would here mention that these accumulators have undergone, during the past two years, most severe and exhaustive tests by very competent authorities in France, Belgium, and this country. The extracts of some of the important reports will accompany the prospectus, which will shortly be issued to the public.

Swelling of the active material in accumulator plates has always been one of the greatest, if not the greatest, difficulty that has had to be contended with. With oxide plates it is produced by the difference of dilatation, the swelling of the active material and its consequent disintegration, the disintegrated parts, moreover, establishing but too often what is known as a "short circuit" (accidental contact between the two poles). I may mention that the oxide accumulators, notwithstanding these inherent defects, may be said hitherto to have taken precedence over the pure lead or Planté type, such as we are dealing with to-day, for the only reason that a pure lead plate has, up to now, never attained an equal electrical capacity, though known to be far more robust. With Mr. Blot's system we have even a much higher capacity than with any industrial oxide accumulator known, at the same time combining all the solid qualities and advantages peculiar to the Planté system (pure lead). Before leaving this question



1. Frame support for mounting plates in cell.

2. Complete plate; 4 shuttles.



6. Whole and half shuttle.

3. Complete plate; 8 shuttles.

7. Showing embossed and corrugated ribbon with loose ends.

4. Shuttles placed horizontally.

5. Shuttles placed vertically.

8. Complete cell in glass.

of buckling or swelling, I would like to explain how this inherent drawback is entirely obviated with the "Blot" plate. As already explained, the active material is composed of alternately corrugated and embossed ribbons, these ribbons being left entirely free at the base of the plate, allowing sufficient room for their extension and expansion vertically and horizontally. This is the only system where necessary expansion has been practically provided for, and this important point will be easily appreciated by all electricians, and particularly by those who have already had experience and paid for it.

The conductivity between frame and active material is a point which is of great importance. It is of no use being able to put a large quantity of electricity into an accumulator unless you can get it out again in a sufficient proportion. It will therefore be seen that the conducting surface of an accumulator plate must of necessity be proportionate to the electrical capacity of the active material. This is assured in the "Blot" Accumulator by the "shuttle" which forms the core of each coil of ribbon, such shuttle varying in thickness and consequent conductivity in accordance with the surface, size, and thickness of the ribbons themselves. The core of this shuttle is soldered electrically to the frame, thus connecting the active material with both, and ensuring a proper electrical contact of all the lead ribbons.

The rigorous tests which this accumulator have undergone have proved, beyond a doubt, their extraordinary durability, even at high rates of charge and discharge. Positive plates which have been in constant use during two years, and for which the current has been taken at the rate of 2½ ampères per pound, show no signs of deterioration. We have such a plate on the table before us, guaranteed to have been in use two years, and if we scratch the surface it will be seen that the surface only is attacked, the lead underneath having remained absolutely in its metallic state. With elements of such construction, moreover, it is possible, after a number of years' use, to reverse the polarity and use the plates to the last.

In conclusion, it may be stated that Mr. Preece, in his report, says:—"We have obtained 12·7 ampère hours per kilogram of plates. It acts under heavy rates, discharges in a superior manner, and it seems to be admirably adapted for traction purposes, as well as for electric lighting. The ampère-hour efficiency is 88 per cent., and the Watt-hour efficiency 76 per cent. at the normal rate of discharge." Mr. T. Parker, of Wolverhampton, a recognised authority, declares that the storage capacity of the "Blot" is the highest for its weight. It can be charged without injury in a very short time, and the energy is available at a great rate of discharge without damage. He adds:—"I have examined cells that had been in use for two and a half years; there was no buckling; the cell had given no trouble or loss by internal short-circuiting. There is positive prospect that their small depreciation, when working, will produce a new era in the use of accumulators."

The engravings which illustrate this article fully show the details of the construction of the battery and its finished appearance.

Liverpool Police and Automotors.

IN a report to the Watch Committee on motor-cars and light street locomotives, the Assistant Head Constable of Liverpool suggests that eight miles an hour should be fixed as the maximum speed, that there should be no restrictions on their use in streets along the docks, but that they should not be allowed to cross the city except during such hours of the night as the Committee might fix. With regard to the scheme which is on foot to establish a line of locomotives for traction on the road between Liverpool and Manchester, to which we referred in our last issue, the Assistant Head Constable understands that the present intention is to use three wagons with each locomotive; this traffic, therefore, would not be subject to the Act of last year, which only allows one wagon, but would be subject to the Acts 24 and 25, 28 and 29, and 41 and 42 Vict., under which the local authority has power to make regulations as to route and hours.

DOINGS OF PUBLIC COMPANIES.

Return of British Motor Syndicate Subscriptions.

WE understand that it is an unquestionable fact that some of the subscriptions to the British Motor Syndicate issue are being returned. Inquiries addressed to brokers show that in cases where sufficient pressure has been put upon the promoters, subscribers of £3 each for the shares have been able to obtain the return of their money.

SOME of the members of this Syndicate visited Coventry on Thursday last, and inspected some of the works there under the guidance of Mr. H. J. Lawson. Some speeches were made at a luncheon and informal meeting which took place later, but nothing of much importance with reference to the recent issue transpired. Many prophecies were made as to the profits to be gained in the future; threats were hurled at those concerned in rival patents; but no reference was made to dissatisfied applicants for allotments, and to the efforts which are being made to secure a return of the capital subscribed.

OUR contemporary, the *Pall Mall Gazette*—which took a prominent part in exposing the worthlessness of the master patents which were offered to the public—recently had the following note on the subject:—"We have little patience with those who were foolish enough to subscribe to the British Motor Syndicate issue; but still, the less trouble they have in getting their money back the more shall we be pleased. 'In a recent issue of your paper,' writes one of them to-day from the North, 'you stated that the Syndicate was, under pressure, returning the money to some of the allottees, and as I am an unfortunate victim, I should esteem it a great kindness if you would give me information as to how I might recover the money already paid to the Syndicate's bankers.' Such letters as these, of course, suggest the need of organisation. Communications we have received show that while some have obtained the return of their money, others are moving for it through their individual solicitors. Might we suggest that it would save much time, trouble, and expense if the subscribers acted collectively instead of individually? Perhaps one of the firms of solicitors or one of the shareholders who are acting would be willing to step forward with name and address, that a nucleus for joint action might be formed." We have also received innumerable letters on the same subject, and of much the same tenour; our advice has been of similar purport to that given by the *Pall Mall*, and we are very pleased to note that a combination of clients and solicitors has taken place.

New Issues.

STEEL WELDLESS FITTINGS FOR MOTOR-CARS, CYCLES, &c.

The Standard Weldless Tube and Cycle Components (Ltd.) (Chillingworth's Patents), is an important undertaking which has just been formed with a capital of £160,000, divided into £1 ordinary shares, for the purpose of purchasing the Standard Tube Company, of Birmingham, including all the freehold works, land, machinery, tools, &c., as well as additional machinery necessary to increase the output of weldless steel tubing up to 5,000,000 feet per annum, and to acquire Chillingworth's Patents, the adoption of which, it is claimed, will create a revolution in the manufacture of fittings for motor-cars, cycles, engines, &c. These fittings are stronger and lighter than those put together with the ordinary fittings now used. By Chillingworth's process sockets of all sizes and shapes can be forced outwards by pressure from the inside of tubing in a manner previously impracticable, thereby effecting a great saving in price, time, labour, and material, whilst in the production of weldless motor-car and cycle steel fittings the saving is even greater, whilst the fittings are absolutely reliable. Already a very large sale of these tubes has been effected in Germany, &c., and the Board of Directors, which is a very strong one, certainly appear to be fully justified in their anticipations of profits set forth in the prospectus which is now placed before the public. A practical demonstration was given on Wednesday last of these remarkable patents, and we notice that Mr. A. G. S. Manning (late engineer to the East and West India Dock Company), and Mr. F. R. B. Liebenrood, after inspecting the Chillingworth process, have agreed to join the Board on behalf of the vendors. A deserved feature is made of the fact that there are no preference, deferred, or founders' shares, and consequently the value and profit derived from the purchase and taking over of the property will accrue entirely to the ordinary shareholders from the first. Emphatically favourable reports upon the patents are given by Mr. Fletcher Moulton, Q.C., Mr. T. M. Goodeve, and Messrs. Brewer and Son, and any profits arising from the re-sale of the foreign patents, subsidiary companies, licenses to work, &c., will go to swell the profits for the ordinary shareholders. The directors propose setting aside £30,000 for working capital, and the services of Mr. Lewis, the present manager of the Standard Tube Works, have been secured for a period of five years. The offices of the Company are 7, Philpot Lane, E.C. Specimens of the fittings manufactured by this process can be seen at the Works, Wharf Street, Aston, Birmingham; 2, Cherry Street, Birmingham; 7, Philpot Lane, E.C.; and at 76, Queen Victoria Street, London, E.C. Subscriptions (2s. 6*d.* per share on application) will be received by Parr's Bank, Limited, 77, Lombard Street, E.C., and the Birmingham District and Counties Banking Company (Limited), Colmore Row, Birmingham, and their respective branches, where prospectuses can also be obtained.

New Companies Registered.

[Under this heading we intend in future giving a full list of any new Companies registered which take power to make, deal, or become interested in any manner in automotor vehicles. Where detailed particulars are not given under this heading we shall be pleased to reply to inquiries through the "Answers to Correspondents" column. All communications should be addressed to the Editor. The only stipulation which we make is that where the inquiry involves a search of the records at Somerset House—as in the case of information on the subject of the holdings of shareholders—a postal order must be enclosed to cover the Government stamp of one shilling which is charged before a search is allowed to be made.]

	Capital. £
Cycle Electric Lamp Co. (Limited), Manchester	30,000
Cycle Steel and Screw Co. (Limited), Birmingham	5,000
"D B" Spoke Co. (Limited), Warwick	5,000
E. and H. Hora (Limited)	25,000
Electrical Traffic Syndicate (Limited)	1,000
Garrison Cycle Co. (Limited), Heywood	10,000
Girling Cycle and Motor Car Co. (Limited), Brighton	20,000
Globe Venture Syndicate (Limited)	100,000
Goy and Co. (Withers and Chandler) (Limited)	35,000
Great Yarmouth and District Tramways (Limited)	1,000
Harris's Patent Record Gear (Limited)	120,000
Hobart, Bird, and Co. (Limited), Coventry	25,000
Joslins (Limited), Colchester	50,000
Marks' Hub Syndicate (Limited)	2,000
Millet's Patent Motor-Wheel Co. (Limited)	100,000
New Motive Power Syndicate (Limited)	15,000
New Traffic Syndicate (Limited)	12,000
Northway Cycle Co. (Limited)	5,000
Pedersen's Cycle Frame (Limited)	250,000
Raglan Cycle and Anti-Friction Ball Co. (Limited), Birmingham	120,000
South Wales Motor Car and Cycle Co. (Limited), Cardiff	5,000
Star Cycle Co. (Limited), Wolverhampton	120,000
Surrey Tyre (Limited)	2,000
T. D. Oliver and Co. (Limited), Newcastle	10,000
Velodrome Co. (Limited)	30,000
W. A. Lloyd's Cycle Fittings (Limited), Birmingham	40,000

CORRESPONDENCE.

*** *We do not hold ourselves responsible for opinions expressed by our Correspondents.*

*** *The name and address of the writer (not necessarily for publication)* MUST *in all cases accompany letters intended for insertion, or containing queries.*

"AUTOMOTOR" AS A TITLE.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

DEAR SIR,—It is with much pleasure I see we now have a journal devoted entirely to horseless vehicular traffic, and one which I sincerely hope will make a point of disseminating information in regard to the subject in a totally unbiassed manner.

Please forgive me for taking exception to the title you have chosen. In the first place, it sounds very much like the name of an existing paper if the syllable be read backwards; and secondly, the word "Automotor," to my mind, conveys nothing in connection with either vehicles or locomotion, seeing that a stationary steam-engine, for example, might be accurately classed as an "automotor." I would, therefore, suggest that, before it is too late, you should strike out this unnecessary word from your pronoun, and let it be simply THE HORSELESS VEHICLE JOURNAL.—Faithfully yours, ALFD. R. SENNETT.

Putney, *Dec. 10th.*

PNEUMATIC TYRES.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

DEAR SIR,—When reading your journal for December I was much interested in an article *re* "Pneumatic Tyres," and the practical remarks therein stated by Professor H. S. Hele-Shaw. His views seem to be on the same line of thought as mine. A theory which I have for the easy running of the pneumatic tyre is that, when the wheel with its load is being driven or drawn on the ground, the tyre is depressed at the point of contact with the ground (slightly forward of the centre of the wheel), which causes the air to rush round the wheel until it comes to the point of contact at the other side of the wheel or tyre, and the air being under compression, it has a tendency to give the wheel a lift: thus the weight is helping the wheel forward; for you will see from the above description that the centre of the axle has a tendency to be forward of the centre of the periphery.

This principle is demonstrated in a spring wheel, which you will see on a prospectus that I enclose. You will see from this that when the wheel is pushed or drawn the springs give way, letting the axle take a forward position as to the periphery of the wheel: thus the weight is again helping the machine forward. These wheels run with remarkable ease, going over obstacles with great facility. It is through noticing the above facts that I have taken out a patent for an improved wheel, which I consider will supersede two previous ones. I form a hubless wheel, and by suitable arrangements I secure a smaller wheel within the hubless wheel. By this arrangement I come to the rolling principle which the Professor speaks of. When the wheel meets an obstruction it simply rolls over it without being jerked over. By my principle you will see that I get a forward centre when the wheel is driven forward which helps the machine along, and a backward centre when the power is reversed, thus acting as a brake. This wheel is applicable to any kind of vehicle, and can have any kind of tyre on either of the wheels. The wheel really goes over a brick with as easy a motion as a boat over a wave, and really easier than a pneumatic tyre. That is what all riders say who have ridden it.—I am, &c.,

W. P. W. Weatherill.

33, Beech Street, Manchester.

MOTOR VEHICLES FOR SEVENOAKS.

To the Editor of The Automotor and Horseless Vehicle Journal.

Sir,—That charmingly-situated, health-giving town on an eminence, with its (roughly speaking) 23 miles of exceptionally well-kept roads has very poor communication, so far as locomotion upon them is concerned, for its 8,300 inhabitants, let alone for visitors by rail to the pleasant town, or for those who come to see one of the finest old residences in England. I knew Sevenoaks when the population was much less, but was served a great deal better, the London, Chatham, and Dover Railway Company connecting their station and the town with a two-horse omnibus. We also had a good service of trains connecting the two railway stations for the charge of 1*d*. per passenger. The line is still there, but the train service has been allowed to cease, and in its place we have the Company's 'bus, which only makes four journeys each way for the charge of 6*d*., which is far too high for the middle class. No doubt the great cost attendant upon keeping horses deterred anyone from placing omnibuses on our roads, but now the new Act, which came into operation at the end of 1896, finds the means to overcome that difficulty. I trust we shall soon see some enterprising gentleman form a "Sevenoaks Motor Syndicate," and commence by placing two "electrical" cars on the two principal roads, both to start early in the morning from the Royal Oak Hotel. "A" car to proceed down the London Road to the South Eastern Railway Station, thence to the London, Chatham, and Dover Station, and up St. John's Hill through High Street to the Royal Oak Hotel. "B" car should proceed through the High Street down St. John's Hill to the London, Chatham, and Dover Railway, thence to the South Eastern Railway, and back to the Royal Oak Hotel by the London Road. I would suggest that the journeys be made continuous throughout the day, thus affording good communication to the inhabitants as well as to railway passengers. Those who take this matter up, if it is well managed, popular fares being charged, and quarterly or yearly tickets issued at moderate rates, will not only reap a good profit from their undertaking, but will confer a boon upon visitors and the inhabitants generally, and will also materially enhance the welfare of the town of Sevenoaks.

Albert Bath.

MASTER PATENTS.

To the Editor of The Automotor and Horseless Vehicle Journal.

Sir,—In a letter on the subject of the patents owned by the British Motor Syndicate published in one of your contemporaries recently, Mr. Walter Rowbotham writes:—"Now, it is possible to vaporise them" (heavy hydrocarbons) "by a body in the cylinder heated by means of electricity, and thus the danger of fire or of flame blowing out is obviated, and the engine is ready for starting in a few seconds. I ask you if you do not consider this a master patent, and if you do not think there is as much distinction between this method of vaporising and that of using an outside flame, as between the Otto and the other makes of gas-engine?"

Mr. Rowbotham does not state to what particular patent he refers, but it is certain that the British Motor Syndicate owns no master patent for the method of vaporising hydrocarbons which he describes. The method of vaporising heavy hydrocarbons by means of an electric heating resistance, so that the resulting vapour may be ignited and burned, was published in several technical journals about 10 or 11 years ago (I have not my references by me as I write, and so cannot give exact dates), and was patented about 11 or 12 years ago. It does not follow, however, because the Syndicate referred to does not own a master patent for this method, that it does not own valuable subsidiary patents. That may, or may not, be the case.

J. G. Lorrain.

LIGHT *v.* HEAVY OILS AS EXPLOSIVES.

To the Editor of The Automotor and Horseless Vehicle Journal.

Sir,—I have noticed in several papers paragraphs about motor-cars firing themselves. I should like to point out that this arises from the fact that the said cars derive their motive power from the use of the light hydrocarbons, such as benzine, petrol, or naphtha, which vaporise at a very low temperature and ignite on the appearance of a light. If a heavy hydrocarbon were used this would not take place, as that grade oil needs considerable heat to effect its vaporisation, and is nothing like so inflammable as the lighter one. But for this very reason, and also on account of the smell and smoke given off from the heavy grade, these dangerous hydrocarbons are preferred.

Now, by the letters lately appearing in so many papers, people are led to believe that, the Otto cycle patent having expired, there are no patents of value to be obtained for motor-car engines, thus implying that the said engines are practically perfect. If this is so, why do not makers produce their cars free from the need of water, free from vibration, free from smell, and, last but not least, free from the danger of firing? That they have not done so is clearly evidenced by the occurrences of a few days ago, which, I expect, will be pretty frequent while people use these dangerous light oils.

I should like to inform you that the heavy grade oils can be used, and there are patented methods of vaporising them without using any outside heat, the vaporisation being effected in the interior of the cylinder without the aid of flame. There are also patents for anti-vibration, for practically avoiding smell and vapour, when a heavy grade oil is used, and for dispensing with water for cooling purposes, though, as you state in your issue of the 16th inst., these are not in the possession of the British Motor Syndicate.

A motor-car built on the lines I have indicated would be comfortable and quite safe, and so would rapidly become popular.—Yours faithfully, Walter Rowbotham.

27, Vittoria Street, Birmingham, *Dec. 31st.*

SELF-PROPELLING TRAFFIC.

To the Editor of The Automotor and Horseless Vehicle Journal.

Dear Sir,—I have watched with the deepest interest the turn matters have taken in regard to this important subject, which, if properly handled, may be made at no remote date to constitute an industry of great magnitude and of national importance. Those who have not especially studied it appear to be under the erroneous impression—possibly from the fact of the newest form of motor-vehicle having been introduced from the Continent—that the subject is new to our country. This, however, is far from being the fact, for at one time we led in this branch, and indeed at the commencement of this century we in England were quite as far advanced, at least in regard to the heavier type of self-propelling vehicle, as are our Continental friends to-day.

In 1831 steam stage-coaches were running regularly, punctually, and satisfactorily between the towns of Cheltenham and Gloucester, giving great satisfaction to passengers, and conveying them at a cheaper rate than the horse-drawn stage-coaches of the time. In 1846 steam stage-coaches were running every hour between St. George's Square, Glasgow, and Paisley; these being so well patronised that they were almost always overcrowded, and had to be supplemented by a kind of trailing dog-cart, conveying six persons in addition to the 20 passengers—sometimes, it is averred, overcrowded up to 40—carried on the coach. Further developments in both cases were put a stop to by the antagonistic and short-sighted policy pursued by the road trustees, who caused ridges of stones 18 inches in depth to be placed across the roads for the purpose of impeding the progress of the mechanically-propelled coaches to such an extent indeed as to render the roads impassable to horse-drawn traffic, the latter being compelled to make a detour during the prevalence of this unpatriotic and un-English mode of opposition. Sufficient time, however, had been given to unequivocally demonstrate the unqualified success of the innovation, with the result that owners of landed estates, farmers, and others interested in horse-flesh began to take alarm at the probable effect developments in that mode of terrestrial travel and transport might have upon their individual interests, and they in turn began to offer the greatest possible opposition in their power. This opposition unhappily was rendered but too effectual through their obtaining the passing of most iniquitous highway bills, by which mechanically-propelled vehicles were taxed so highly in their running on turnpike roads as to render their earnings unremunerative; such tolls, indeed, amounting in some instances to as many pounds for steam-carriages as shillings were charged for horse-drawn vehicles.

The effect of all this was to nip in the bud, so far as rural highways were concerned, the industry which we to-day are re-inaugurating. In towns the onerous restrictions weighed less heavily, and in 1832 we had in London a line of steam omnibuses plying regularly and satisfactorily between Paddington and the Bank, whereby it was proved that—even with the comparatively primitive steam-engine then available—an expenditure of but 14 lbs. of coke per mile was all that was necessary to propel an omnibus containing some 20 passengers, and weighing some 2½ to 3 tons, notwithstanding the fact that Pentonville Hill had to be negotiated on each journey.

About this time occurred the historical event known as the "railway mania," this having the effect of completely diverting public attention from this mode of locomotion to that by means of locomotives on smooth rails. Sufficient, however, has been done to demonstrate great economical and other advantages to be inherent to horseless road locomotion. Nothing more of public importance could be done during the existence of the legislative restrictions, and it is indeed remarkable to trace what an immense amount of work and individual experimenting has been done in our own country since that time by engineers and inventors, who knew that their efforts could not result in any public benefit unless the then existing laws were altered.

Horseless road locomotion was therefore exiled from our shores and, driven from their native land, more than one of our English-built self-propelling carriages—half a century since—sought asylum in foreign lands. One emigrated to the "States," another made peregrinations in Brussels, whilst another disported itself upon the boulevards of Paris, the patent for which, indeed, was purchased by a French Company for no less a sum than £16,000, quite a refreshing fact to contemplate in these days of the wholesale purchase of foreign patents.

Happily, to-day our highways are once again thrown open to self-propelling traffic, but, unfortunately, during the "close time" an entirely new profession has sprung up—that of the Company promoter—and in this case it has suited the pockets and convenience of these gentlemen to induce the public to believe that not only were the vehicles themselves exiled from our country, but with them went all the engineering talent, ability, perseverance, energy, and invention of which it would appear we have been foolish enough to assume our own country may have reason to be proud. Now we are invited by heads of this novel profession to pay very large sums of money for patents (*sic*) relating to what they are pleased to call "motor-cars"—vehicles which do not in any way appeal to English tastes or play their *rôle* in anything like a satisfactory manner, being, indeed, entirely devoid of that degree of luxury which has come to be identified with the productions of the British carriage manufacturer.

Upon the Continent—due in a large measure to the establishment of a large and influential "Automobile Club"—the subject of horseless road locomotion has been viewed more or less from the point of view of sport, and the attention of the French engineer and carriage-builder has been directed almost exclusively to the production of light self-propelling road vehicles, possessing the sole merit of being able to travel at a high rate of speed, such, as—very properly—is not permitted in our own country.

In Great Britain, unfortunately, we have been very slow to appreciate the advantages of good roads and proper travelling equipages. Long after the art of coach building had in other countries attained to a considerable degree of perfection, we were still travelling by saddle, transporting by pack-mule, and wading shoulder-deep in almost impassable highways. Both roads and vehicles have been steadily improved since the day when Walter Rippon constructed the first coach in this country—the one built for Queen "Bess"—until to-day we possess a system of highways extending to no less than 140,000 miles, excellently constructed and efficiently maintained, as well as equipages of all kinds, which reflect the greatest credit upon the coach-builder, and a breed of horses of which our country may be justly proud. In the face of this, and the fact that we are a horse-loving race, I think no good case has been made out for their substitution by the so-called "motor-car," or light self-propelling horseless carriage; therefore our Continental friends, confining themselves as they have to this class of traffic, have not advanced matters for us in the least degree, except in the notable instance of the Serpollet inexplosible steam generator and its application to mechanically-propelled road vehicles, in connection with which M. Serpollet's energy and ability in surmounting a difficulty once inherent to the employment of steam, and his recent very successful adaptation of liquid fuel, is worthy of the highest commendation.

There is, however, a side to the horseless road-locomotion movement which should be fraught with the greatest advantage to our country, and that is the mechanical road-transport of goods and the public conveyance of passengers. Occupying the first position in this relation undoubtedly is the adaptation of mechanical road transport to the exigencies of modern agriculture, then to passenger transport by means of omnibuses—with the horse-drawn prototype of which our streets have now become so inconveniently over-crowded—and lastly, but of vast importance, the delivery of all kinds of goods, not only by forwarding agents, but by all classes of our tradesmen. For such work, with the exception of the very lightest type of trade delivery cart, there can be no shadow of doubt that the most suitable motive power we possess to-day is steam, and after that, for urban service, electricity. In regard to these, the engineers of this country certainly require no extraneous assistance, either from the Continent or elsewhere, and my great wish in craving space in your columns is to draw public attention to this fact. With regard to petroleum motors, undoubtedly there is a vast field in store for these in connection with the lighter types of vehicle so soon as they shall have sufficiently developed as to become apposite for fulfilling the conditions required of them in this relation, and in regard to which English engineers, now that there are excellent prospects of an ample return for their labours, are now making steady progress.

We have in our own country engineering works of vast extent, most perfect organisation, and successful working, as the high class of the products turned out serve to show. We have also carriage-builders of eminence who can hold their own against foreign competitors. All that is wanted is the friendly co-operation and the taking of energetic measures on the part of English engineers and coach-builders, to bring about the much-desired change in our modes of road locomotion of the heavier or mercantile type. In my position as Hon. Executive Commissioner of the International Carriage Exhibition recently held at the Crystal Palace, I had the great advantage of conversations with each type of manufacturer, and I saw the paramount necessity for this co-operation, and I further ventured to suggest a scheme by which it could be fulfilled, and which has been received in a very gratifying manner by those interested. It is that neither carriage-builders nor engineers should construct self-propelling vehicles outright, for neither are fitted for such work, but that the vehicles should be designed in such a manner that the portions properly appertaining to each class of manufacturer should be kept distinct. This is quite a simple matter if the vehicles be designed on common-sense principles, namely, if the body be kept quite distinct from the under-frame, as in the construction of railway coaches. This being done there is nothing to prevent our engineers from making their under-frames complete with their motors in large quantities, turned out to gauge and template, with the maximum of economy, whilst, on the other hand, our carriage-builders would have nothing new to trouble themselves with, but would be kept busy in utilising their great experience in the construction of bodies, comprising elegance, comfort, and high quality of workmanship and finish. In this relation it is really amusing to contrast even the latest Continental production with the earliest of our own. Take for example the steam stage-coaches, referred to as having run between Glasgow and Paisley, and which were designed by the eminent engineer, Scott Russell, who built the "Great Eastern" steamship. These carriages were most elaborately fitted up and decorated, carried 20 passengers, had the body quite distinct from the under-frames, and were slung on elastic and highly efficient C springs. In the modern Continental petroleum-carriage, which has been brought to us with such a vociferous flourish of trumpets by the Company promoter, all these common-sense arrangements have been forgotten with the result that it is the most uncomfortable of vehicles, its vibration is almost intolerable, its noise most aggravating, and its odoriferous exhalations most offensive; for these great advantages (*sic*) the British public are paying vast sums of money.

Allow me to make the following suggestion, which, if acted upon, I feel confident would have a most beneficial effect, not only in expediting the introduction of a more efficient and more economical mode of common road locomotion, but also upon the engineering, carriage manufacturing, and cognate industries of our country, namely, that an "Association," for the purpose of assisting in the development and exploitation of self-propelling vehicles of British design and workmanship, should be formed; the work of such Association to consist principally in the getting out of designs in fulfilment of the undoubtedly existing requirements of the Agriculturist, the Carrier, the Tradesman, the Cabman, the Omnibus proprietor, &c., &c.

Manufacturing engineers, coach-builders, and allied trades would, of course, participate in such an association, the machinery and mechanical arrangements of such vehicles being constructed by existing British engineering firms, whilst the bodies and general coach-building would be carried out in the manufactories of British coach-builders, or, as the President of the British Institute of Carriage Manufacturers recently and wittily put it—the coach-builders would furnish elegant bodies, and the engineers motor souls. The Association should be possessed of a suitable staff and show-rooms for the permanent exhibition of British-built vehicles, as a set-off against what would soon be seen to be the second-rate productions of foreign design, and manufacturers would be spared the great expense and labour of getting out and pushing their own designs, whilst undue competition would be avoided.

It is scarcely necessary to point out—for this has already been done by experts in the columns of many newspapers—that the claim set up by a certain Company, or Companies, as to the holding of *master* patents, cannot for one moment be maintained. It is not necessary to hold a master patent or, indeed, any kind of patent, for the purpose of building self-propelling vehicles of all kinds; but during development undoubtedly such novel devices and expedients would be evolved as would constitute subject matter for Her Majesty's patent, and thus a Company commencing to-day, without the payment of a single penny for patents, would find itself in a year or so in quite as strong a position in this regard as those having paid many thousands of pounds for patents, which, as an eminent authority has pointed out, are practically valueless.

Permit me to say that I have discussed this scheme with the leading members of both the carriage-building and engineering trades, and, further, that I am in a position to state that the operation of such a concern could be carried on under the supervision and advice of the most eminent authorities representative of both industries, and strangely enough it could begin its operations with a bundle of orders from its very inception. Were such an arrangement carried out, I am convinced it would be to the great advantage of the engineering and carriage-building industries of this country, whilst the consumer would be most materially benefited, for how could Companies, whose shareholders have spent, or wasted, vast sums of money in the purchase of patents, possibly compete with existing firms already in a high degree of organisation, and who would not have to set apart any percentage whatever for money thus sunken?

With apologies for the length of my letter.

Faithfully yours,

Alfred R. Sennett, A.M.I.C.E.,
M.I.M.E., M.I.E.E.

Institution of Civil Engineers,
Westminster, S.W. *Dec. 8th*, 1896.

A RUN IN A PEUGEOT CARRIAGE.

To the Editor of The Automotor and Horseless Vehicle Journal.

Sir,—It may interest you to know that I made a satisfactory journey in my Peugeot carriage just before Christmas, from London to my home, four miles beyond Monmouth.

Perhaps a rough description of the vehicle, a photograph of which appeared in your December issue, would not be out of place. It was built by "La Société Anonyme des Automobiles Peugeot," of Paris, and is of the phaeton type, to seat four, all facing forward; it is fitted with a detachable canopy, which has leather blinds to unroll at the sides when necessary, and a glass window in front; the wheels are built on cycle lines, with steel tensional spokes, solid rubber tyres, and ball bearings The motor is an inverted Daimler, developing 3¾ horse-power. The carriage is geared for four speeds forward and one backwards. The fuel is of course the usual rectified petroleum or petrol, and is stored in a main tank containing sufficient for a run of 90 or 100 miles; from this tank it is fed automatically into a Phénix float-feed carburettor, where the petrol is vaporised and mixed with air, ready to do its work behind the pistons when ignited by the usual platinum ignition tubes. The cooling water is circulated by means of a rotary pump. The steering is actuated by a handle-bar, and is so arranged that each wheel turns on its own pivot, and the angle of turning of each is differential. The back wheels are of course also able to run each at its own speed by means of compensating gear.

To return to the journey alluded to above, we (friend, self, and luggage) left London (Knightsbridge) at 6.45 a.m., on Tuesday, 22nd ult., in darkness and fog, owing to which we had to proceed rather slowly for some distance, but after we got out in the country we found the ground hard with frost for 20 miles or so which was favourable. The route taken was as follows:—Hounslow, Staines, Egham, Virginia Water, Reading, Newbury, Hungerford, Swindon.

Owing to taking wrong routes and losing our way we did not arrive at Purton, five miles beyond Swindon (that night's destination), till 8.30 p.m. The distance from London to Purton by the correct route is about 81 miles, but we must have covered considerably over that distance.

The next day we were delayed by the non-arrival of our petrol supply, and, after waiting until 2.30 p.m., had to leave with a supply of common benzoline. Passing through Cirencester, we descended Birdlip Hill (Cotswold) in grand style. It is very steep and treacherous, nearly two miles in length, with several sharp curves, renowned for fatal accidents. Stopping that night at Gloucester, we proceeded the next afternoon leisurely on to Ross, but we repented our late start, as it became very dark and rained heavily, and we got some miles out of our way through being wrongly directed.

Owing to these facts, and difficulties in getting oil, we did not leave Ross until 9 p.m., and passed through Monmouth, arriving home (four miles beyond) about midnight.

Nothing of any importance occurred to the mechanism during the journey, with the exception of the pump ceasing to act two or three times near the end, due to mud. Some very steep hills were ascended with ease.

Had it not been for the long delay at Purton we should doubtless have had no difficulty in doing the journey comfortably in two days, as we had intended, although we had very bad roads and weather all the third day.

I have now done between 600 and 700 miles in this carriage, including the journey between London and Cambridge four times (two of which were done before November 14th).

I think this speaks well for the car.—Yours truly,

C. S. ROLLS, Mem. S.P.T.A.

South Lodge, Rutland Gate, S.W.

LONDON ELECTRICAL CAB COMPANY.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

SIR,—We shareholders have just received notice that 10*s.* per share (£1 shares) of the above Company is due on Monday next.

So far, we have not heard of any "trial trips" of these cabs! Can you explain why all the capital is called up before one cab is placed for hire on the streets? What has become of half our capital! Is it not sufficient to complete one cab?

Myself and other shareholders will be much obliged for any information or advice you can give us *re* this Company.—Yours faithfully,

SHAREHOLDER A.

January 14th.

NEW INVENTIONS.

Compiled for "THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL" by HERBERT HADDAN and Co., Registered Patent Agents, of 18, Buckingham Street, Strand, W.C., London.

Patents Applied For.

27,354. December 1st, 1896. E. W. BONSON. An improved electrical switch for power or traction purposes.

27,368. December 2nd, 1896. R. WADSWORTH. Motor or self-propelled road or street sweeping, scraping, sanding, and watering machines, watering vans, and carts.

27,373. December 2nd, 1896. A. J. WESTLAKE. Improvements in motor cycles and vehicles.

27,381. December 2nd, 1896. A. H. ALLEN. A new or improved motive power for horseless carriages.

27,423. December 2nd, 1896. W. W. CURTIES. A variable speed and reversing contrivance for motor-driven vehicles.

27,538. December 3rd, 1896. H. C. CAPEL and T. CLARKSON. Improvements in or relating to motor-carriages.

27,591. December 3rd, 1896. T. W. NAYLER. Improvements relating to gearing for motor-propelled vehicles.

27,603. December 4th, 1896. H. C. L. HOLDEN. Improvements in the construction of internal combustion engines in combination with cycles or carriages.

27,696. December 4th, 1896. F. L. MUIRHEAD, 124, Chancery Lane, London. Improvements relating to electrically-propelled vehicles.

27,714. December 5th, 1896. H. MELLER and C. A. BURGHARDT. Improvements in the method of driving motor-cars, motor-carriages, boats, and other vehicles.

27,793. December 5th, 1896. J. A. and W. D. DRAKE. Improvements in driving apparatus for motor-carriages and the like.

27,863. December 7th, 1896. W. W. CURTIES. Improvements in driving mechanism for steam-propelled vehicles.

27,915. December 7th, 1896. C. F. WOOD. Improvements in mechanically-propelled vehicles.

28,128. December 8th, 1896. G. IDEN. Improvements in the construction of mechanically-propelled vehicles.

28,160. December 8th, 1896. J. F. SLEAT, H. SKELTON, and C. HORSLEY. Improvements in and connected with driving-gear for velocipedes, motor-cars, and other vehicles.

28,192. December 9th, 1896. H. R. GILLING. Improvements in and relating to pneumatic springs for cycles, motor-cars, and other vehicles.

28,312. December 11th, 1896. J. HURROCK and D. J. McDONALD. Improvements in and relating to motor-cars.

28,331. December 11th, 1896. E. J. PENNINGTON. Improvements in starting devices for mechanically-propelled vehicles.

28,407. December 11th, 1896. H. H. GRIFFIN and G. GIBSON. Improvements in self-propelled vehicles.

28,474. December 12th, 1896. T. BOSHER and E. MOUNTFORD. Improvements in and relating to motor-carriages.

28,476. December 12th, 1896. J. and R. BURNS. Improvements in cycles, motor-cycles, motor-cars, and other vehicles.

28,519. December 14th, 1896. G. H. SCOTT and R. H. TAYLOR. A method and apparatus for automatically changing speeds of driving gears for bicycles, tricycles, motor-cars, &c.

28,850. December 15th, 1896. H. LANE. Improvements in the method of and apparatus for applying motive power to vehicles running on ordinary roads.

28,866. December 15th, 1896. J. GEISENHOF. Improvements in steering devices or under-frames for the fore-carriages of motor-cars.

28,867. December 15th, 1896. J. GEISENHOF. An improved motor-van.

28,985. December 17th, 1896. C. D. JENKINS. Improvements in and relating to motors for bicycles, tricycles, and other vehicles.

29,062. December 18th, 1896. J. FAVETS. Improvements in driving gear for cycles, motor-cars, and other road vehicles.

29,126. December 18th, 1896. V. POPP. Improvements in compressed air locomotive carriages.

29,210. December 19th, 1896. A. H. SMITH. Improvements in driving-gear for cycles, motor-cars, and the like.

29,378. December 22nd, 1896. A. G. ADAMSON and T. SCOTT. Improvements in autocars.

29,394. December 22nd, 1896. G. F. THOMPSON. Improvements in and connected with variable speed mechanism for self-propelling vehicles and other purposes.

29,486. December 22nd, 1896. A. J. BOULT. Improvements in or relating to road vehicles and motor mechanism for the same. (P. A. Darracq, France.)

29,528. December 23rd, 1896. A. MUSKER and C. MUSKER. Improvements in or connected with steam generators for auto-vehicles.

29,635. December 24th, 1896. J. R. K. LAW. Improvements in the driving gear of cycles, motor-cars, and other vehicles.

29,856. December 28th, 1896. W. J. H. JONES. Improvements in motor-propelled vehicles.

29,882. December 29th, 1896. C. PROVIS. Improvements in motor-cars, cycles, and other vehicles driven by electric, steam, oil, gas, or water power.

29,933. December 29th, 1896. The Hon. R. T. D. BROUGHAM and W. C. BERSEY. Improvements in controlling apparatus for electrically-propelled vehicles.

30,003. December 30th, 1896. W. WATT. Improvements in and relating to cycles, motor-cars, and other road vehicles.

THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

CONTENTS of No. 1.

CONTENTS of No. 2.

CONTENTS of No. 3.

Publishers—Messrs. F. KING & Co. (Limited), 62, *St. Martin's Lane, London, W.C.*

SITUATIONS WANTED.

ROLLING STOCK manufacturer's son, age 26, with engineering and commercial experience, desires agency for motor-cars in busy centre. Large connection. Address J. A. H., care of King & Co., Limited, 62, St. Martin's-lane, London, W.C.

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AS DRIVER or CONDUCTOR.—Captain of Great Wheel, Earl's Court; take charge of motors. Joseph Banks, 34, Beer-street, Wandsworth-bridge-road, Fulham.

AS CONDUCTOR.—Thoroughly experienced; good references. F. Blackwell, 35, Percy-road, Shepherd's-bush.

AS DRIVER.—Roger system or Daimler; experienced. A. J. E., 57, Iverson-road, West Hampstead, N.W.

THE AUTOMOTOR

AND

HORSELESS VEHICLE JOURNAL

A RECORD AND REVIEW OF APPLIED AUTOMATIC LOCOMOTION.

Circulates amongst Makers and Users of Autocars, Cycles, etc., in the United Kingdom, the Colonies and the Continent.

VOL. I. NO. 5. FEBRUARY 17TH, 1897. PRICE SIXPENCE.

CONTENTS.

BENZINE MOTOR-CYCLE.*

ONE is apt to feel that the railway locomotive is a magazine of power, an annihilator of distance, an embodiment of energy, and altogether a marvellous production which commands respect almost as if it were a thing possessed of life and intelligence. Recently a locomotive has been devised for the use of the individual, which is no less interesting than the railway locomotive. It combines the peculiarities of the bicycle and the locomotive, and forms a new species of machine known as the motor-cycle. The particular machine which we illustrate was made in Munich, Bavaria. It was used in Germany by Mr. Henry Hirsch, of the *Scientific American* corps, and was by him brought to this country. It has been run over the ample floors of this office, much to the interest and amusement of the *employés* and visitors who chanced to be present at the time.

We have made an elaborate set of illustrations on account of the novelty of the machine, as well as the interest attached to the motor, aside from its connection with the bicycle.

Fig. 1 is a side view, partly in section. Fig. 2 is an enlarged perspective view of a portion of one of the cylinders, showing the valve motion. Fig. 3 is a sectional view of the benzine reservoir. Fig. 4 is a view of the igniting apparatus, with parts broken away to show the internal construction. Fig. 5 is a detail view of one of the ignition tubes. Fig. 6 shows the valve controller.

The frame of the machine is formed of four parallel tubes, two upon either side, connected with the main journal boxes of the rear or drive wheel, and united at their forward ends with two pairs of oblique tubes connected by cross-bars at the top, and carrying the steering head, in which is received the shank of the front fork, as in an ordinary bicycle.

Between the two pairs of horizontal bars are secured two motor cylinders, formed in one casting, and provided with a water jacket. The cylinders contain pistons connected by piston rods with the crank on the main shaft. The bearings of the crank-pins, as well as the bearings of the main shaft, are rendered nearly frictionless by the use of balls, as in the bearings of an ordinary bicycle. The cylinders are single-acting, and the cranks, which are on opposite sides of the rear wheel, are parallel, and extend in the same direction. The engines work on the four-cycle principle, and are so timed as to give one effective impulse for each revolution of the drive wheel.

On the top of the cylinder, above the explosion chamber at the rear of the piston is a valve-chest, containing two pairs of poppet-valves, one pair to each cylinder. The valve-chest is furnished with two separate chambers, one for the supply of the explosive mixture, the other for the escape of the exhaust, and the valves are held to their seats by spiral springs surrounding their stems, as shown. The valves which admit the explosive mixture are provided with light springs, so that when the pistons move forward the valves open inward automatically; but the exhaust valves are furnished with heavier springs, which hold them to their seats at all times, except when they are depressed by the valve operating levers, A A'.

These levers are made to open their respective valves in alternation by the peculiar combination of levers shown more clearly in Fig. 2. Upon the side of the rear or drive wheel is secured a cam, B, upon which presses a roller, *a*, carried by the arm, *b*, jointed to the lower side bar. A rod connected with the arm, *b*, is jointed to one end of the lever, C, the opposite end of which carries the hook, D. To the hook, D, is pivoted a three-armed lever, E, which is held in frictional contact with the hook by a strong spiral spring.

* From the *Scientific American.*

M 2

Pivoted to the top of the cylinders are two arms, *c*, *c'*, which are pressed towards the centre of the cylinder by springs. The forward projecting arm of the lever, E, is capable of bearing against the free end of one or the other of the arms, *c*, *c'*. The shorter arms of the lever, E, are alternately brought into engagement with studs, *d*, *d'*, projecting from the top of the cylinders. The angled arms, A, A', are pivoted on a rod supported by ears projecting from the cylinders, and their downwardly projecting ends are engaged in alternation by the hook, D. This action of the exhaust mechanism controls the machine.

The ignition of the charge is effected by heating the nickel tubes projecting about 2½ inches from the rear ends of the cylinders into the ignition box. In this box is placed a heating vapour burner, receiving its vapour from the vertical tube at the side of the box, which contains a wick saturated with benzine supplied from the reservoir. The tubes extend into a fireclay chamber, in which are loosely placed three nickel spirals below the tubes, for distributing and retaining the heat. The heating through the action of the engine. The tube, *i*, projects into the reservoir, and is provided with a hollow spherical lower end in which is formed a transverse slot. In this tube is inserted a wire or gauze cone connected at the top to the regulating valve, H, which latter also communicates with an air-supply valve, *k*. The regulating valve, which is thin, is arranged to slide over the opening which communicates through the pipe, *l*, with the supply side of the valve casing. The proportion of benzine vapour and air conveyed to the engine depends upon the position of the valve, H, and this is regulated by the lever, *m*, pivoted to the handle bar and connected with the valve, H, by a rod. The lever, *m*, at its free end has a latch which is arranged to pass under a lug projecting from the handle bar when the valve is closed, and when the lever is released to open the valve, the regulating cone screwing on the end of the lever rests against a finger projecting from the handle bar, and serves to adjust the position of the valve by engagement with the finger as it is screwed along the threaded end of the lever.

Fig. 1.

burner, arranged in this way, effectively heats both nickel tubes, thus insuring prompt and regular explosions. The ignition tube is provided at its inner end with a flange which is clamped in place by a yoke, shown in Fig. 5. The lower oblique tube on one side of the machine conveys air to the burner, and the oblique tube on the other side serves as a chimney for carrying the products of combustion from the burner. These tubes terminate in a comparted hood, F.

The benzine is contained in the reservoir, G, supported by the oblique tubes at the front of the machine. This reservoir is connected directly by the small pipe, *e*, with the burner which heats the ignition tube. In the top of the reservoir, G, is inserted a screw-capped filling tube, *f*, the lower end of which is covered with wire gauze. To the top is attached a screw-capped nipple, *g*, through which extends a wire having on its lower end a cork float, by means of which the depth of the liquid in the reservoir is ascertained.

A conical air supply tube, *h*, projects into the reservoir, and is provided at the top with a hood through which air enters into the reservoir. This hood is furnished with a check-valve which keeps the tube closed except when a partial vacuum is formed

The exhaust escaping through the exhaust valve is taken to a hood, I, made in the form of a hollow quarter-cylinder, which is divided into two compartments by a perforated curved partition. The exhaust pipe enters into the smaller compartment, and the larger compartment is filled with asbestos cord. The convex surface of the hood, I, is perforated. The asbestos cord serves as a muffler, which deadens the noise of the exhaust.

Over the drive wheel is supported a curved water tank, which is connected with the water jacket surrounding the cylinders, and the circulation of water serves to prevent the overheating of the cylinders. Strong elastic bands are connected with the connecting rod and with an arm mounted on a rock-shaft at the top of the cylinder. These elastic bands may be put under tension to assist in starting by means of a screw at the top of the frame, which is operated by a crank and mitre gear. The oil for the lubrication of the cylinders is contained in the upper oblique tube of the frame, and is fed to the cylinders by a sight feed, o.

To start the motor-cycle, the reservoir, G, is partly filled with benzine or gasoline; the door at the back of the ignition box is opened, and the burner for heating the ignition tube is started by giving it a preliminary heating by means of an alcohol torch. As the door at the rear of the ignition box

Fig. 2.

F.G. 3.

is opened for this purpose, the air supply pipe is closed automatically by means of a connection with the rear door. When the tubes are red hot the valve, H, is opened, the rubber bands are put under tension and the machine is moved forward by the operator until an explosion occurs, when he mounts the machine and proceeds on his way. The proportion of the supply of air charged with petroleum vapour and pure air is regulated by the

Fig. 4.

valve, H. By manipulating the cone on the lever, m, the supply of explosive mixture, and, consequently, the speed of the machine, is regulated. When the machine is fairly under way, the tension of the rubber bands is released.

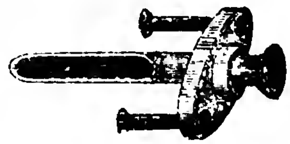

Fig. 5.

The action of the machine is as follows:—The forward motion of the piston draws in the explosive mixture through the valve, H, as already described. On its return, it compresses the explosive mixture in the explosion chamber behind the piston,

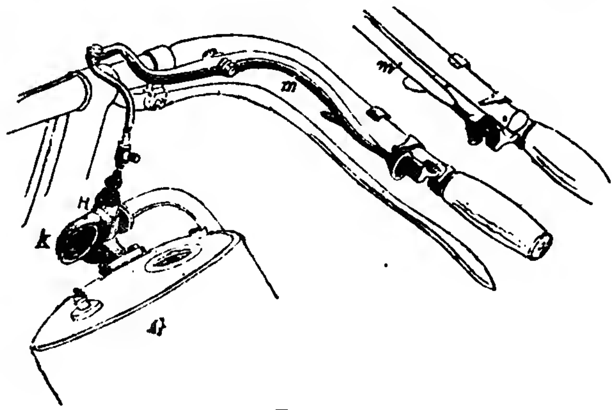

Fig. 6.

and a portion of the mixture is forced into the hot tube, where it is ignited, forcing the piston outwardly, giving the propelling impulse. The return stroke of the piston expels the products of combustion through the exhaust valve, which is opened by the cam, B, at the proper moment through the agency of the roller, *a*, and the hook, D, as already described, and the cylinders operate in alternation, thereby giving one effective impulse for each revolution of the drive wheel. To stop the machine, it is only necessary to close the valve, H, and apply the brake in the usual way.

The engine cylinders are $3\frac{9}{16}$ inches in diameter, with a stroke of $4\frac{3}{4}$ inches. The supply and exhaust valve apertures are $\frac{1}{2}$ inch diameter. The benzine reservoir is 13 inches long and $7\frac{1}{2}$ inches in diameter. The driving wheel is 22 inches in diameter, and the guiding wheel is 26 inches in diameter. The pneumatic tyres are made specially large and heavy to support the weight of the machine and rider. The tread of the machine is 4 feet; weight when in running order, 115 lbs. The reservoir contains a supply of benzine sufficient for a run of 12 hours. The machine is able to run at a speed of from three to 24 miles per hour.

MECHANICAL TRACTION OF ROAD CARRIAGES.

This, the fourth and last of the series of Arnold Lectures for the present session, was delivered by Mr. James W. Thomson to a large audience, in the Gymnasium of Gordon's College, Glasgow, on the 30th ult. Ex-Baillie Kemp, one of the Governors, presided. The subject was dealt with under three heads—steam, oil, and electric power. At the outset, a description was given of a steam van recently constructed by the Thornycroft Steam Carriage and Van Company, Chiswick, London, as illustrated by The Automotor and Horseless Vehicle Journal. The van weighs, with its boiler—which is of the vertical water-tube type—motor, and accessories, some 30 cwts., and has a carrying capacity of one ton. The Serpollet system of steam-car propulsion was then dealt with, and by means of a number of sectional diagrams the principle of the invention explained. The boiler is constructed of steel tubes of a concave form, which are very thick compared with their aperture, which is only a thin slit curved to follow the section of the tube. The slits vary in width from $\frac{1}{25}$ inch in the smaller sizes to $\frac{1}{8}$ inch in the larger tubes. The tubes are brought to a red heat, and a hand-pump is used to inject into them a small quantity of water, which is instantaneously turned into steam. On its passage through the upper tubes the steam becomes super-heated, and is delivered to the motor in this state, thus effecting economy in working. The motor now begins to work, and operates an automatic feed-pump, which delivers a constant supply of water to the boiler, no further attention being required by the driver. The speed of the engine, and therefore of the vehicle, is controlled by regulating the amount of water injected into the boiler, so that steam sufficient for the registered speed only is supplied. This is effected by means of a three-way valve placed between the feed-pump and the boiler. At full speed the valve is turned into a position allowing all the water from the pump into the boiler. When a lower rate of speed is required, part of the water from the pump is intercepted by the valve and returned to the feed supply tank; and when required to stop the car, the valve is adjusted so that all the water is intercepted and returned to the tank. No more steam being generated, the engine ceases to work, and the car comes to a standstill. A variety of views were shown of carriages and vans fitted with Serpollet generators. Attention was next given to oil-driven vehicles, the lecturer describing very fully the principle and construction of the Daimler motor, which, he stated, is that at present used by the bulk of the Continental motor-carriage builders. Oil engines, it was pointed out, differed only in detail, the principle being the gasification of petroleum, the vapour being mixed with air forms an explosive gas, which is ignited in the motor-cylinders, the force of the explosion driving forward the piston and operating the crank through the connecting rods. Sectional drawings and views of carriages, for pleasure and business purposes, fitted with oil motors, were projected on the screen, and the main features explained, as were also drawings and views of electrically-driven vehicles. In this connection the storage battery was explained, as being the main source of power in electric carriages. A very fine specimen of the coachbuilder's art was shown in a Victoria, just completed by Messrs. Thrupp and Maberly, London, for the Queen, from the designs of a Spanish electrical engineer. Information is meantime being withheld as to the nature of the elements of the primary dry battery, with which the carriage is fitted, the bare statement being made that the battery complete weighed only 2 cwts., and has a capacity and output to give a speed of 10 miles an hour for a period of 60 hours without requiring to be recharged. The recharging is also said to be easily and cheaply accomplished. If the statement furnished is realised a revolution in the use of electrically-driven carriages is bound to follow. The lecturer concluded by referring to the change of the conditions affecting motor-car traffic by the Act that came into force on November 14th last. The removal of restrictions should encourage a demand for self-propelled vehicles, and greater efforts on the part of carriage-builders and engineers to produce carriages of convenient and attractive design, and motors and driving-gear which can be manipulated and controlled with a minimum of skilled attention. An enthusiastic vote of thanks was accorded to Mr. Thomson.

AN AMERICAN VIEW OF THE FUTURE OF MOTOR-CARRIAGES.

As our cousins in the United States have had a considerably longer experience of the agricultural uses to which motor-wagons can be put, the following views, adopted by their experts, from a leading contemporary will doubtless be of interest:—

"There are two different ways of looking at motor-carriages—the business way and the pleasurable way. For the moment, at all events, it is the former that seems to have the greater future before it. Notwithstanding the immense extension of railways, there are still large tracts of country in which the sound of the passing engine is either not heard at all, or heard but very faintly. The slow-moving wagon is still the only means of carrying goods to market. Here, if there be anything in vendors' assurances, is a field for the new industry which can be worked with great profit. Every kind of agricultural produce will be heaped upon motor-wagons, and that large item in the cost of farming which is concerned with the management and care of horses will be suppressed. The motor-wagon, or the motor which is to draw the wagon, will be loaded as opportunity offers, and then will start for the distant town or station with no more outlay in labour than the wages of the man who sees that the power, whatever it is, is in working order, and that the machine itself is under proper guidance.

"But what is really wanted in many parts of the country is a co-operative motor—a motor which shall go about the villages and pick up a wagon here and a cart there, and so put large farmers and small farmers on a level in regard to the carriage of their goods. That this is impossible now we can quite see, but it may not be always impossible. It may not, that is, be beyond the power of science to devise a kind of vehicle, or a mode of coupling vehicles together, which shall make it safe to attach many to the same motor, even on an ordinary road. There will be abundant stimulus to the ingenuity of inventors in the large profits that might be made by anyone who can put an end to what is for the moment an insuperable difficulty."

Mr. W. Worby Beaumont has issued a notification that his civil and mechanical engineering practice, in favour of which he has resigned his editorial connection with *The Engineer*, will now receive his undivided attention at 222, Strand, London, W.C.

sowed brains and conscientious labour; they reap a golden harvest to-day. Their carriages, combining the best points of London and Parisian vehicles, and this combination improved not a little by the technical skill and artistic tastes of the brothers, are models of serviceableness and beauty. Orders come to the firm from all parts of the world; the "Heir apparent," Prince of Wales, added his patronage. Medals and diplomas, more than we have space to inventory, were awarded in various exhibitions. The extensive show-rooms at the corner of St. Vincent Street and Bothwell Circus, and the manufactory and principal show-rooms in North Street, where over a hundred workmen are employed, are well worthy of a visit.

Mr. Alexander Henderson is an honorary member of

of the principal cities?"

"It will be a long time before we see them largely used in our streets, at any rate as pleasure carriages. They may be more fully adopted for traction or commercial purposes, and the relieving of horses of their heavier burdens."

"Are the carriage-builders perfectly ready and willing to co-operate with engineers in evolving the carriage of the future?"

"I think the carriage-builders are perfectly willing to co-operate with the engineers in evolving the carriage of the future. We should all aim at improvement and development."

"Do you like the present Continental types, or do you expect to see an entirely novel departure made for this special purpose?"

M 4

"I think perhaps the present Continental types, that of the phaetons, have been selected for their adaptability for the motors in use there. The same types of carriages have not been in much favour in this country for many years. I would like to see a novel departure made for this special purpose, as it would foster and emulate original research; something light, graceful, and easy, the *tout ensemble* of which will be beautiful and artistic."

"Have you yet built or used a motor-carriage?"

"Our firm made the steam-carriage in 1872 for the late Mr. Charles Randolph, of Glasgow, the eminent engineer and shipbuilder, which was exhibited in the Crystal Palace at the last exhibition."

Thanking Mr. Henderson for his courtesy, our representative requested a photo of Mr. Randolph's carriage for reproduction, and the same appears below.

ELECTRIC TRAMWAYS COMMUNICATION.

The members of the Liverpool Engineering Society held a meeting at the Royal Institution in Colquitt Street on the 1st inst., Mr. S. B. Cottrell presiding, the principal business being the reading of a paper by Mr. T. M. Bigley, on the subject of "Electric Tramways to Connect Towns with Neighbouring Districts."

Mr. Bigley said that it would be worth while, he thought, to consider the subject of how to establish a more up-to date system of communication between towns and outlying districts which are at present connected only by the ordinary roads. There were many such districts throughout the country, not sufficiently busy, it might be, to attract or need a costly railway, and which could not be so conveniently served by the recently-styled light railway, which would be well suited by and afford a remunerative amount of traffic for an electric tramway laid along the high road. There was a pretty general belief that electricity was the "coming" motive power that would meet this want. In other countries it had already efficiently supplied it, and as there were very good roads in many of our country districts, should not a combination of these two facts suggest a practical means of bringing about the desired end? Mr. Bigley then, in an interesting manner, referred to the electric tramways already established in Great Britain, and to their adoption on the Continent and in North America. Special allusion was made to the electric tramway line at Hartlepool, recently inspected by the lecturer, who remarked that there ought to be in tramways of similar design and construction, extended, it might be, to at least a light goods as well as a passenger traffic, a solution of the question under consideration.

A discussion followed the reading of the paper, and Mr. Bigley was thanked for having contributed it.

OLYMPIA MOTOR-CAR EXHIBITION.

The International Cycling and Motor Exhibition Company are opening an exhibition at Olympia, Kensington, on Saturday next, February 20th, and the management, we understand, are making every effort to make this the largest and finest exhibition that has yet been carried out. This being their first start, we trust that all those interested in the future of the motor-car industry will come forward to help make the exhibition a fully representative one, so as to include all types of vehicles and motors, together with accessories up to date. This magnificent building is certainly one of the most suitable places in London which could be selected for an exhibition of this nature, as the enormous size should give ample scope for testing the vehicles in motion, and its central position and the great facility with which it can be reached from all parts should give it every opportunity of being a success from a commercial point of view. It is proposed to hold a series of grand bicycle races, and to have other entertainments, &c., to attract the people. The management is in the hands of Mr. Wallace Jones, and the Secretary is Mr. Cuthbert F. Griffin. To those who are interested practically in motor-cars, &c., who have not already secured spaces in the building, we would suggest that they should at once communicate with the management with a view to exhibiting vehicles, &c., as we are pleased to learn that the whole exhibition is in the hands of entirely independent gentlemen, whose great endeavour will be to place every type of vehicle and motor upon an equal footing, and give the best opportunities for testing the merits and examining into the details of the various claims of inventors, carriage-builders, &c.

Mr. Randolph's Steam Carriage.

THE ABERDEEN MOTOR-CAR DEPUTATION.

The Links and Parks Committee of the Aberdeen Town Council met on the 27th ult., under the presidency of Mr. Wilkie. The report of the motor-car deputation, whose doings in London were fully reported in our last issue, was accepted, and the deputation thanked for their diligence. It was agreed to take no action in the matter meantime.

The report is as follows :—In submitting their report your deputation have to state that it is not their intention to deal with every kind of motor vehicle in the market. They have confined their investigations mainly to the question of the practicability of applying self-propelling power to a heavy vehicle, such as would be required by the Links and Parks Committee as a conveyance to and from the beach. Your deputation have had opportunity of inquiring into the various possibilities for this purpose of oil, electricity, and steam, and of in some degree gauging their possibilities for the future, and they are pleased to be able to lay before the committee definite views as to which of these motive powers is best suited for the kind of vehicle referred to.

Oil Motors.

The Daimler Company, which deals in oil-motors, was first visited. This Company is at present devoting all its energies to the manufacture of small motor-cars, and has not yet experimented with anything larger than a vehicle to hold three or four persons. An offer was however made by this Company to supply an omnibus to hold 20 persons for the sum of £348, but hearing various opinions from the manager and his assistant, your deputation came to the conclusion that the oil-motor in its present state of development is practically useless for a heavy omnibus.

Electricity.

Your deputation next directed their attention to electricity as a locomotive power, and, along with Mr. Georgeson, of Mr. J. T. Clark's Coachbuilding Works, Aberdeen, visited Messrs. White, Jacoby, and Co., electrical and mechanical engineers, Blenheim Place, Camden Town. One of the chief objections to the electric motor-car is the great weight of the necessary accumulators. The firm of Messrs. White, Jacoby, and Co. are at present endeavouring to remove this difficulty, and are the inventors of the lightest accumulators now in the market; but your deputation were disappointed to find that an omnibus to hold 20 persons, even although fitted with this accumulator, would weigh over four tons. The expense of such an omnibus would also be very great. The battery would cost about £120, and the cells are expensive and require frequent renewing. In view of this, and the still greater objection that it takes one hour to charge the accumulators for a three hours' run, your deputation were forced to the further conclusion that electricity is also at present impracticable. These conclusions were confirmed by a visit to Messrs. Julius Harvey and Co., Queen Victoria Street, a firm which is connected with all the important motor-carriage builders in Britain and on the Continent. The representative of this firm maintained that steam is the only motive power which is capable of doing the work required by such a vehicle, and that there is no immediate prospect of either oil or electricity taking its place where much power is required.

Steam.

He referred your deputation to the Serpollet Company as being able to supply a vehicle to go on rails or road, which would exactly meet the requirements of the Links and Parks Committee. Your deputation were informed by Mr. Harding, of the Serpollet Company, that cars worked on this system could be seen at Willesden on tramway rails, and that a small road-car worked on the same principle was also in operation there. The Serpollet tramway-car as seen at Willesden was a large vehicle capable of holding 50 persons. The shape was the same as that of the ordinary horse tramway-car, and the motor, being situated beneath, was not visible. The principle of the Serpollet system has already been given in the public prints, and the following advantages are claimed for this form of car or omnibus :—(1) The instantaneous generation of vapour ; (2) the great elasticity of power, which can be raised in one moment from 1 horse-power to 20 horse-power ; (3) freedom from all danger of explosion ; (4) absolute control over both stopping and starting ; (5) absence of steam, smoke, noise, and vibration ; (6) the automatic cleansing of the boiler by the rush of vapour ; (7) great economy over horse traction. With regard to this last, the cost of running is computed at about half of that where horses are used.

This kind of car has been used with great success in Paris during the last two years on rails, but the Company claim that they are equally adaptable to road and street traffic, and affirm that they have received an order from the Paris Omnibus Company for 60 omnibuses to be worked on the same principle. The small street-car, although not so shapely a vehicle as the rail-car, worked admirably, and, from the exceedingly ingenious construction of the fore-axle, was very easily and quickly turned. The Serpollet car can be worked and controlled by an ordinary intelligent person, and, as has been stated, there is no smell, or vibration, or danger of explosion. It is equal to the electric car, even with a reduced weight of accumulators, and has an immense amount of reserve power for gradients and increase of speed.

This form of car is also very highly recommended by Sir David Salomons, one of the highest authorities on the present motor-car movement, and a practical engineer himself. This gentleman, speaking at Liverpool in the month of November, said :—

"My faith more than ever is pinned to steam after seeing the recent carriage of M. Serpollet in Paris. It runs up the steepest hill as on level ground. The ride from Paris to Versailles is very hilly, and with my carriage (which has an oil motor), I required an hour and twenty minutes to make the journey, but the little Serpollet carriage covered the distance in somewhat over half an hour, and on the long steep incline it rushed in front of every other vehicle, whether motor or horse drawn. There is not the slightest doubt but that the steam carriage, as solved by M. Serpollet, is the coming one. The boiler is small, non-explosive, and self-cleansing. The burner has nothing in it to get out of order, and the power given off is enormous compared with the size and weight of the vehicle. Sixteen English miles can be covered with this carriage easily per hour." Sir David Salomons further says :—"I have expressed myself very strongly that steam, and steam alone, will be the motive power of the future for self-propelled traffic. I feel confident that within a short time nine out of every ten motor vehicles will be constructed with steam motors."

After such an expression of opinion by so eminent and disinterested an authority as Sir David Salomons, and from what your deputation were able to see for themselves at Willesden and elsewhere, they have no hesitation in saying that the Serpollet car is the only thing in the market, or likely to be in the market for some time, which would suit the requirements of the Links and Parks Committee for the conveyance of passengers to and from the sea beach. Since your deputation returned, they have been in correspondence with Messrs. Julius Harvey and Co., with the view of obtaining from the Serpollet Company a price for supplying an omnibus. From the information received your deputation believe that a Serpollet omnibus, to hold from 20 to 30 persons, will cost from £600 to £700. The French makers, however, are so full of work they cannot supply England, and the English Company have not yet completed their own manufacturing arrangements. Under these circumstances, your deputation beg to recommend that the Council should defer giving any order until matters are further developed, as they believe that better terms will be got in a short time, when the Serpollet English factory is in operation.

THE STIRLING MOTOR-CARRIAGE.

This vehicle, which we illustrate herewith, has attracted great attention during the present month in Glasgow, where the public have been treated to a practical demonstration of its capabilities, and the amount of interest and enthusiasm aroused has been enormous. Messrs. J. and C. Stirling, of Glasgow, the builders, are to be congratulated on the unqualified success of the trial runs of their first car. The car left the carriage works for its first run on Saturday morning, the 6th instant, and a correspondent writes us as follows on the way it performed:—Proceeding along Cadzow Street, it was turned into Quarry Street to test its hill climbing qualities. This gradient was surmounted at the rate of six to eight miles an hour. The car then proceeded *viâ* Duke Street to Larkhall and Stonehouse. All the hills were taken at the same rate, including the long steep ascent out of Larkhall. On the return journey, in running fast downhill, the capabilities of the stopping and starting arrangements were fully tested, when it was found that the car at all times was under the absolute control of the driver. The brake gear is so perfect and complete that at any time the car can be brought to a standstill within a few yards. On Monday, over frozen roads, the car was driven *viâ* Bothwell and Uddingston to Glasgow, reaching the city under the hour, where it proceeded along Argyle Street, Union Street, Renfield Street, Sauchiehall Street, Bothwell Street, to the Central Station, Gordon Street, Buchanan Street, Jamaica Street, Eglinton Street, Cumberland Street, up Stockwell to Argyle Street, then back to Buchanan Street *viâ* Queen Street and St. Vincent Place, returning to Hamilton by Rutherglen and Cambuslang. Its behaviour in the thick of the traffic was perfect—stopping, starting, and reversing at the will of the driver. On Tuesday, several parties of local ladies and gentlemen interested in the new mode of locomotion were driven round the district, including a climb into Motherwell. All were delighted with the ease, comfort, and safety with which the car could be manipulated under all conditions. With regard to the cost of running the car, it may be stated that the fuel consumed is exactly in proportion to the work done, and the consumpt ceases the moment the car is stopped. The cost works out at about one halfpenny per mile, which on a run to Glasgow and back, carrying four to six persons, would cost something under threepence per head. For those who have not seen this carriage, we are able to furnish them with a brief description of it. The car is built to seat four persons on two seats, both looking forward, somewhat on the lines of a mail or Stanhope phaeton, the back seat being slightly raised in order that the view may not be obstructed by the persons occupying the seat in front. The body is varnished natural walnut, and the wheels and under carriage painted vermillion, with black lines. The car is driven by a two-cylinder Daimler oil motor, carried in a neat casing in front of the dash-board. It has now been demonstrated that the motor-car is a thoroughly practical vehicle, and it is only a matter of time when it will come into regular and general use. A very important point, and one which will interest all who contemplate acquiring motor-cars for trade purposes, is that the method on which Messrs. Stirlings' motor-cars are constructed admits of interchangeable bodies, so that the owner of a motor-van may in a few minutes convert it into a comfortable pleasure carriage.

We understand Messrs. Stirling are at present engaged on new designs for light, handy motor-cars to seat two persons, fitted with bicycle wheels and pneumatic tyres, for which there is certain to spring up a very great demand. At their recent exhibition a very neat design for parcel-delivery van was shown, and they hope shortly to have in hand a serviceable wagonette to carry eight persons. Messrs Stirling are to be congratulated on their enterprise and foresight in taking up a new industry which must ere long rival and surpass in importance the vast cycle trade. We believe the firm have recently been approached by several Glasgow capitalists with the view of acquiring their business and the benefits of certain advantageous working arrangements with the leading motor manufacturers in England which the firm have secured, in order to at once develop the business on a scale commensurate with its importance, and at the same time maintain the premier position in Scotland which the firm has already attained. Should the proposal be accepted, a very rapid development of the new industry is certain to take place, and employment found for a large number of hands.

NOTES OF THE MONTH.

THE abandonment of the North-Eastern Railway Company's scheme for a proposed railway between Cramlington and Blyth was a sore disappointment to the local public. But, failing to secure the needed assistance in that direction, a new scheme has been formulated by Mr. Mark Doney, of Shankhouse, the object of which is to secure improved communication between the town of Blyth and the outlying districts. The advent of the motor-car opens out a means by which the residents in the Cramlington and Shankhouse localities may more conveniently connect themselves with the world outside their own immediate district.

A CAPITAL exhibition of autocars was held last week at the Waverley Market, Edinburgh, when the vehicles exhibited—most of which have been illustrated in these columns—attracted a very large number of visitors.

WE are favoured with the compliments of the British Electric Traction Company, and a pamphlet on various methods of tramway working, having special reference to electric traction. We refer to it here because the overhead system of the distribution of electrical energy is fully described, and the system is given the testimonial of being superior to any other "for simplicity of operation, cheapness of construction, flexibility in adaption, and reliability in service." American and Continental companies have the credit of having carried the system through its experimental stages, and upon it is worked quite 95 per cent. of the world's electric tramway mileage. The percentage is doubtless correct; but the British public will be long before they adopt the hideous ugliness and great dangers to life which are involved in overhead electrical systems.

MILITARY men are discussing very seriously the possible uses in war of the motor-car. In a modern battle it might well seem to be as much out of place as Queen Boadicea's scythed chariots, but it might be made useful as a kind of movable hospital and for the conveyance of the wounded to the rear. Armour-plated and furnished with Maxims or other light and quick-firing guns, the car might conceivably be used to charge an enemy. Caran d'Ache several months ago made what he calls "Automobilism in War" a subject of one of his caricatures. He imagines an automatic clockwork soldier running on wheels, and serving the double purpose of a stalking-horse and carrier of soldiers' kits. The military motor-car would furnish equally good material for the caricaturist, but the idea of using it as a moving fort is not wholly absurd. Indeed, according to the *Army and Navy Gazette*, some prominent military officers are of opinion that the motor-car, when perfected, is destined to be to the army what the torpedo-boat is to the navy.

AN exhibition of motor-cars and cycles was, during last month, conducted in two of the showrooms of Messrs. J. and C. Stirling, coachbuilders, Hamilton, the proceeds being in aid of the funds of the Orphan Homes of Scotland.

MR. WORDIE, of the firm of Messrs. Wordie and Co., of Dundee, made merry one evening recently with his employés over the threatened advent of the motor, and stated that "several times he had told his Dundee employés, in a jocular way, that they would be able to do away with horses, that the carter would walk into the office and get his box of electric energy for 10, 15, or 20 miles, that he would then screw it on to his cart, turn a handle, and drive away. He did not think there was any probability of such a thing coming to pass in their day. But the motor-car had been developed, and would stay, although whether it would be a success was quite a different matter." The reform may not come in the way Mr. Wordie has sketched—but it is not safe for him to prophesy as to the ultimate result.

CONSIDERABLE speculation has been aroused by the registration of a limited company, entitled the "Maxim Motor Company (Limited)," with a total capital of £7. We are not aware whether the whole of this amount of capital is "called" or not, or whether any portion of it is held in reserve. Inasmuch, however, as the "Company" has been formed to adopt an agreement between Mr. H. Maxim and the "Company," and, as amongst its professed objects is stated to be the manufacture of "flying machines," many people have not unnaturally jumped at the conclusion that Mr. Hiram S. Maxim is associated with this somewhat curious enterprise. We are, however, able to state, on the authority of a letter which we have received from Mr. Hiram S. Maxim, that he has nothing whatever to do with the matter. The Mr. "H." Maxim referred to is Mr. Hudson Maxim, a very different person.

IT is, of course, a matter of common knowledge that Mr. Hiram S. Maxim has been for some time engaged at the Maxim-Nordenfelt guns and ammunition works in the designing and construction of several types of light motors; and the step which has been taken in registering the title of the Company referred to is obviously an unscrupulous attempt to gain possession of a name which it is judged would be an attractive one to the investing public. Mr. Maxim has, we understand, placed the matter in the hands of his solicitor, though we very much doubt that he will be able to obtain any legal redress for having been forestalled in such a manner.

THE Electricity Committee of the St. Pancras Vestry, considering the probable extensive demand for current to charge the accumulators for motor vehicles, hold that every facility should be granted to encourage this class of consumer, having regard to the fact that the charging would be carried out during the hours the central stations were running on a light load. Subject to special regulations as to the hours of charging, they have fixed the price for charging accumulators at 2*d*. per unit.

AT a public meeting in the Wednesbury Town Hall, on the 3rd inst, the Mayor presiding, a resolution was passed, on the motion of the Mayor, seconded by the ex-Mayor, sanctioning the decision of the Town Council to oppose in Parliament the Birmingham, Wolverhampton, and District Tramways Bill, 1897.

Mrs. Wood, the proprietress of some factory buildings near Mitcham Common, who died last week, had a great taste for inventing. One of her latest ideas was the invention of a motor-horse, which could be attached to any car. Mrs. Wood had had several models prepared, but the work was not completed before her death. We gave a description of this motor in our December issue.

As there has been some discussion recently as to municipalising the tramways, it is of interest to note what a vast enterprise tramways have become in the United Kingdom, which originally was very slow to take the movement up, and gave George Francis Train, the inventor of tramways, but a cool reception when he came from America to England to try and introduce the new system of street locomotion. A Parliamentary Return just issued shows that the authorised capital of all the tramway companies in the United Kingdom amounts to over £18,000,000, and of this nearly £14,000,000 of capital is for English and Welsh companies. The paid-up capital, however, is only £14,157,354 for the United Kingdom, and £11,160,108 for England and Wales. The total capital expended during the year was £11,742,204, as compared with £11,685,355 in the preceding year. The total for the United Kingdom was £15,195,993, against £14,956,343. The length of line open for public traffic in the United Kingdom was 1,009 miles, an increase of 27 miles on the preceding year.

Mr. Albert Scarfe, of High Street, Colchester, arranged last month a novel method of helping that deserving institution, the Essex and Colchester Hospital. He placed at the service of all comers a handsome brougham motor-car, on the condition that not less than sixpence was contributed to the hospital. The secretary of the institution (Mr. C. E. Bland) arranged that one of his assistants should be in attendance with a box to collect the money, and the result was a considerable sum was collected in aid of a worthy cause.

At the February meeting of the Warwickshire County Council that body had under discussion the question of enforcing the law regulating the use of light locomotives on highways. The Earl of Warwick said he had written Mr. Henry Chaplin asking if it was possible to make any alterations in the present regulations. The President of the Board of Agriculture had replied that it was not desirable to make any alterations so soon, but at the same time was good enough to say the matter should be taken into consideration. Although the police had regulations under which to work, it was almost impossible for them to arrest the driver of a car going at the rate of some 20 miles an hour. Mr. Vero urged that it would be most unwise for the Council to try and fetter the great motor-car industry. The Marquis of Hertford said the Committee thought it would be unwise to attempt any private legislation on their part at present. If they found the cars become dangerous it would then be time enough for the Committee to interfere, and ask the Council to take steps to make more stringent bye-laws. The recommendation of the Committee to enforce the law regulating the use of light locomotives on highways was adopted.

In another column we give a full report of the Aberdeen motor-car deputation's report to the Town Council; and a copy of this having been sent to Sir David Salomons, he has written the local authorities a letter, in which he gives some valuable information as to how a 'bus on the Serpollet system could be got up within a reasonable time and at a reasonable cost. He is very pronounced as to the superiority of the Serpollet motor over the other motors now in the market. Although wedded to electricity himself, he says he cannot recommend it in the meantime. Councillor Wilkie, who is the principal mover in the matter, is continuing his inquiries in regard to motor-cars, and he expects to be able shortly to lay before the Links and Parks Committee several proposals supported by high engineering authorities.

When we have tramcars running to the Pyramids we may look for football in the Holy Land. The concession of the Egyptian Government permitting the Cairo Tramway Company to lay a line of rails to the Pyramids seems to shake the dust of sanctity from the associations which have always surrounded these famous monuments of long departed ages. Imagine the shock which the antiquary, with a mind filled with the traditions of Egyptian Kings, must feel when he reads, "All the way to the Pyramids and back, 1*d*." Truly civilisation has much to answer for.

The eleventh ordinary general meeting of the Accrington Corporation Steam Tramways Company was held at the Victoria Restaurant, Accrington, on the 5th. The Chairman, in moving the adoption of the report, said he was glad to meet the shareholders under such favourable circumstances. The dividend had been honestly earned, and the Company was now in a sound condition. In the future they could look forward to a dividend of 6 per cent. on preference and ordinary shares. Mr. Riley seconded the motion, and the report was adopted. An interim dividend of 6 per cent. on preference and ordinary shares was declared, and a suggestion was made that the dividends of ordinary shareholders should be reduced from 8 per cent. to 6 per cent.

The report of the directors of the Blackburn Corporation Tramways Company (Limited), submitted to the shareholders at an extraordinary general meeting of the Company held on the 11th inst., states that the past half-year, as compared with the corresponding half-year ending December 31st, 1895, shows an increase in the gross revenue balance of £232 3*s*. 4*l*.; whilst, taking the whole year, 1896 shows a total increase over 1895 of £508 11*s*. 3*d*. The net balance of £2,026 10*s*. 6*d*. is sufficient to pay a dividend at the rate of 6 per cent. per annum to preference and 4 per cent. per annum to ordinary shareholders. According to the decision of the shareholders in December last, the directors have made an arrangement with the Corporation for electric traction on Preston Road and Witton sections, all the terms of which, with the exception of one or two matters of detail, have been settled, and the agreement is expected to be ready for completion at an early date.

Sir David Salomons, Bart., will read a paper before the Society of Arts on Wednesday, May 12th, on "Motor Traffic: Technical Considerations."

THE FLEUSS TUBELESS PNEUMATIC TYRE.

WE give herewith a couple of engravings showing the construction of this tyre, which has rapidly taken its place amongst the leading makes, and bids fair to outstrip most of them in popularity. It is succeeding on its merits, as it is very simple, easily repaired, and comfortable to ride. We have not yet had an opportunity of trying the tyre on an automotor vehicle, but hope to be able to do so shortly, when we will report our opinion. In the meantime we may state that the following claims made for the tyre for cycling purposes are completely sustained in practice:—

The tubeless tyre is precisely the same externally as any other tyre; it has all the advantages of speed attributable to the single tube without its disadvantages; it is easier to detach than any other on the market; it is the best of all puncture-resisting

INFLATED

tyres; the system of manufacture necessitates automatic sealing of small punctures from thorns, &c., while there is no additional weight or thickness added; it has no air tube to burst or get pinched between cover and rim, or to be chafed by cover, or spoke heads and nipples; it has extensible edges, therefore works more easily than any wired-on cover, or cover with inextensible edges; it holds air better than any other tyre which has an independent air tube; and it does not need a patch to repair a puncture, a blob of solution is all that is necessary, the pressure of air from inflation does the rest.

The makers of the tyre are the Tubeless Pneumatic Tyre and

DETACHED
FOR REPAIR

Capon Heaton (Limited), 31, Moor Street, Birmingham. We append a photograph of Mr. Henry A. Fleuss, the inventor of the tyre, who is a well-known patentee of ice-making and refrigerating machinery, the tyre business being only a profitable way of utilising his leisure hours.

A GOSPEL MOTOR-CAR.

WITH AN ASSISTANT-PREACHER ENGINEER!

A BAPTIST chapel in Woolwich is announced for sale, the advertisement describing it as "suitable for a cycle maker's establishment and show-rooms." Across the Atlantic the Baptists have taken time by the forelock and made arrangements whereby they can continue to propagate the Gospel even though their chapels have to be sold or let to cycle manufacturers. They have just built what is described as "the Horseless Gospel Wagon," and the originator is the Rev. E. E. Knapp, pastor of one of the New York Baptist chapels, who is well known in this country in connection with his advanced ideas of furthering the doctrines of Christianity. Mr. Knapp recognises that people will not go to chapel, so he has decided that the chapel should be taken to them. Hence the Horseless Gospel Wagon, which is propelled by a gasoline motor, and will travel at any speed up to 14 miles an hour. The frame of the vehicle is naturally rather large. The driver or engineer sits in front, whilst the minister speaks from his pulpit in the middle of the car. Around him are seats for his choir of 12 ladies and gentlemen. In the rear is fixed a powerful organ, which is played by Mrs. Knapp. Mr. Knapp is to be assisted in his work by the Rev. Dr. Henry Hudson, who will also act as assistant engineer. The horseless chapel will travel throughout New York, stopping outside saloons to enable the tipplers to hear something of the Word of God. During the winter months a tank of coffee will be kept, and this will be distributed, together with tracts and hymn-books, amongst the crowd around. The car has some resemblance to the gaudy wagons connected with travelling circuses, as it is decorated in such a way as to attract as much attention as possible.

THE WOLSELEY AUTO-CARRIAGE.

This carriage, which was exhibited at the National Show, is in the form of a dogcart, the seats being arranged for two people back to back. It has three wheels, the one steering wheel in front being similar to that of a bath chair. The framework throughout consists of tubes, rendering it very light, and yet strong.
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The Wolseley Auto-Carriage.

to fit the hardened steel bushes in the ends of the connecting-rods.

The differential speed gear is of a new and special design particulars of which we may be able to describe in a future issue, together with a section of the car. The forward and backward motions, and the application of the brake, are all worked with one lever, which can be fixed either side of the car.

The firing is effected by an electric spark from a small accumulator, which is carried in a box in the front footboard. The engine is made in a very substantial manner, and, being designed for hard use, has good long bearings, cast steel frame, &c., and an aluminium bed-plate. All the bearings are fitted with grease lubricators, which will last for a considerable time without replenishing. The exhaust discharges on to the ground, after assisting to cool the water in the tank. One good feature about the car is the handy way in which the seats, &c., are arranged to allow of ready examination of the motor and gearing.

CHEAP ELECTRICITY FOR AUTO-MOTORS.

About a year ago, when the electrical engineer to the Brighton Corporation proposed a certain reduced scale of charges for electricity supplied for lighting and motive purposes, the engineers of various electrical corporations in London wrote long
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engineers in the employment of private corporations declared that the proposals of Mr. Wright were financially impossible and must result in failure. In his report to the Brighton Corporation, Mr. Wright says:—"The financial success of the Brighton system of charging, coupled with the fact that some 29 other towns throughout the country have already decided to adopt it, is strong enough evidence of the commercial soundness of the principles on which it has been based. From last year's results we actually find that the only extra cost the Corporation are now put to in having to continue to supply electricity, after the plant, &c., has been got ready for the purpose, amounts to nearly five-eighths of a penny per unit. In other words, supposing each consumer last year paid the cost of getting ready the plant, &c., necessary for his wants, amounting to $\frac{1}{4}d.$ per lamp per day demanded, and was then charged for all the electricity consumed at the rate of $\frac{5}{8}d.$ per unit, the result of the year's working would have shown a net profit of close upon £1,000. As, however, our initial price of 7*d.*

for the first hour each day does not yet quite cover the cost of getting ready and running during that hour, there still remains a loss on the sale of the 7*d.* units, which has obviously been made up out of the profit arising from the sale of low price units. Now, if all the units after the first hour's daily use at 7*d.* were charged at a penny each, the entire expenditure would be covered by the revenue. As, however, something undoubtedly ought to be put aside every year to the contingency fund, I strongly recommend you for the present year to fix the charge for the low price units not at 1*d.* but 1½*d.* This will ensure our making an adequate net profit, while at the same time it will give a very considerable impetus to the use of electricity in private houses and for motors. This alteration in the tariff will greatly benefit the general body of ratepayers, who will, through their district fund, get the electricity consumed by the street lamps at something under 2*d.* per unit instead of at 3¼*d.* It will also have the effect of reducing the average price paid by private houses and shops from about 5*d.* to 4*d.* per unit. It should be borne in mind that a tariff of 1½*d.* after the first hour will make electricity, if it be used regularly, as economical for power purposes or for cooking as the average gas-engine or stove. Such a tariff will enable us to supply motor-car batteries and the sea-shore tramways at an encouraging price. There are probably some 60 or 70 gas-engines still running in Brighton, and the many hours these are in use each day make it just as well worth our while to encourage their substitution by electric motors as it does for us to cater for the daytime users of artificial light. I am convinced that the effect of this tariff, which I strongly advise you to adopt, will considerably reduce our expenses per unit in supplying electricity to the ratepayers in general, as it will still further diversify the classes of the consumers supplied, and thereby spread out over the day the useful duty done by the plant and mains."

The committee recommended that the initial charge of 7*d.* per unit for an average of one hour per lamp per day be continued, and that the charge for electricity over such average be reduced from 3*d.* to 1½*d.* per unit.

In London the charges for electricity vary from 5*d.* per unit in St. Pancras, where the municipality has control, to 8*d.* in the City, where the supply of current is in the hands of a private company. The Westminster Electrical Supply Corporation charge 6*d.* per unit, and the Metropolitan Company 7½*d.* A unit, it may be explained, is the quantity of electricity required to keep a 16 candle-power lamp incandescent for 16 hours. A representative of *The Daily Telegraph* has had a conversation with the secretary of one of the leading electrical companies, and drew his attention to the report of the engineer to the Brighton Corporation. The official, while very courteous, declared his inability to accept, on the strength of a newspaper report, so extraordinary a statement as that electricity could be supplied at the rate of 1½*d.* per Board of Trade unit. He pointed out that what is known as the Brighton proposals had been entirely refuted in a correspondence which took place in an electrical journal some months ago. The representative, in reply, pointed to the engineer's report, in which the success was made quite clear—so much so, that a further reduction was proposed for the current year. To this the rejoinder was that it would be impossible to pronounce an opinion on the facts in the report. To a query as to whether the high price of electricity in London was due to increased cost of production or the desire to pay a large dividend to shareholders, the reply was that neither of these factors entered seriously into the matter. The only thing, therefore, that was made clear is that the inhabitants of Brighton can have electric light for the price of gas, or about one-half what it costs the unhappy inhabitant of the metropolis, who is, of all persons in the United Kingdom, the most dependent on artificial illumination.

STRAKER'S MOTORS.

MR. SIDNEY STRAKER, of 139, Cannon Street, London, has introduced a variety of oil motors suitable for all descriptions of motor traffic. We illustrate two of these engines, Fig. 1 representing a double-cylinder motor of four horse-power; while Fig 2 shows a single-cylinder motor of ¾ horse-power. Much

FIG. 1.

care has been exercised in designing these engines, as the various parts are easily accessible, while the lubricating arrangements are very complete. The workmanship and material are all that can be desired, and we can safely recommend these motors to carriage-builders and others who may wish to experimentally convert an ordinary carriage into one to be propelled by machinery. The following are some particulars with reference

FIG. 2.

to the four horse-power double-cylinder engine:—It is speeded at 400 revolutions per minute, and if supplied for working light oils will require petroleum of 0·68 to 0·7 s.g., or if for heavy oils such as Royal Daylight, &c. The speed of the motor is variable to the extent of about 30 per cent., which is effected by actuating the cylinder adjustments supplied with it. The total approximate weight may be taken at 200 lbs., and the circulating water necessary for this motor will vary from 10 to 18 gallons.

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CONTINENTAL NOTES.

(FROM OUR OWN CORRESPONDENT.)

Automotor Race from Marseilles to Nice.

NICE, *Feb. 1st*, 1897.

FOR some considerable time past great interest has been aroused on the Continent as to the probable result of the motor contest from Marseilles to Nice. This was organised by the Comité des Fêtes at Nice, in conjunction with the Automobile Club of France, valuable prizes being offered to nearly all finishing. The weather has proved the chief drawback to those who entered for the affair, the rain and snow, which have continuously fallen for weeks past, rendering the roads rotten, and in many places absolutely unsafe. It is true that the weather cleared a day or two before the actual start, but the wind which prevailed did but little towards drying up the roads, or to make travelling easier.

During the three days of the actual race scarcely any rain or snow fell, but the wind was bitter and piercingly cold, making riding a very unpleasant matter. The course, the total length of which is, roughly, about 145 miles in length, consists of roads which are none too good, and which are very uneven, some of the gradients being extremely steep.

Six o'clock on Friday morning, the 29th ult., had been fixed for the start, but in accordance with the wishes of many of the people of Marseilles, who wished to attend the function, the time of departure was delayed till seven. The extra hour, however, did not make much difference to the temperature, the air being so wintry and the wind so biting that none but the most enthusiastic turned out. Out of the entries the good muster of 28 motor-carriages and 9 motor-cycles faced the starter, and were despatched at intervals of one minute. The following is a list of those who left Marseilles :—

M. Baulthy, Paris (Panhard and Levassor).
M. Petrus, Nice (Peugeot).
M. Charron, Paris (Panhard and Levassor).
M. René de Knyff, Paris (Panhard and Levassor).
M. Egrevi, Paris.
M. A. Lemaître, Ay. (Panhard and Levassor).
M. Prévost, Paris (Panhard and Levassor).
Comte de Chasseloup-Laubat (Dion steam tractor).
M. M. Dupré, Tours.
M. E. Giraud, Paris.
M. Laumaillé, Nice (Peugeot).
M. Albert Peter, Nice (Peugeot).
M. Beauvais, Toulon (Peugeot).
M. Bruninghaus, Nuits.
M. Albert Gautier, Nice.
M. Millaux, Bollène (Peugeot).
Vicomte de Sallmard, Nice.
Bicycle Club of Lyons (Benz carriage).
M. Vauquelin, Cannes.
M. Henri Peugeot, Audincourt (Peugeot).
M. D. Courtois, Laon.
M. Comiot, Paris.
M. E. Michelin, Clermont-Ferrand.
M. Drassel, Paris (Vacher).
M. Cahen Marcel, Paris.
M. Sibilat, Rouen.
M. A. Michelin, Paris (Dion Steam).

The following were the motor cyclists who started :—

M. Lafitte, Marseilles.
M. E. Chesnay, Dijon.
M. Rivierre, Paris (Dion tricycle).
M. Cabassus, Marseilles (Dion tricycle).
MM. Chauchard and Nicodémi, Nice.
M. Monter, Paris.
M. Marcellin, Marseilles.
M. E. Roussier.
M. Bussac, Marseilles.

The arrangements made throughout the course were admirable, the police and the municipal authorities co-operating to keep a clear passage-way by issuing notices to the inhabitants to keep the children out of danger, while suspending the traffic at special points in order that the contending motor-cars might have every chance of securing an unimpeded passage. From the commencement of the first stage, interest was centred in the doings of M. Lemaître on the Panhard-Levassor, and the Comte de Chasseloup-Laubat, whose steam tractor fairly held its own on the level, while gaining a distinct advantage on any rising ground. The inhabitants of the various villages and towns turned out in full force, and gave the automotorists a very cordial welcome as they passed. Several accidents happened towards the end of the first day's run, obstructions in the road being the chief cause of the upsets which occurred. The Comte de Chasseloup-Laubat only stopped twice on this stage—once for coke and the second time for water; he being untroubled in all other respects. His nearest antagonist, M. Lemaître, was, however, bothered a great deal with punctured tyres.

The order of arrival at Fréjus was as follows :—

	H.	M.	S.
Comte Chasseloup-Laubat	4	47	14
Prévost	5	12	11
Lemaître	5	12	17
E. Giraud	5	38	11
De. Knyff	5	43	51
Levielté	6	2	11
Gauthier	6	6	24
Peugeot	6	9	15
Chesnay (motor-cycle)	6	17	14
Vicomte de Soulier (motor-cycle)...	6	19	18
Lafitte (motor-cycle)	6	20	0
Cabassus (motor-cycle)	6	29	7
Marcellin (motor-cycle)	6	41	7
Bruninghaus....	6	46	7
Rivierre (motor-cycle)	7	18	6
Chauchard & Nicodémi (motor-cycle)	7	42	15

In the second day's run the events of the preceding one were practically repeated—steam in the person of the Comte de Chasseloup-Laubat taking the lead and easily keeping it—his nearest attendant being again M. Lemaître. Mishaps were fairly plentiful, mainly happening to the motor-cycles, which somehow seemed to be in the way. It would be useless to give the times for this stage or the short one on Sunday from Nice to La Turbie, a distance of some 11½ miles only. Suffice it to state that Comte de Chasseloup-Laubat succeeded in covering the 42 miles between Fréjus and Nice in 1 h. 50 m. 44 s., M. Lemaître arriving some 13 minutes later. The first motor-cycle into Nice was that driven by M. Monter, which was the property of Baron Zulen de Wyevelt, the time taken on the road being 2 h. 12 m. 5 s. In the last short processional stage from Nice to La Turbie yesterday (Sunday), M. A. Michelin succeeded in getting in first with his steam tractor in 31 m. 50 s., the Comte de Chasseloup-Laubat arriving second in 37 m. 50 s., and M. Lemaître third in 52 m. 55 s.

The following is the official time for the three days' race over the full distance, as issued by the authority of the Automobile Club :—

Motor-Carriages.

		H.	M.	S.
1.	Chasseloup-Laubat	7	45	9
2.	Lemaître	8	17	27
3.	Prévost	8	26	58
4.	De Knyff	9	5	14
5.	E. Giraud	9	24	23
6.	A. Michelin	9	35	50
7.	Gauthier	9	47	12
8.	Henri Peugeot	9	48	42
9.	Leveillé	10	10	24
10.	Bruninghaus	10	15	19
11.	Egrevi	11	51	6
12.	Cahen Marcel	11	56	5
13.	Peter	11	58	58

		H.	M.	S.
14.	Beauvard	12	24	55
15.	Sibilat	12	50	59
16.	Courtois	12	51	40
17.	Petrus	13	20	29
18.	Millaud	13	29	56
19.	Dravet	14	20	3
20.	Laumaillé	14	29	7
21.	Bicycle Club Lyonnais	18	6	23
22.	Dupré-Neuvy	18	10	30
23.	De Sahlmard	19	29	29

Motor-Cycles.

		H.	M.	S.
1.	Chesnay	9	23	36
2.	Marcellin	9	40	53
3.	Vicomte de Soulié	9	46	18
4.	Monter	10	13	31
5.	Rivierre	10	29	57
6.	Cabassus	10	33	15
7.	Chauchard-Nicodémi	10	45	30

In this instance steam was unquestionably successful, and the result can only provoke another contest over a longer journey, in which the stages should be much longer, and more equally distributed over the number of days occupied than was the case in this instance. The time taken by the winner was very good under all the circumstances, the average speed per hour being 19 miles.

The French Automotor Competition of July.

The Automobile Club of France have officially issued the regulations for the competition, which, as previously announced in these columns, they have arranged for July of this year. The rules are as follows:—

Minimum weight of transport cars for travellers or merchandise, one ton.

Article 1.—A competition organised between autocars (automobiles, traction carriages, and road trains) for the following purposes:—

(1) Public transport of persons in the towns; communication between the railway stations and places not directly connected by railway.
(2) Services for the delivery and transport of goods.

Article 2.—The meeting or competition will take place on several routes branching from a town situated in the neighbourhood of Paris, the 1st of July, 1897, and following days.

Article 3.—The competition will have regard to cost—that is to say, will consider the load and the total expense of carrying it; it will take account of the different factors which influence the net cost, and of the connection between the weight carried and the weight of the rolling stock, as well as the comfort of the same.

Article 4.—The following will be admitted to the competition:—

(1) Vehicles which will carry (exclusive of conductors) at least ten passengers, with 30 kilogrammes of luggage.
(2) Vehicles for goods, carrying a minimum of a ton.
(3) Mixed vehicles, built in view of the transport simultaneously of travellers and merchandise, with a minimum of weight carried of 1,000 kilogrammes.

The Commission will make classes, according to the carriages engaged in the competition.

All the vehicles must have the certificate of class furnished by the Commission of the Automobile Club.

The competition is international.

Article 5.—The number of vehicles is not limited, but no constructor can send several vehicles of the same type and of similar dimensions.

Article 6.—For each vehicle entered an entrance fee of 200 francs must be paid up to June 1st, or twice this amount after that date.

The entrance list will be closed at midnight on June 25th.

Every application for entry must be accompanied with the entrance fee, which in all cases will be acknowledged.

Article 7.—Every competitor should send before June 15th a photograph of the vehicles he is entering, together with the selling price.

The competitors must send in good time to the *locales*, to be named by the committee of the Automobile Club, the necessaries required for the competition.

These articles will be afterwards delivered to the competitors under the authority of the Automobile Club.

All the vehicles should be able to run a distance of 15 kilometres at least without needing replenishing.

Article 8.—The trials will consist of a six days' service, constituting a total run of 300 kilometres.

Each vehicle will twice make the following series:—

First Series: Route A, 40 kilometres, with stoppages every 1 kilometre.

Second Series: Route B, 50 kilometres, with stoppages every 5 kilometres.

Third Series: Route C, 60 kilometres, with stoppages every 10 kilometres.

There will be stoppages appointed on ascents and declivities, on macadamised and paved roads.

The vehicles engaged will be divided into groups, so that each day in each of the three directions A, B, C, they will carry different loads.

All the vehicles will run with the load according to their capacity as stated by their owners.

Article 9. The Commissioners, chosen among the members of the Commission of the Club not competing, will accompany the vehicles. They will be charged with—

(1) Noting the amount of consumption of oil for fuel and lubricating, &c.
(2) Timing the courses at the stopping-places and by the way, according to the regulations which will be given them by the Commission.

The speed on the rising ground will be considered from the point of view of its effects on the stability of the vehicle. The Commission will decide the maximum of speed to impose on each vehicle following its conditions of entry, and the Commissioner will be charged with seeing them respected.

(3) Noting in each case the distance the vehicles run before completely stopping under the action of the brake.
(4) Noting their estimation of the vehicles in reckoning the facility of their control of going forwards or backwards, of their security and comfort, of the expense of keeping them up, of their capacity to redeem the capital charge on them, of the frequency, the importance, and the facility for doing repairs, and of the frequency of replenishing.

Article 10.—In the town which is the centre of the competition there will be a place where the "stabling" of the vehicles will be obligatory.

Repairs must be made in the presence of the Commissioners.

Article 11.—Medals and diplomas will be granted to the vehicles which are recognised as fulfilling the conditions requisite for one of the services in view of which the competition is organised.

There will be prepared by the Commission a report, giving a reproduction of the photograph of each vehicle and the details of the competition.

This report will be sent by the President of the Automobile Club of France to the Society of Civil Engineers of France, to the industrial Societies of different localities, and to the Maires of Communes. It will have, in short, all the publicity possible.

Article 12.—Competitors must conform to the ultimate decisions of the Commission, particularly in regard to the details of the regulation of the trials.

Article 13.—The civil and penal responsibilities which rest upon the competitors being so well understood, the Commission decline all responsibilities whatever in this regard.

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NOTICES.

Contributions and articles likely to prove of interest to our readers will receive due attention, but in all cases the name and address of the writer must be given, not necessarily for publication.

All matter intended for publication should reach us not later than the 10th of each month. Stamped envelope must be sent if the manuscript is required to be returned.

All Advertisements should be sent to the Advertising Department, F. King and Co., Limited, 62, *St. Martin's Lane, London, W.C., where Advertising Rates may be had on application.*

The Annual Subscription is 7s., including prepaid postage to any part of the world.

Cheques and Post Office Orders should be made payable to F. King and Co., Limited, *and crossed London and County Bank; otherwise no responsibility will be accepted.*

The Automotor and Horseless Vehicle Journal *can be obtained through* Messrs. W. H. Smith and Son, *and at* Willing and Co.'s *bookstalls.*

When any difficulty is experienced in procuring the Journal from local newsvendors, intending subscribers can obtain each issue direct from the Publishing Office, by filling up and forwarding, with remittance, the Subscription Form accompanying the Paper.

The Automotor and Horseless Vehicle Journal.

A RECORD AND REVIEW OF APPLIED AUTOMATIC LOCOMOTION.

FEBRUARY 17TH, 1897.

ANSWERS TO CORRESPONDENTS.

Angus (Liverpool).—The best test would be for the makers to enter for *The Engineer* contest, when they could be certain of absolutely fair play; but, as we are advised, they have no intention of taking that course.

J. Hartland (Belfast).—The engines are 6 inches in diameter, with a stroke of 10 inches; the normal pressure being 60 lbs., the cut-off takes place at three-eighths of the stroke. Our experience is that they are somewhat noisy, but reliable.

Inventor (Holloway).—It is only part of a complicated game of bluff. Wait until some firm of standing is attacked; you will see a very different result.

G. MAURICE (Hartlepool).—Benzine which flashes at the temperature stated is prohibited by Statute.

STUDENT (Dublin).—Write to Whittaker's and Longman's for their catalogues; they both publish works which will be of service to you.

A.S., E.R., G.N., W.B., and E.S.—Illness and absence from town must be pleaded as the only excuse for want of attention; but you shall find in the next issue the items you inquire about.

MECHANIC (Coventry).—The differential speed gear shown in the engraving you send was probably known to the engineers of ancient Babylon; but that fact does not, of course, prevent anyone calling it a "master patent" in 1897.

IGNORAMUS (Greenhithe).—If you will submit a definite problem we will work it out for you, as you frankly state that you are ignorant of the first principles involved.

GEORGE MCINTYRE (Leeds).—We cannot identify the vehicle by the meagre description you send. Probably it belongs to the Motor Syndicate, who have purchased a number of Continental carriages.

ARCHDEACON OF TUAM.—We cannot in the present transitory stage of the industry advise the purchase of any particular carriage or motor for the purpose you mention. The next few months will see some radical changes, and the chances are very great that you would eventually repent buying any of the makes which are for the moment before the public.

W. BOURNE (Perth).—For some reason the Thirsk correspondent now declines to go further into the matter.

H. W. WEBB (Beckenham).—Several makers are experimenting upon compressed gas as a motive power for light carriages, but hitherto we have not met with a thoroughly satisfactory system. The charging will, of course, always be a difficult matter.

H.A.P. (Glasgow)—Thanks for your letter. The pocket-book is not all we should like, but to compare it with those which have been in existence for nearly 20 years is hardly fair. A work of that kind can only be a thing of gradual growth. We have many tables and data in hand already to improve the next. The firing arrangement of the invention you mention has been altered, and we will illustrate it in an early issue. The copy of the specification is not yet ready—we will advise you when it is published.

P. THOMPSON (Dublin).—In nearly every instance the steering is effected by means of the front wheels, but independent gear as we have illustrated is used.

MATTHEW DONALD (Manchester).—The wheel is the subject matter of a patent, and as you are already in communication with the makers they are the proper people to apply to.

PUBLICITY (Glasgow).—You had better apply to our publishers, Messrs. F. King & Co. (Limited), 62, St. Martin's Lane, London, W.C.; they will advise you on the questions involved as to the best method of obtaining the greatest publicity for your exhibition.

TYRES (Northampton).—The general opinion appears to be that for heavy traction work ordinary pneumatic tyres are useless.

JAMES (Hartlepool).—The thickness should certainly not be less than three-eighths of an inch. If you tried to make the walls thinner you could not get a sound casting.

J. DIXON (York).—It is rumoured that an amalgamation of some of the great builders has been actually accomplished, with a view to the subsequent addition of a motor branch.

A. YOUNG (Antwerp).—We cannot give you the information. Provisional protection only has been applied for, and therefore nothing has been published.

E. H. (Yarmouth).—There is nothing unusual in such a course. It is surely worth paying the extra money to have the opportunity of being off the bargain at any time you choose.

SPECULATOR (Devon).—There is no market, and consequently no reliable price for the shares.

!"CUANDO escribe, refiérese Al "THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL."

THE SHUFFLING TRICKERY OF THE BRITISH MOTOR SYNDICATE.

WHEN the promoters of the £3,000,000 *fiasco* based upon the ruins—we can scarcely call such a substructure a foundation—of the British Motor Syndicate issued their recent prospectus to the public we denounced the document as a dishonourable one. While adopting an extreme step of this kind we took the opportunity of expressing a hope that those concerned in that impudent attempt to fleece the public of money would, for the sake of the industry in which we are all concerned, mend their ways, and do their best, by manufacturing motors and carriages, to justify the position which they had assumed as leaders in the automotor world.

We greatly regret to find that every step taken by the Syndicate, and every glimpse that outsiders can obtain as to its methods of management, only tends to more conclusively prove that the policy of this Company is one of bluff and nothing more.

During the last month, many instances which would prove this contention have cropped up, but the bare mention of a few will suffice. On the front page of a contemporary, which we regret to mention is strongly suspected of being within the "sphere of influence" of the British Motor Syndicate, we find, under date the 23rd ult., the following notice printed in flaming red letters:—

BRITISH MOTOR SYNDICATE

v.

HON. C. S. ROLLS.

PATENTS UPHELD.

MR. JUSTICE NORTH GRANTS PERPETUAL INJUNCTION.

THE DEFENDANT PAYS.

"Licenses are granted to manufacture on advantageous terms, but proceedings will be instituted immediately, claiming an injunction and damages, against any person infringing any of these rights."

Now, in order to appreciate this manifesto at its true value, it is necessary to go back to the £3,000,000 prospectus, in which it was stated that the British Motor Syndicate held all the "master patents" for motor-carriages in this country. As a matter of fact, they do not possess a single one—and this fact has been pointed out by every independent technical journal in the kingdom — but awkward things, like facts, rarely trouble the conscience or the digestion of "Showmen" of the calibre of those who rule this Syndicate. In private conversation and in public speeches they had talked wildly of the injunctions which they meant to obtain to prove their position, and so something resembling snch a legal progress had to be obtained at any cost. Their appreciation of the valne of an injunction somewhat resembled Sam Weller's love of the magic word "alibi"—it had to be got—anyhow, at any price, and on any terms, and then the position wonld be saved, as the engineering world would at once bow to the all-powerful Syndicate.

The victim selected for the experiment was the Hon. C. S. Rolls, who is a member of the Motor-Car Clnb, and, in the eye of the law an infant. He is an enthusiast in antomotor carriages, and he has always been foremost in placing his vehicle at the disposal of those who were likely to help on the movement. In October of last year, when he desired to purchase a motor-carriage of the Pengeot type, he wrote to Mr. H. Lawson and the British Motor Syndicate (Limited) for information as to who represented M. Pengeot in this conntry, and from both qnarters he received a reply that they regretted their inability to give the desired information, not being agents for the firm in question. As a result, he bonght a carriage on the Continent, and brought it to England, when he was threatened by the Syndicate with an action if he did not pay them a royalty in respect of the motor nsed.

We have no desire to enter here into all the complicated legal questions which would arise even if the Syndicate's patent in this car happened to be a valid one, bnt we may mention that, on the facts as stated to us by the Hon. C. S. Rolls, wo have a strong legal opinion that in no case conld he have been made liable for a royalty or for damages. The gnardians of the defendant in this case, however, took a rational conrse. The Hon. C. S. Rolls is an amateur rider, he has bnt little at stake in this hobby, and they came to terms with the Syndicate, as the cheapest way ont of their difficnlty.

What were the terms? That the British Motor Syndicate should pay their own costs, and that in consideration of a nominal payment of £15 they would give Mr. Rolls a perpetual license to use this carriage. Where is the victory? Where is there any npholding of patents? As a matter of fact, not a word was said on that snbject. These patents are to-day as free from the stamp of legal approval as they were when they were first transferred to the Syndicate.

When snch efforts as these are made to hoodwink the public, and when we are told that the Articles of Association of the Syndicate contain snch extraordinary clauses as those which are reprinted in another colnmn, it is small matter for wonder that shareholders who have been dnped into applying for an allotment are combining to get their freedom from the snares by which they have been entangled. We read, too, that the Earl of Winchilsca has resigned his seat on the Board of Directors of the Great Horseless Carriage Company, and that Mr. E. T. Hooley is seeking to minimise his connection with Mr. Lawson. He states that he was asked to act as broker to the British Motor-Car Company, and he did so, receiving a fee therefor. He did not take any shares in the Company, nor had he anything to do with floating it. His only connection with the Company was in the capacity of broker. If those connected with the Syndicate cannot or will not mend their ways then the sooner the concern is dead and buried the better. The longer it goes on in its present way the less reputation will be left to all who are connected with the concern, and when the bnbble does burst the worse will it be for all who are now trying to pnff it ont to the fullest possible size.

MECHANICAL HAULAGE BETWEEN LIVERPOOL AND MANCHESTER.

That practical steps are now to be taken in the direction of promoting mechanical hanlage between Liverpool and Manchester is evident. A meeting was held last week of the Prize Scheme Snb-Committee of the Liverpool Branch of the Self-Propelled Traffic Association, at which Messrs. Alfred Holt, A. L. Jones, A. Bromley Holmes, and E. Shrapnell Smith (Hon. Sec.) attended. The proposal to offer a premium for the best self-contained motor-wagon was deferred. The Snb-Committee then considered the qnestion of advertising for tenders for the conveyance of goods between Liverpool and Manchester by mechanical hanlage, and a resolntion in favonr of this conrse was adopted. Tenderers are to base their offers on the assumption that the weight to be carried will not be less than a thousand tons per week, and the time occupied in transit must not exceed fifteen honrs. We trnst that a practical resnlt will be obtained, as the conditions are eminently business-like, and shonld attract the attention of some of our leading engineers.

MOTOR-CARS FOR DUST COLLECTING.

The Urban District Council of Chiswick is among the first of local authorities to adopt the steam motor-car for the purposes of the collection of dust and house refuse. Hitherto the Council has followed the course pursued by its predecessor, the Chiswick Local Board, and has let the dust collection to contractors. Under this system the cost has increased yearly, while the work has been very inefficiently performed, complaints being constantly received of the non-removal of dust. At a recent meeting the Council received tenders for dust collection for the year from April 1st next at £2,000 and £1,900 respectively, the latter sum being £460 in excess of the sum for the year ending on March 31st next. Before accepting either of these tenders the Council instructed the surveyor, Mr. Arthur Ramsden, to report as to the saving likely to be effected by the purchase for dust-collecting purposes of a steam motor tip-car, a design for which, prepared by Mr. John I. Thornycroft, had been submitted by the Steam Wagon and Carriage Company of Chiswick. This could be purchased for £350. The surveyor reported that if two of the motor-cars were purchased at the price stated, and the payment spread over three years, he estimated that there would be an immediate saving of £50 a year, and that at the end of three years the saving would be about £250 per annum. The Council has decided to purchase two of the motor-cars on the terms suggested, to be delivered on March 31st next.

DOINGS OF PUBLIC COMPANIES.

The British Motor Syndicate.

THE *Financial Times* has been busily investigating the prospectus which was issued by the above Syndicate, and states that the numerous requests for advice led them to re-examine the prospectus of this bombastic undertaking, and a point that seemed worthy of attention was the fact that the Memorandum of Association was conspicuous by its absence. Its place was taken by a number of mediocre illustrations, and the only satisfaction obtainable was in the statement that "the Memorandum and Articles of Association . . . . can be inspected at the office of the Syndicate." Unwillingness to encroach upon the time of the Syndicate's officials, whose energy, we fancy, must be fairly well exhausted by the demands for a return of subscriptions, led them to pursue their investigations at Somerset House, with results that they venture to describe as astounding in the extreme. It will be remembered that the Syndicate was originally formed with a capital of £150,000, in November, 1895. Nine months later this amount was increased to £1,000,000. The Articles of Association, dated 21st November, 1895, contain the following clauses:—

Transfer and Transmission.

18. Save as hereinafter provided, no share in the Syndicate shall be sold or transferred to a person who is not a member, provided that it shall be in the discretion of the directors to determine that any share or shares in the Syndicate may be sold or transferred to any person or persons who is not a member.

19. Save as hereinafter provided, any member of the Syndicate proposing to transfer any shares in the Syndicate (hereinafter called the retiring member) shall give notice in writing to the Syndicate that he desires to transfer the same. Such notice (hereinafter called the transfer notice) shall constitute the Syndicate his agent for the sale of the shares, at a price to be fixed by the directors, or if such price is disputed by the retiring member, at a price to be ascertained by arbitration pursuant to the Arbitration Act, 1889. In case the transfer notice shall include several shares, it shall operate as if it were a separate notice in respect of each share. The transfer notice shall not be revocable except with the sanction of the directors.

20. If the Syndicate shall, within two months after being served with the transfer notice, find a purchaser for the shares, and shall give notice thereof to the retiring member, he shall be bound, upon payment of the price fixed in accordance with the last preceding article, to transfer the shares to the purchaser.

21. If the retiring member, after having become bound as aforesaid, makes default in transferring the shares, the Syndicate may receive the purchase-money, and shall thereupon cause the name of the purchaser to be entered upon the register as the holder of the shares, and shall hold the purchase-money in trust for the retiring member.

22. The receipt of the Syndicate for the purchase-money shall be a good discharge to the purchaser, and after his name has been entered on the register in purported exercise of the aforesaid power, the validity of the proceedings shall not be questioned by any person.

23. If the Syndicate shall not, within two months after being served with the transfer notice, find a purchaser for the shares, and give notice in manner aforesaid, the retiring member shall be at liberty to sell or transfer the shares to such person, and at such price as he shall think fit. Provided that he shall first have given an option to the directors to find a purchaser at that price, and they shall not, within ten days after such option has been given, have found a purchaser accordingly.

24. The shares specified in any transfer notice shall, subject to the directors' discretion, mentioned in Art. 18 in the first instance, be offered to the members. Such offer shall be made by a written notice specifying the number of shares to which the member is entitled, and limiting a term within which the offer, if not accepted, will be deemed to be declined. After the expiration of that term, or the earlier receipt of an intimation from the member to whom such notice is given that he declines to accept the shares offered, the directors shall be at liberty to sell such shares to any person or persons as they shall think fit, at the price fixed in accordance with Art. —.

In face of these extraordinary articles we cordially endorse the following remarks made by our contemporary:—

"In the course of a fairly extensive experience of public companies and their ways we have never heard of such extraordinary provisions as those contained in the above articles. It would not be surprising to find a private syndicate erecting ingenious barriers to prevent the introduction of an unfriendly element upon the death or defection of one of its members, and we trust that when the matter has been brought before the notice of Mr. Harry J. Lawson, he will promptly assure us that the articles we have quoted were devised to meet such a contingency in the days when the Syndicate comprised merely a small circle, and when harmony and unanimity were essential to the building up of the huge scheme with which the world is to-day only too familiar. The members of the Stock Exchange who are now dealing in the shares; people who have realised, or desire to realise, their holdings even at the depreciated price now ruling; those who may possibly see some potential value in the shares, and who after purchasing run the risk of finding the transaction cancelled—all these sections of the community have a right to demand from Mr. Harry J. Lawson an immediate explanation.

"Either the arbitrary powers conferred upon the directors still hold good, or else they have been waived. In the former case, a monstrous disability is imposed with regard to the disposition of the holdings; in the latter case, the public should be assured that they are perfectly at liberty to buy or sell in the open market, in accordance with the universal practice. Assuming that the above articles still exercise binding force, the shareholders who have already commenced to repent, and who have sought to free themselves from the consequences of their foolishness, will repent the more, and will be stimulated to further efforts for the return of their money, while those who have bolstered themselves up with hopes that all may yet be well will begin to entertain serious misgivings concerning the future. At present there is practically no possibility of organised opposition to the management—excepting, of course, the legal proceedings that are understood to be pending. There is no statutory meeting of shareholders to afford an opportunity for protest, as this function must be presumed to have been held in the days of the Syndicate's obscurity. We believe that the great bulk of the shares are still held by Mr. Harry J. Lawson and his colleagues, and if this be so, the convening of an extraordinary meeting is probably impracticable. The annual meeting is not likely to be held yet awhile, so that the complaisant individuals who took part in the recent junketting at Coventry may not be able to renew for some months to come the acquaintanceship then formed. We regret that that opportunity for a serious consideration of the position was not taken advantage of either by Mr. Lawson or by those of his critics who possessed the necessary *locus standi*. Denunciation of 'printers' twaddle' is interesting, and, indeed, amusing, but a reply to honest criticism would have been more to the point."

London Electrical Cab Co. (Limited).

THE statutory general meeting of the shareholders of the London Electrical Cab Company (Limited) was held on the 29th ult., at Winchester House, Old Broad Street, Mr. H. H. Mulliner (the chairman of the Company) presiding.

The CHAIRMAN said: Our attention has been called to several very silly letters in the papers, wondering why a large number of cabs are not already on the streets of London. Well, it is perhaps hardly necessary to explain that until the Company was formed and the capital received it was quite impossible to order the cabs, and when they are ordered they require to be built, all of which takes some time. It would have been quite possible to have had one ready by now, and with this one we might have organised trial trips, &c., with newspaper reporters present, and have so created an impression that we were very busy people. Personally, I am very tired of hearing about trial trips with motor-carriages, and I think some of the public are in accord with me with these views. What would interest them and me much more would be to see a number of electrical cabs which would not only run a trial trip, but which would run commercially, and which would be capable of earning a dividend to the shareholders. (Applause.) As far as actually running an electrical carriage is concerned, there is no difficulty about that. Mr. Bersey, whose services we have, and the whole of whose patents we have acquired the use of, run electrical carriages several years ago, which were quite as good even then as any electrical omnibus or other electrical motor-carriages which have been seen or heard of recently. Since then, and previous to the formation of this Company, Mr. Bersey has wonderfully improved these carriages, and, as referred to in the prospectus, had already attained a great degree of perfection with them. Our responsibilities are, however, much more serious than building electrical carriages, which will simply run along to the astonishment and delight of the public. Our responsibility is to build electrical carriages not only which will run along to the satisfaction of the users, and fulfil all the requirements of the Act, but which will be suitable to stand the immense amount of wear entailed by daily public use in London, and, what is still more important, they must be so constructed and so arranged, both as regards the supply of electricity and the durability of their parts, that they will be capable of earning good dividends for the shareholders. And whilst on this subject, I should like to trouble you with our views on electricity as a motive power for vehicles in London, because our views vary very much from what is generally understood on this subject. I have no belief whatever in the idea that persons will be able to buy an electrical carriage and keep it themselves, and charge it with electricity from the ordinary electric light arrangements that they may have fitted up to their house or stables. It might happen in a few cases that persons could do this, but they would have to have considerable expensive electrical apparatus, and they would also have to have a competent electrician to deal with the necessary charging, &c. Further than this, as the cost of electricity depends upon the amount which is used, the supply would prove very expensive, and no makers of accumulators would probably be willing to guarantee the accumulators to individual persons, as there would be considerable doubt as to their being properly looked after. But I have the very greatest belief in electricity as the future motive power for street traffic in London, where, in cases like the London Electrical Cab Company, it can be organised on a thoroughly business-like basis, *i.e.*, where you can have one experienced man responsible for the charging of the accumulators, and where you can contract with the supply companies and the accumulator makers, and where you can have exactly the apparatus necessary for taking the accumulators on and off, &c. Then the drivers need have no knowledge at all of electricity, and have nothing to think of except conducting the vehicles, every precaution having been taken to ensure that these drivers should not be able in any way to interfere with and so possibly damage the electrical apparatus.

Now as to what we have actually done in these two months. Our first thought was, naturally, to design the cabs. I have here 30 drawings, showing how thoroughly this work has been done; but these drawings, now they are completed, do not nearly represent the work which has been put into them. I believe these drawings now represent a perfect and suitable vehicle; they are the result of the whole of Mr. Bersey's experience of eight years, together with Mr. Brougham's experience as a practical electrician, and any experience I may claim to possess as a practical coachbuilder. I wish to mention here the obligation we are under to the Great Horseless Carriage Company, who have lent us their draughtsmen, their engineers, and aided us in every way in their power. You will remember that on the prospectus a report from Mr. Manville was published, and we naturally considered that no vehicle should be commenced until Mr. Manville had passed it as being, in his opinion, perfect. I believe Mr. Manville to be the highest authority we have in all matters of electrical traction, and before he passed these drawings and specifications, which he has now done, he thoroughly went into every point with us, and suggested many valuable improvements. Perhaps the most valuable improvement to which I refer is the Johnson-Lundell Series Parallel Controller. This invention will produce the following results:—(1) It is the only invention which enables the electricity to be used in exactly the ratio that it is required—*i.e.*, there is no perpetual waste of electricity going on through resistance or other means, as is usual. This alone would save from 35 per cent. to 40 per cent. in the amount of electricity used. (2) It will considerably simplify the construction of the vehicle by saving several complicated changes of speed-gearings, &c., and by saving these and the necessary handles it will make the driving of the vehicle much easier. After considerable negotiations we have acquired the sole use of this invention for the purposes for which this Company is formed by payment of a royalty per vehicle, and after payment of this royalty the price of the vehicle will be reduced below the cost at which it could be constructed without it. We have, further, gained the hearty co-operation of the British Thomson-Houston Company, the largest and most experienced makers of electrical traction apparatus in the world.

Another step was to obtain suitable premises. In this direction we consider we have been fortunate. We have taken a lease of large premises in the most convenient spot in London for our trade, viz., Lambeth, near Westminster Bridge. Next, the question of the electrical apparatus for transforming the electricity and for taking off and removing the accumulators, &c. This has all had to be worked out in the same way and tendered for, and is now on order. One more matter, and perhaps the most important—that is the accumulators. Mr. Manville drew up a complete statement of the various requirements, and invited tenders and samples from every maker of repute. These samples are being tested at Faraday House in a perpetual state of vibration, or as near as possible the same conditions they will be subjected to in actual use. Meantime, for our first vehicles we had to order accumulators, and I am glad to say that we have been able to place this contract with the Electric Power Storage Company. I need hardly say that we insisted, and the Electric Power Storage Company agreed to guarantee these accumulators at 10 per cent., as stated on the prospectus. I should like to add that the more I have gone into this the more confident I am that electricity is the future motive power for street traffic in London, and I confidently believe that the original shareholders in the London Electrical Cab Company will have much to congratulats themselves upon in the future. There is one thing more we have to congratulate ourselves upon, viz., that instead of having to spend money in building works and putting down expensive machinery, &c., this Company is, up to now, practically incurring no expenses whatever.

Mr. Green. I should like to know how many shares have been allotted, and how much has been paid up?

Mr. Wiltshire. Will you kindly say how many cabs you propose to run?

Captain Frederick. Will the tariff to the public be the ordinary tariff of the London cabs, or similar to the present system now adopted in London; or will there be a special rate?

The Chairman. In reply to the questions which have been asked, I may say that the total amount subscribed by the public was something like £63,000, and the vendors were most reasonable with the Company in making the following conditions, which I think you will admit are very fair. The conditions were, first, that the proportion of working capital should remain exactly the same as stated in the prospectus, viz., the unusually large amount of two-thirds working capital, and one-third to the vendors. This leaves us with about £42,000 working capital, which is ample to prove the success of this business, and when that success is obtained then the balance of the Company's capital will, I am sure, be readily subscribed, and I hope at a good premium, of which the shareholders will have the benefit. Then, and not until then, will the vendors receive the balance of the agreed purchase price. (Applause.)

Mr. GREEN. Do I understand that amount has all been paid?

The CHAIRMAN. The £63,000 has been fully paid. Mr. Wiltshire asked how many cabs were to be constructed at first. The first lot which will be put on the streets will be 24 in number, but that is no exact criterion, because as soon as these are built the others will come on quickly. The actual commencement will be with 24 cabs, the others coming on as fast as there is a demand and they can be finished off. Captain Frederick inquired if the tariff for the use of these vehicles will be the same as for ordinary cabs. It will be exactly the same. That matter is not in our hands: the cabs will be all licensed by the authorities of Scotland Yard, and as they fix the fares we have no right to charge more, but no doubt we could charge less.

A vote of thanks was passed to the Chairman and directors, and the meeting separated.

New Companies Registered.

[Under this heading we intend in future giving a full list of any new Companies registered which take power to make, deal, or become interested in any manner in automotor vehicles. Where detailed particulars are not given under this heading we shall be pleased to reply to inquiries through the "Answers to Correspondents" column. All communications should be addressed to the Editor. The only stipulation which we make is that where the inquiry involves a search of the records at Somerset House—as in the case of information on the subject of the holdings of shareholders—a postal order must be enclosed to cover the Government stamp of one shilling which is charged before a search is allowed to be made.]

	Capital. £
Anglo-Bavarian Steel Ball Co. (Limited), Birmingham	50,000
"Blot" Electric Accumulator (Limited)	160,000
Britannia Cycle and Component Parts Co. (Limited), Birmingham	2,000
British Cycle Parts Co. (Limited)	6,000
Defiance Cycle and Motor-Car Co. (Limited), Swansea	10,000
Elysée Palace Hotel Co. (Limited), Paris	253,000
G. H. Cox, Southsea, Cycle Co. (Limited), Southsea	5,000
Grant Rhea Cycle Co. (Limited)	15,000
Hadley's Chain Co. (Limited), Birmingham	6,000
Hyde Cycle and Machinists' Co. (Limited), Manchester	25,000
Instantaneous Wrench Co. (Limited)	5,000
Joseph Rhodes and Sons (Limited), Wakefield	50,000
Maxim Motor Co. (Limited)	7
Metal Tube Jointing Co. (Limited)	30,000
Métropole Acatene (Chainless) Cycle Corporation (Limited)	180,000
Motor and Cycle Saddle Co. (Limited), Birmingham	3,000
Motor-Car Components Co. (Limited)	7
New Hudson Cycle Extension (Limited)	50,000
New Jointless Rim (Limited)	200,000
Pennington Motor Co. (Limited)	100,000
Petrolia Co. (Limited)	5,000
Practical Primary Electrical Battery Syndicate (Limited)	8,000
Rowe's Paragon Cycle and Sulky Co. (Limited)	2,000
Simpson Rubber and Tyre Patents (Limited), Birmingham	10,000
Standard Weldless Tube and Cycle Components (Limited)	160,000
Thomas Elsley (Limited)	60,000
Tom-Tit Cycle Co. (Limited)	10,000
Westminster Engineering Co. (Limited)	20,000

New Issues.

THE LONDON MOTOR-VAN AND WAGON COMPANY (LIMITED).

THE London Motor-Van and Wagon Company (Limited), with a share capital of £300,000, is a Company formed to manufacture, sell, or let out on hire motor parcels delivery vans, motor carriers' vans, and the like. The idea of applying the motor to this purpose is eminently practical, and will be welcomed by the public for reasons both of convenience and economy. With a board of directors, composed of successful business men like Mr. H. R. Paterson (Carter, Paterson, and Co.), Mr. W. R. Sutton (of Messrs. Sutton and Co., the well-known carriers), Colonel Lewis Vivian Lloyd (director of the London and North-Western Railway), Mr. D. E. Cardinald (director of the Manchester Brewery Company), and Mr. James S. Burroughes (of Messrs. Burroughes and Watts, billiard table manufacturers), the affairs of the Company are certain to be properly administered, and the investing public can be sure that what can be done in a practical form to prove the value of motor vehicles as applied to commerce will be done to the very best of the ability of the able board of directors. With such facilities as these gentlemen have at their command for furthering the interests of this Company, the shareholders should reap a splendid harvest as pioneers commercially of this new industry. A very good feature of this issue is the fact that £150,000 is to be reserved for working capital, whilst the vendors' shares are deferred, and receive no dividend until 5 per cent. has been paid on the ordinary shares. As showing the great interest taken in this development of the motor industry by business people in London, the directors have received encouraging letters from such people as Mr. F. Colman (of J. and J. Colman, mustard manufacturers), Peter Robinson, Harrod's Stores, Liberty and Co., D. H. Evans, and many others, all of whom express their belief in the benefit which will accrue from the enterprise. The lists open on February 17th and close February 19th. Prospectuses can be obtained at the offices of the Company, 6, Old Jewry, London, E.C.

LEATHER SHOD WHEEL COMPANY (LIMITED).

WITH a capital of £300,000 in £1 shares, of which 200,000 are offered for subscription at par, the Leather Shod Wheel Company (Limited) has, the prospectus states, been formed to take over the patent rights for the United Kingdom of an improvement in wheels, namely, the leather tyre invented by Messrs. Pierron and Klein, which it is claimed should supersede all present forms of vehicle tyres, as it is elastic, durable, quiet, cheap, and light running. Although the elastic qualities of leather have long been known, it is only now that it has been successfully applied to wheels of vehicles, to lessen the shock of contact with the ground and reduce vibration, for which purpose it has proved itself an admirable substitute for rubber, being more durable and much cheaper. Orders for tyres have been received from the Bank of England, the House of Commons, the Mint, and other bodies and corporations, and the leading railways and omnibus and cab concerns. Numerous advantages are claimed for the invention over existing tyres, and large profits are anticipated. In addition to the patent of Messrs. Pierron and Klein, the Company acquires various patents and applications for patents which are considered of importance in the manufacture of tyres of this class, whether of leather or rubber. The purchase price is £100,000 in shares and £140,000 in shares, cash, or shares and cash, 60,000 shares being reserved for working capital.

President	Sir David Salomons, Bart.
Secretary	Andrew W. Barr, Esq.
President of the Liverpool Centre	The Earl of Derby, G.C.B.
Hon. Local Secretary	E. Shrapnell Smith, Esq.
Semi-Official Journal of the Association	The Automotor and Horseless Vehicle Journal.

MECHANICAL HAULAGE ON COMMON ROADS.

A meeting of the Liverpool and District Centre of the Self-Propelled Traffic Association was held at the Royal Institution, Liverpool, on Tuesday, 19th ult., when a paper on the above subject was read by Mr. W. Worby Beaumont, M. Inst. C.E., M. Inst. Mech. E. Mr. Alfred Holt presided. It may be mentioned that Mr. Beaumont left London on the Tuesday afternoon and returned by midnight train, special permission having been obtained from Mr. Justice Henn Collins in the Queen's Bench Division, who was hearing a case concerning oil-engine patent rights, in which Mr. Beaumont was chief expert witness. Mr. Justice Collins said he understood Mr. Beaumont was to "give a lecture in Liverpool and be back in time to lecture me to-morrow."

The Chairman said Mr. Beaumont was going to give them information as to mechanical haulage on common roads, which was a subject of greater interest than he (Mr. Holt) could easily describe. If mechanical haulage on common roads could, by the ingenuity of the engineer, be brought to anything like the perfection of haulage on railways, many questions of great importance to the world, and especially to that locality, would be solved. The very heavy charges and the clumsiness of traffic would be obviated, and we should be able to carry on a traffic in a variety of articles we had never thought of. (Hear, hear.)

Mr. Beaumont's paper was as follows :—

Since last I had the honour of speaking on this subject in Liverpool, the development of the mechanically-propelled road vehicle has not been sufficient to change the situation of the would-be user. The Locomotives on Highways Act of 1896 came into force on the 14th of November last, after the preparation of regulations under the Act by the Local Government Board, and on that day an impressive proof of the great interest taken by the public in the self-propelled vehicle was afforded by the vast concourse of people who assembled in and near London and Brighton to witness the start and run of a number of motor-cars from the Hotel Metropôle of the one, to the Hotel Metropôle of the other. This demonstration of the capabilities of the motor-carriage was organised by the Motor-Car Club to mark the end of the old regime of unreasoning opposition to mechanical power on the high roads, and the commencement of a new era, marked, as it is hoped it will be, by the advantages which belong to facility of transport for men and things.

For all practical purposes the motor vehicle, and the motor-hauled vehicle, is now free to use the roads. The Local Government Board rules and regulations are very satisfactory, and Mr. Hugh Owen and Major Tulloch are to be congratulated on so very successful a first effort. Some slight modification will no doubt be found necessary after a year or so of working, and those who made the regulations will, no doubt, in the same enlightened spirit make such modifications as may be dictated by expediency from the mechanical, commercial, and transport facilities points of view.

Until this freedom was actually obtained, British engineers were loth to spend either time or money on the design of motor vehicles to suit modern requirements, or to embark on a career of that most expensive of occupations—namely, experimenting. Hence, although they are now free, they are not ready, and it will be some time before anything like a generally acceptable design for motor vehicles for the heavier work will be reached. For the lighter vehicles, the Continental makers have already arrived at designs which must be accepted as meeting the requirements of those who are prepared to look upon the benefits derivable from the use of motor vehicles as sufficient to merit some care ; to merit the bestowal on the motor and its gear of a part, at least, of the care and consideration which would otherwise have to be spent on a horse or horses. I am quite aware that these vehicles are almost all propelled by mineral spirit motors, and that there are valid objections to the use of this spirit, because of the care necessary, the smell of the exhaust, the necessity of constant running, and the vibration when the vehicle is standing. The third and fourth of these objections will be gradually removed ; the first two belong equally to a horse, and the first—namely, the care—attaches to the possession of almost everything worth having. The amount of careful attention necessary, or of care imposed, will, however, be lessened by the use of motors in which petroleum-oil is employed as fuel, and there is reason to believe that this will ere long be found possible. Indeed, at least one kind of small motor-carriage is at present running with ordinary lamp-oil. This lessens care or apprehension of danger, but at present does not lessen trouble or smell, and the undisputed easiness which attends the vaporisation and combustion of mineral spirit, and the simplicity of the motor parts required for its use, have to be given up as the price of the greater safety and greater economy. The price of a suitable mineral spirit or oil of easy evaporation will no doubt decrease with the increased employment, as the present high price is partly caused by regulations which have now been modified, and the consequently small incentive to refiners in this country or to oil merchants to keep in stock the foreign distillate.

The use of heavy oil depends much on the achievement of a sympathy of action between the oil-feed and the amount of resistance which the engine in very varied work experiences. Even more than this must be attained, for it is necessary that the cutting off of the oil-feed shall anticipate by a working stroke the cutting off of the work. When this is done, foul exhaust as an attendant of variable work will be avoided, and one of the greatest objections to the heavy oil removed. This has been very nearly if not quite achieved in the new Roots motor, in which the governing by the exhaust also governs not only the draught of oil-vapour into the cylinder, but the supply of oil to the vaporiser.

The objections to which I have referred obtain chiefly with reference to motors and oils or mineral spirits for passenger vehicles. They do not obtain with regard to vehicles for trading purposes, or, at all events, not to the same extent. It is as well to admit that there are objections, but it is equally or more important that we should not be guilty of causing delay in the development of a much-required means of transit by indulging in that cheap wisdom that shows itself in mere adverse criticism. The feeblest vitality rarely refuses to show its activity in this occupation ; but when the end sought is one which all men admit to be desirable, all men should lend their encouragement, or at least refrain from the pitiable weakness of deprecating as incomplete a thing which is avowedly in course of development. In this spirit we must acknowledge that our Continental neighbours have produced motor vehicles which, if we never got any better, would have their uses, and many uses; but we hope to improve upon these vehicles in various ways. In the same way we should admit our gratification at the change in our laws which will permit us to make these improvements, while we at the same time hope for some modification in the regulations under the new Act. This, however, is a small matter compared with the anxiety lest local regulation-makers may not refrain from that form of criticism and activity to which I have already referred.

In England there is now considerable activity in the production of motor vehicles, chiefly of the smaller kinds or smaller powers, and there is little doubt that this limitation will for some time characterise the new industry. The smaller powers are not only more easily obtained, but construction and experiment are less expensive, and there is at the same time the encouragement of a very considerable demand.

The power required in the heavier vehicles introduces difficulties of many kinds, not only in the motor itself, but in its fuel, its working fluid, and the transmission of its power to the driving-wheels.

On the quantity of power required some remarks may be made.

The great range in the rate of doing work which a horse has at his command is the cause of the very unfavourable position taken by the mechanical horse, in comparison with animal horse. The power of a horse expressed in lbs. raised 1 foot in a minute has been measured by several experimenters, including James Watt, whose arbitrary determination of what shall be called a horse-power is used almost throughout the world. Watt found that the average rate of work of a good horse working eight hours per day was 22,000 lbs. raised 1 foot in one minute, that is to say 22,000 foot lbs. To give a liberal horse-power by a steam engine he added 50 per cent. to this, and determined that the raising of 33,000 lbs. 1 foot high per minute, or 33,000 foot lbs. per minute, should be a steam engine horse-power This horse-power may be a large number of lbs. raised a small height, or a small number of lbs. raised a greater height, and so long as the feet and lbs. multiplied together equal 33,000 they represent one horse-power. Now this is founded on the rate of doing work by a horse who has to keep on doing it during eight hours. The mechanical horse can continue this performance 100 or any number of hours, but after a fraction of this time the horse would be tired and incapable, or dead. On the other hand, however, the horse can for a short time do work at a very much, a vastly greater rate. This the mechanical horse cannot do. The horse can, for a short time, exert a pull in starting a vehicle or in pulling up a hill at a very slow speed, which may be from 200 to 800 or more per cent. greater than the average pull it can exert over a period of an hour or a few hours. In these cases the horse-power of 33,000 foot lbs. per minute will be made up of nearly all lbs. and very few feet, or may be only a few inches. The horse-power of an engine is largely made up of feet per minute or of piston speed, and in fact, from the mechanical point of view, the steam-engine, although it may be exerting a very heavy pull, does no work until that pull is enough to cause motion. A total pressure of steam of say 1,000 lbs. may bear upon a piston, but so long as it does not move, no steam is used and no work is done. The horse exercising a pull which is ineffectual does, on the other hand, suffer loss of tissue. The engine which is one horse-power running at 800 revolutions per minute is not equal to the power of a one man when running at 100 revolutions per minute, and it only exercises one-eighth of its horse-power. Thus an engine of one horse-power, driving a motor vehicle without the intervention of speed gearing, is not capable of a fraction of the power of a one-horse animal in starting a vehicle, yet the same engine, when the vehicle is moving at a speed corresponding to that of the normal speed of the engine, would tire the horse to death. The great difference then between the horse and the engine is that the horse can exercise its greatest pull when at its lowest speed, and the engine cannot exert its full power or pull until it reaches its full speed. When the horse finds that its load increases and more power is required, he slows down and gives it. The engine, on the other hand, must maintain its speed to full work and can only give out more power by increase in speed, other things remaining equal. Hence decrease in the speed of the motor vehicle is essential when the power required to move it is increased, the speed of the motor being unaltered or increased. Hence it is that an electric tramway car is, under present arrangements, fitted with a pair of 10 or 15 horse-power motors. To place the mechanical horse in the position of the animal horse, the intervention of variable speed gear, which will enable the engine to run at its normal speed, whether the vehicle is starting, moving slowly or fast, is necessary. If such gear cannot be used, the horse-power required in the engine must be many times that which is necessary for average work by horses on ordinary roads.

The relation between the power of a horse and of a one-horse engine is independent of the position of the engine, or of whether it hauls a vehicle by means of a rope from a winding drum, or whether it is fixed on a self-propelled vehicle. There is no anomaly in the fact that a three-horse mechanical horse is required on a vehicle which would be easily hauled by a one-horse animal. These things I have mentioned at length, firstly, because there is a good deal of misunderstanding on the subject, and secondly, because they are at the bottom of the question of cost.

An engine which is sufficiently powerful to propel a vehicle at legal speed on average roads would be sufficiently powerful to propel the same vehicle up the hills if the users would be content to mount the hills at horse speed. This, however, seldom satisfies them. As soon as they get mechanical motors they want to go flying up hills at from two to five times the speed of a horse, and although the pace does not kill, it costs, and if persisted in it will kill a possible industry in the construction of a splendidly useful means of transport, and other advantages to the community which such a means would confer.

One other point which is in favour of the horse should be mentioned. In ascending a hill a horse is enabled to increase its tractive power, either by an actual transfer of a part of the load to its back, or by the virtual transfer by a suitably-inclined trace, as in the Brigg attachment. Part of the work to be done against gravity is thus more advantageously performed. This advantage cannot be obtained for the mechanical horse or motor-wagon by any means at present available.* No advantage would attend placing most of the load on the front wheels, unless they were drivers, for the proportion of the load on all the wheels remains the same on the hill while the

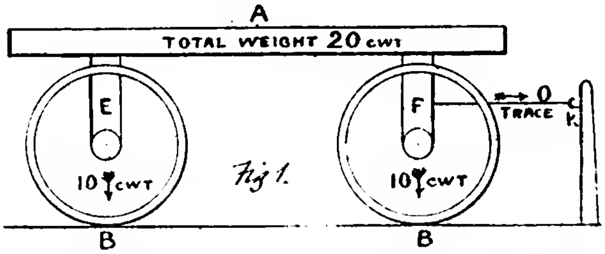


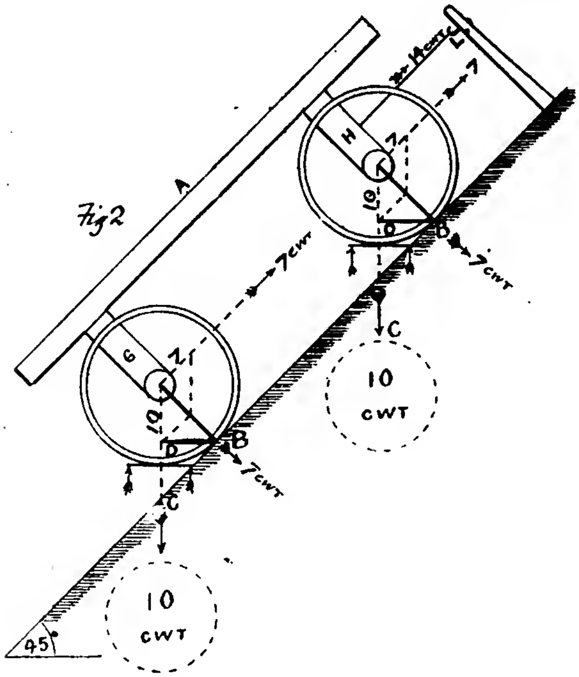
Fig 1.

vehicle is hauled or pushed as when on the level, although it is reduced in quantity. This may be shown by the diagrams Figs. 1 and 2, first used by Mr. T. H. Brigg to represent a symmetric four-wheeled vehicle on the level and on a gradient of 45 degrees or 1 in 1. The vehicle is assumed to weigh 20 cwt., 10 cwt. being on each wheel. A trace is assumed to be attached at F, Fig. 1, or it may pass F, and be attached at K, and for simplicity of comparison it is fastened to a post at K.

It is not infrequently stated that the equality of the loads on the front and hind wheels, which is here shown while the

* In cases of haulage by road locomotives or tractors this could be done where the engine power is sufficient to utilise increased adhesion.

vehicle is horizontal, is lost on ascending a hill by a decrease of the front wheel load and increase of the hind wheel load, because the centre of gravity of the load has changed as regards its vertical position over the ground within the wheel base. It would be a very serious thing for some motors if this occurred, but it does not. Assuming that the 20 cwt. includes the whole of the vehicle, with its wheels, and that its centre of gravity is situated at some point below A. To prevent the vehicle from running back down hill, the trace in Fig. 2 is attached at L, as it would be to a horse. Now the conditions as to the loads on the wheels and no pull on the trace in Fig. 1 have changed in Fig. 2 to the lessened weight of 7 cwt. on each wheel, and a pull of 14 cwt. on the trace. The points of incidence of the load on the road are at B B, at right angles to the road under the axle, as in Fig. 1. The action of the load of 10 cwt. on each axle is vertically downward, in the direction of the arrows C C, and joining this line to the point B in each case by the line D, we have the direction and a scale of magnitude for the forces shown by the parallelogram, which gives us a total of 14 cwt. on the road under two wheels, and a pull of 14 cwt., which has to be resisted by the horse. If the load on the wheels changed with



the change of point of incidence of centre of gravity of wagon on the road, with high load the wagon would turn over, as it would be outside the rear of the hind wheels. If, instead of by a trace, the descent of the vehicle be prevented by upward reaction, as shown by the horizontal lines and small arrows, the load of 10 cwt. will fall on each, although the vehicle is inclined the gradient of 45 degrees. The effect of gravity in these cases cannot be considered without reference to the forces resisting it.

It is not my intention to bring before the Association any illustrations or descriptions of the now numerous forms of light motor vehicles, most of which have been described many times, or of the more recent vehicles described by me in November last before the Society of Arts. I propose rather to deal with some questions on which I have been more particularly occupied, relating to the choice of motors and motor vehicles for the heavier classes of traffic, and to consider what are the kinds of work which can be performed with economical advantages by motor vehicles. With regard to the lighter kinds of business goods and passenger transport, wherein the cost of moving a given number or quantity over a given mileage is the main question, there can be no doubt that mechanical haulage will become cheaper, and offer numerous advantages over horse haulage. It would, nevertheless, be folly to pretend to a belief that even for these purposes the motor-car will entirely displace the horse for some of the miscellaneous work for which its easy adaptability makes its supremacy secure. The shunting work performed in crowded railway stations is an example of this, but only an extreme one, for there is much of the miscellaneous work of business establishments, farms, and contractors' work which will ever require the assistance of the artist in haulage, which a horse is.

For the plain straightforward work, however, which is by far the largest in quantity, there will be within a year some, and within two years, many vehicles, which will perform the work at a profit compared with horse haulage. The actual cost will, however, vary in different districts and towns, and to give figures would be misleading. The vehicles which would meet the requirements of London, or the greater part of it, or of Manchester, would not suit Liverpool, which has ten main streets having long gradients varying from 1 in 17 downwards, and the mean of seven of which is about 1 in 23. For working in Liverpool, the average motor vehicle would require more power than in London. Again, for country use, as, for instance, carriers' carts and light vans, the motive power suitable for Kent would be unnecessarily large for Berkshire, and the motor not economical. The choice of a motor vehicle and the cost of fuel depend not only on these questions, but on the answer the intending purchaser will give to the question as to the gradients, and to the minimum speed on them he will be content to demand. It further depends upon the design and construction of not only the motor, but of the gearing by means of which the power is transmitted to the driving-wheels; and it is on many points in these questions that the actual cost of working depends. In a general way the cost of fuel and lubricating oil for oil motors, and of electrical ignition, when that is used, may be taken at about 1*d.* per horse-power per hour, and for mineral spirit motors 1·30*d.* per horse-power per hour. Taking, then, a four-person vehicle, requiring a three horse-power motor, capable of full legal speed on the level, and (with a good gear) somewhat faster than a horse would walk up ordinary hills, the cost would be about 0·4*d.* and 0·55*d.* respectively per car mile on a mean speed of eight miles per hour.

For steam motors worked with coke or steam fuel the cost would be less, the vibration less; but this kind of carriage-motor for small vehicles is not yet forthcoming. Steam motors worked with boilers with oil fuel will probably cost more, but will be more easily fed and handled, and will offer the other advantages of steam. These may be sooner forthcoming.

On exceptionally good roads nearly level, or with compensating moderate gradients, the cost would be less. The cost for heavier vehicles would be proportionately more. For a good size of country carrier's van weighing, say, 2·5 tons loaded, about 2·5 horse-power would be required on a good level road for a speed of 8 miles per hour, or of about 3·75 horse-power for a speed of 12 miles per hour. It is, however, the heavy gradients which run up the cost, and as showing the great cost of rapid hill-climbing it may be mentioned that the 2·5 horse-power for 8 miles per hour on the level grows to about 10·5 horse-power for the same speed up a hill of 1 in 20, and about 21 horse-power if the gradient is 1 in 10. At 3 miles per hour, however, up a gradient of 1 in 20, only about 4 horse-power is required. These quantities must, of course, all be increased for dealing with bad roads, and in all cases they may be doubled for this purpose; so that to take 2½ tons of vehicle and load up 1 in 10 at 8 miles per hour would require 42 horse-power. I have only given a few figures by way of example, so as to show the enormous increase in power required, and therefore of cost, of high speed up hill. It must also be remembered that the higher the power applied to a self-moving vehicle, the greater the rate of wear and tear of everything. The figures serve to show that mechanical traction may be very economical at considerable speeds on good level roads and at slow speeds up hill, but that it is expensive when high speeds are observed up hill. Not only are high speeds up hill costly for fuel, but they are costly because the motors in the first instance cost more, are larger, and more difficult to stow; they are heavier to carry about, they are less efficient on level and good roads, and wear and tear is greater.

These figures also serve to show how much more consideration most people ought to have for the horse on hill-roads. The craving for high speeds up hills cannot be too much condemned.

For heavier vehicles proportionately higher figures obtain. Having the horse-power required, the cost of oil or other fuel may be estimated. For very heavy vehicles, such as those proposed for carrying from five to ten tons, there seems to be no reason for departing from the opinions I expressed in Liverpool last September. Motor vehicles for such loads have not yet been offered, but when they are, they will generally be slow-speed vehicles, and built much upon the experience of steam traction-engine or road locomotive makers. Where the quantity of material to be moved regularly is very considerable, road locomotives hauling suitable vehicles will be used; but for variety work, a heavy motor vehicle with very high pressure engine and boiler, and in some cases with condensers, will be used. Generally, it does not appear that there will for the present be very much change on usual practice. The law now, however, permits the use of road locomotives under conditions which will stimulate the production of a high class of motor-wagon of large freight capacity, and low dead weight. A road locomotive under the Act may weigh three tons unloaded, and without fuel, water, or accumulators, or with an attached wagon it may weigh four tons unloaded.

The three tons rule is more favourable than the four tons rule, especially for hilly districts, as the load may be made available for adhesion, and a motor vehicle weighing three tons empty may possibly be made to carry five or six tons at moderate and slow speeds, and in some districts haul a vehicle weighing one ton and carrying from two to three tons.

Estimate of Cost of Hauling 20 tons nett 35 miles per day by Road Locomotives.

	£	s.	d.	£	s.	d.
Special road locomotive....				895	0	0
Four special wagons 15 feet by 7 feet....				400	0	0
Three spring drawbars				15	0	0
				£1,310	0	0
Interest on £1,310 at 5 per cent.	65	10	0			
Depreciation at 10 per cent.	131	0	0			
				196	10	0
One driver at 30*s.* per week	78	0	0			
One steersman at 20*s.* per week....	52	0	0			
One assistant at 18*s.* per week	47	0	0			
Oil waste, &c., 200 days at 2*s.* 6*d.*	25	0	0			
Coal, 200 days at 10 cwt., 100 tons at 15*s.* per ton	75	0	0			
				277	0	0
Total expenditure per annum				£473	10	0

Taking 20 tons each trip, being loaded both ways, journey (35 miles) to be done in one day, at 200 working days = 140,000 ton miles per year = about 0·8*d.* per ton mile; add 0·1*d.* for unforeseen contingencies which may arise, and the cost will be under a penny per ton mile. Three wagons will be used behind each engine; one wagon held in reserve. The wagons will weigh about 3¼ tons each, making the gross load hauled equal to about 30 tons, exclusive of weight of engine.

The vehicles have, however, yet to be designed, or at least to be made, and at present the steam cart-horse, or traction-engine, is the only means available for conducting continuous heavy traffic over common roads. By these means, however, it can be shown by trustworthy estimates, based on years of actual practice, that the cost of carrying heavy goods in 20-ton trains, consisting of an engine and three wagons, need not exceed about 1*d.* per ton per mile, or, say, 3*s.* per ton for a 35-mile journey. This estimate includes engine, four wagons, one being for reserve, drawbars, brakes and fuel, oil, interest, depreciation at 10 per cent., and labour. I append a detailed estimate, as made by Messrs. C. Burrell and Sons, for a 35-mile traction-train service, and the experience of other well-known firms, including Messrs. Fowler and Co., Messrs. Ransomes, Simms, and Jefferies, Messrs. McLaren Bros., and others, will, I believe, confirm it. So long as present restrictions are in force, Messrs. Burrell propose to run the trains at night, returning the next night, but when these restrictions are removed, better running could no doubt be made during the day.

To haul 3,000 tons per day would require 150 trains, making a loaded trip each way at a total cost for rolling stock, including 150 spare wagons, of £196,000. Motor-wagons for the same quantity conveyed, each motor-wagon carrying five tons, would cost £240,000, but the speed would be five miles per hour instead of four. This, however, would not be any useful gain on a trip such as the 32 miles between Liverpool and Manchester, and the number of men required per ton mile, even if each motor-wagon hauled one wagon, would be much greater than with the traction train.

Now assuming the traction trains to be adopted for this purpose, it will be readily seen that for such a constant service the roads would have to be specially prepared, and something in the nature of a plate-way, as proposed by Mr. Holt, would be required. No ordinary macadam road would be suitable, even with the wood-tread wheels for the wagons, and the rubber tyres used by Messrs. Burrell for the engines.

The road question thus presents itself as an important one in this problem, and for such a line of traffic as that under consideration, the facilities offered by the Light Railways Act, 1896, demand careful attention, while the handy road locomotive will claim for its own the work of local collection and distribution by means of wagons which will run on either ordinary road, plate-way, or rails. For this purpose numerous handy road locomotives will be required, and the well-paved streets of the greater part of Liverpool are well-suited to the work.

That mechanical haulage on common roads will be a feature of the near future for a large proportion of all the transport, and much of the passenger work of streets and roads, cannot be doubted; but the lighter vehicles and goods vans are at present most promising. For lines of continuous heavy traffic, such as that proposed between Manchester and Liverpool, there can be little doubt that the provisions of the Light Railways Act will modify procedure. The consideration of the conduct of heavy, continuous traffic thus leads me beyond the subject of this paper, as I do not consider that even haulage on tramways comes within it. How far the successful use of gas engines on tramways, as at Dessau, Dresden, and Blackpool, may be taken as an indication of possibilities for motor vehicles I am not prepared to say. It may, however, be useful to record the fact that at Blackpool the cost of gas per car mile for 40 passenger cars, and with gas at 3*s.* per 1,000 cubic feet, has fallen to 1·005*d.*, the consumption of gas per car mile, on a week's average during wet weather, when the rail-resistance is lessened, being only 28 cubic feet. In dry weather it will sometimes reach 35 cubic feet, when the cost is 1·25*d.* per car mile. The cost of haulage by gas engines is thus very low as compared with horse-power involving the keep of from 9 to 11 horses per car, a sum for renewals which includes from two to three new horses per car per year, and usually costs over 5*d.* per car mile. As with motor-cars, however, the cost per car mile depends very much upon the gradients, but as the cars are fitted with a low speed for hill climbing the increase is limited, and the arrangement of clutch and gear adopted by the Gas Traction Company permits the change to be made without shock.

The system of gas-cars used is known as the Luhrig, but a number of patented improvements have been made by the Traction Company which add materially to the success of the system, but it does not appear likely to compete with oil motors for light long-distance motor-cars.

The use of electricity in the propulsion of motor-carriages can hardly be said to have made any important strides. As

I have elsewhere said, this is almost entirely a question of secondary batteries or accumulators, and in particular it is a question of their strength more than of their capacity or rate of discharge. The London Electric Cab Company is now preparing to construct cabs of usual passenger capacity, and to be worked by secondary batteries, which will be carried in changeable boxes, weighing in all 12 cwt., carried under the cab, arrangements being now worked out for receiving the cab, removing its spent battery box, putting in a box of newly-charged batteries, and releasing the cab in three minutes.

The heaviest motor-car work done by secondary batteries at present is the experimental running of the London Electrical Omnibus Company's omnibus, weighing 2·25 tons, without its cells, of which there are 70, each weighing about 23 lbs., or a total of 1,610 lbs.

The St. Pancras Vestry are considering the use of electrical motor refuse-collecting vans, and having their own electric supply station, it is proposed to supply the charging current during the day, when the electric lighting load is small, at 2*d.* per unit, or 1,000 Watts. The vans are estimated to weigh 1 ton 2 cwt., motor and gearing 6 cwt., and batteries 12 cwt., the total weight of the van unloaded being thus 2 tons. Each van would carry 26 cwt., and cost complete £208, of which £63 is for accumulators and £65 for motor and gearing. The traction power required per ton of a four-wheeled van of the kind proposed, has been found, according to some published reports, to be 0·78 horse on dry level macadam, and 1·28 horse on the wet gravel road. These figures become 1·7 horse and 2·2, on a gradient of 1 in 26 at a low speed. It is estimated that a saving of about £30 per year, per van, would be made, assuming 2*d.* per unit for current, the use of one horse-power per ton on an average, and allowing 20 per cent. depreciation on accumulators, and 9*s.* 6*d.* per day for a horse and man.

There cannot be any doubt that secondary batteries will ere long be made capable of withstanding such jolting as cannot be avoided, with a good method of suspension of the cell-carrying box, and some such form of cell as the Fitzgerald aflnidic, will probably contribute to this result, or the Faure-King E.P.S. cells with celluloid envelope. The rates of discharge per lb. of these two kinds are given respectively as 1·1 and 0·9 amperes per lb. gross weight, and the specific capacity in ampere hours per lb. gross weight 3·36 and 4·5. The capabilities of secondary batteries are thus much higher than formerly, and with the improvements in their mechanical properties the extension of their use for what may be considered the rather heavy work of omnibuses may become practicable.

Here I must leave the haulage question and regret that the length of time now taken compels me to omit detailed consideration of the various motors—oil, gas, spirit, steam, and electrical—some of which are made under important patents although the mere cycle patents, such as the Otto, have lapsed, and on which much might be said in their suitable application to motor vehicles.

The CHAIRMAN, in moving a vote of thanks to Mr. Beaumont, said, according to the paper, it would be some time before a design for heavy vehicles would come. He (the chairman) regretted that, and wished it would come about this year. The machine one would like to see would be one that would entirely obviate transhipment.

Mr. H. P. BOULNOIS, in seconding the vote, said he agreed with Mr. Beaumont in what he had said about speed. High speed-running engines were a mistake in many ways.

Mr. R. BENNETT controverted a misconception which appeared to exist that master carters could haul goods at 1*d.* per ton per mile. Though the actual cost of haulage might be low, the expenditure at terminals brought this up to a figure that left a by no means considerable margin.

The motion was then put and carried unanimously.

A SCOTTISH branch of the Self-Propelled Traffic Association has now been definitely established, with Messrs. Mitchell and Smith, C.A., 59, St. Vincent Street, Glasgow, hon. local secretaries

THE AMERICAN MOTOR LEAGUE.

THE following are extracts from the "Constitution" of this body:—

Art. I. Sec. 2.—The purposes of this Association shall be the advancement of the interests and the use of motor-vehicles. This shall be done by reports and discussions of the mechanical features, by education and agitation, by directing and correcting legislation, by mutual defence of the rights of said vehicles when threatened by adverse judicial decisions, by assisting in the work of constructing better roads, better sanitary and humane conditions, and in any other proper way which will assist to hasten the use and add to the value of motor-vehicles as a means of transit.

Art. II. Sec. 1.—Any man or woman, 18 years of age or over, of good moral character and respectable standing, friendly to the motor-vehicle and its interests, shall be eligible to membership, and may become a member by application to the secretary of the League.

Art. II. Sec. 4.—Active members shall pay an initiation fee of 2 dollars and an annual fee of 1 dollar, payable in advance.

Our contemporary, *Industries and Iron*, commenting on the foregoing rules, says:—"From these it would appear that those responsible for its inception—and the subscriptions of its members—have not set their subscriptions at quite so high a figure as have those responsible for the inauguration of the British 'Motor-Car Club,' although, so far as we are aware, the latter did not so particularly insist upon the 'moral character' and 'respectable standing' of its members. Perhaps this was wise on their part, having in view the fact that they themselves laid no especial claim, in forming it—nor since, so far as we know—to possess any very great abundance of these traits."

THE English and French of equivalents Weights, Measures, and Distances are fully set out and explained in THE AUTOMOTOR AND HORSELESS VEHICLE DIARY AND POCKET-BOOK for 1897, which contains over 100 pages of information. Price 6*d.*; post free, 7*d.*, of Messrs. F. King and Co., 62, St. Martin's Lane, London, W.C.

To popularise motor-cars no method is likely to be more effective than enabling the public to practically use them. We therefore gladly welcome the offer now made through our advertising pages to book seats for a trip to Brighton and back. No doubt at first the fee will have to be fairly high, especially as we understand the particular carriage in question is a private one built to carry two passengers. We should not be surprised if the advertiser receives more applications than he can possibly provide for, which will probably result in others coming forward and creating a regular motor-car service between London and London-on-Sea. Success to the enterprise!

A MOTOR-CAR SHOW FOR DUNDEE.—Recently much interest has been manifested in connection with the cycle and motor-car shows which have been held in various parts of the country. Last week one took place in Edinburgh, and was attended with so much success that a number of Dundee gentlemen interested in cycling have resolved to promote one in Dundee. The Kinnaird Hall has been booked for the week beginning Monday, April 26th, and already there has been a large demand for floor-space from Cycle Companies and agents. A feature of the show will be the exhibition of motor-cars from different parts of the kingdom.

A DEFINITE start has been made this week to take advantage in a practical form of the facilities given under the New Locomotives on Highways Act for carrying goods by road. Messrs. Elder, Dempster, and Co., the well-known Liverpool shipowners, ask tenders for mechanical haulage of about 1,000 tons per week between Liverpool and Manchester, and we do not doubt there will be several firms who will be prepared to avail themselves of the invitation, full particulars of which will be found in our advertisement columns.

LAW REPORTS.

The History of Pneumatic Tyres.

THE Pneumatic Tyre Company (Limited) *v.* Marwood and Cross action was commenced before Mr. Justice Romer on the 9th inst., and is brought by the plaintiff Company against a firm of cycle manufacturers carrying on business at Nottingham for an injunction to restrain them from infringing Welch's patent (the property of the plaintiff Company) for pneumatic tyres for bicycles, &c. The defence set up by Messrs. Marwood and Cross is that of prior use. They allege that a person named Boulton made tyres in London in the early part of 1891 similar to those described in Welch's specifications—at a period nine months before Welch's patent was granted.

Mr. Fletcher Moulton, Q.C., Mr. Roger Wallis, Q.C., Mr. Walter, and Mr. Graham appeared for the plaintiff Company; and Mr. Thos. Terrell, Q.C., Mr. Houghton, and Mr. Peter Rylands represented the defendants.

Mr. Boulton and a number of other witnesses gave evidence in support of defendants' allegations, after which the plaintiffs called rebutting evidence.

Mr. Harvey Du Cros, the Chairman of the Dunlop Company, was called, and said that when he brought over the pneumatic machines from Ireland he did not believe there was a single pneumatic machine in London, and he did not believe that tyres of this pattern were made at the period which the defendants' witnesses alleged. He was appointed managing director at the end of the year 1890, when the trade was being developed. The tyres and the covers were both hand-made. Pneumatic tyres were seldom seen in 1890, and it was quite a matter of favour to procure one then. At Whitsuntide of 1890 he and his three sons came over from Ireland, and used pneumatic tyres at amateur races in various towns, when they were a novelty. At that time there was no such thing as a detachable tyre on the market. Then, in the year 1891, in the month of April, one of their workmen invented one that was afterwards patented in the joint names of the inventor and himself, and called the Roberts and Du Cros tyre. In the same year (1891) the Company purchased Woods' patent for valves and deflation. Before that they had to cut the tyre to get the air out. Woods' was the first screw valve. Cushion tyres followed the pneumatics. The former were not common early in the year 1890.

Cross-examined on behalf of the defendants, witness said that he was sure he did not know of any detachable tyre in 1890. In 1889, the moment pneumatic tyres appeared, there was a universal condemnation of them in the Press. The objection taken to them at first was that they were unreliable because they slipped. At the close of the year 1890 the merits of pneumatic tyres were largely admitted, and cushion tyres were discarded.

Amongst other witnesses called by the plaintiffs and cross-examined by the defendants was Mr. Jelly, trade manager of the Beeston Company, who stated that his Company turned out 4,000 tyres or thereabouts a week, and that when an action was brought against his Company by the plaintiffs he was most anxious to endeavour to obtain evideuce of anticipation in 1890, and called on Bolton for the purpose. It, however, did not appear that Bolton made tyres with wires in the pockets in 1890, and that Mr. Lawson pressed Bolton for documentary proof. Mrs. Bolton said they found they were oue year out, the tyres being made in 1891 instead of 1890. The action against the witness's Company was settled, but he was absolutely ignorant on what terms. The Boltons' statements were of no use to him. He gave them a sovereign.

Witnesses were called by the plaintiffs to rebut the defendants' evidence, including the captain of the Kingsdale Cycling Club in 1891, of which Bolton was a member. This witness stated that he himself bought his first pneumatic tyre in May, 1891, and had previously, in 1890, ridden with Bolton, and never remembered Bolton, in 1890, having or mentioning pneumatic tyres. In cross-examination, the witness said he could not remember how many times he saw Bolton ride in 1890. He himself did not miss more than two or three club rides, and the club-book would show the names of the riders. The witness, on re-examination, stated that he had no wish to go against Mr. Bolton, and had no interest, pecuniary or otherwise, in the case. Another witness, a member of the club, said that the first time he heard Bolton speak of pneumatic tyres was in 1892, nor had he seen any in Bolton's place in 1890.

Mr. Henry John Lawson, called by the plaintiffs, said that he was acknowledged to be the inventor of the safety, and the founder of its business. For the purposes of the Beeston Company action he scoured the country. He went and saw Bolton. Bolton showed him a bit of brass, &c., as one of his experiments. Witness told him he would pay him handsomely, and asked him for any proofs he could give that he had ever made any pneumatic tyres with wires. He also went with Jelley, and on reference to a document, mentioned by Mrs. Bolton, as fixing the date of making the articles in 1890, and which, on this second occasion, had been produced, it was found that the document fixed the date as in 1891. So there was nothing more to be done. It was not the case his Company got a licence from the plaintiffs on very favourable terms. It turned out favourably because his Company got larger. The witness declared, amongst some laughter, that he "was not taken up by Mr. Hooley." What he wanted to get for his action was documentary proof of prior user, and he could not get it. He was now very much interested in supporting the Welch pateut.

The Editor of the *Cyclist* since 1879 was called, and stated that the Dunlop came out in 1889. At the end of 1890 pneumatic tyres came into use, but it was a matter of favour early in 1891 to get them. In 1890 the only valve in use was the Dunlop one, and the tube had to be cut for deflation. The first cushion tyre was shown in the Stanley Show at the Crystal Palace early in 1890, and was very large, and was humorously styled by its exhibitor—The Rheumatic Tyre.

The evidence having been concluded, Mr. Moulton, Q.C., for the plaintiffs, addressed the Court.

After the mid-day adjournment on Friday last, which was the seventh day of the action, counsel for the defendants said he could see that Mr. Justice Romer was not in his favour, and that he would be glad to have an expression of his view.

Mr. Justice Romer said that he could not say that the defendants had proved to his satisfaction the burden that was laid upon them. There was a good deal of truth in their evidence he dared say, but it was much mixed up with what was not true. It would be a painful thing for him to have to analyse the evidence, as he would have to say a good many things he would rather not say. He should be glad if the matter could stop here.

Counsel accepted this intimation, and Mr. Justice Romer said that he would say nothing then except that the case of the defendants, not having beeu made out to his satisfaction, there must be judgment for the plaintiffs, with costs.

A Motor-Car Accident.

CHARLES *v.* ARNOLD was an action heard on Friday, the 29th ult., before Mr. Justice Hawkins and a common jury, in which the plaintiff claimed compensation for injuries suffered by him in the course of an exhibition of motor-cars and cycles at the Imperial Institute on May 1st last.

Mr. Hawtin and Mr. Scrivener were for the plaintiff; and Mr. Dickens, Q.C., and Mr. Hohler for the defendant.

The plaintiff was a photographic journalist, and his business was to attend exhibitions and other public functions, to take photographs of certain things, and, if necessary, to write a description of what took place. In pursuance of his calling, he went, on May 1st, to the Imperial Institute, where there was a procession of motor-cars. His case was that he spoke to some of those who had authority in connection with the show that was to take place, and by them he was shown into the enclosure where the procession was to be, and to a point from which it would be convenient to him to take photographs. Whilst he was engaged in photographing a car surrounded by Lord Lathom, Sir Somers Vine, and a number of other gentlemen, a car which belonged to the defendant came along in a procession, and when near the plaintiff it suddenly turned to the left, bore down upon him, and crushed him and his photographic machine against the barrier. The defendant assisted the plaintiff, offered him brandy, gave him £2 10*s.* as compensation, and hoped to hear no more of the matter. Charles, in his evidence, said that he joined in this hope, and he tried to go on with his usual work, so as to realise the season's profit. At the end of a week, however, he had to go to a doctor. There was then no objective evidence of injury, but the plaintiff experienced certain pains, and he submitted that the £2 10*s.* was by no means enough to compensate him for the injuries which he had suffered and the expenses to which he had been put in connection with the accident.

In the course of the case a placard was produced, which was headed "Display of Motor-Cars and Cycles," and said, "Visitors are requested not to stand or walk inside the enclosure near the demonstration. Any visitors disregarding this will do so at their own risk." The plaintiff said that he did not take any notice of this, and did not regard it as addressed to him, as he was not there in the character of an ordinary visitor, but as a Press representative.

Mr. Dickens, upon the conclusion of the evidence for the plaintiff, submitted that no case had been made out by him. It had not been shown that there was a breach of any duty which the defendant owed to the plaintiff; nor was there any evidence of negligence on the part of the defendant. He had, however, vidence upon the question of negligence.

The jury intimated that they would hear that evidence.

Mr. Clark, superintendent of the garden of the Imperial Institute and of the enclosure, said that on the day in question it was what was called a "trial day" in reference to a future exhibition. Men were posted to warn people not to enter the enclosure, and to point their attention to the notices. The men were told not to allow anybody whatever within the enclosure, unless they were connected with the Institute or connected with the Motor-Car Exhibition. As to the plaintiff, witness told him personally that he would not grant him admission to the enclosure, and the fact was that he did not grant admission to the enclosure to any other Press man on that day.

In the course of the evidence for the defence the jury handed a written communication to his lordship, who, in his turn, sent it to the counsel in the case.

In the result a juror was, by consent, withdrawn.

The "Silent Tyre" Patent.

On Tuesday, the 3rd inst., a petition was heard by the Judicial Committee of the Privy Council for the extension, by an additional 14 years, of a patent for "Improvements in the manufacture of grooved tyres for wheels." The petitioners were William Hasselwood Carmont, consulting engineer (the inventor and patentee), and the Shrewsbury and Talbot S.T. Cab and Noiseless Tyre Company (Limited), which Company acquired the rights in the patent in 1888 from the Earl of Shrewsbury and Talbot, who acquired them from the new Noiseless Tyre Company, to whom the rights had been transferred by the old Noiseless Tyre Company, which went into liquidation. The ground of the application for the extension of the patent was that since noiseless tyres had become popular, there had not been time to obtain adequate remuneration for the time and outlay expended upon the invention, which was a very valuable and useful one, and the validity of the patent had been proved by actions in the High Court. The application was opposed on the ground that the inventor had been adequately remunerated, and that a further extension of the patent rights would be contrary to the public interest.

Mr. Cozens Hardy, Q.C., Mr. Wilkinson, and Mr. Cozens Hardy, jun., appeared for the petitioners; Mr. Alexander, Q.C., and Mr. W. Baker for various opponents; and Mr. Sutton for the Crown.

Counsel having been heard on both sides,

Lord Herschell, in delivering the judgment of their lordships, said it had been proved from statistics produced to the satisfaction of their lordships that the profits derived in respect to the patent exceeded £25,000, and as their lordships considered this to be adequate remuneration, the petition would be dismissed with costs.

The petition was dismissed accordingly.

£15 by Consent towards a Dividend on £3,000,000.

In the Court of Queen's Bench on Friday, the 22nd ult., Mr. Fletcher Moulton applied for an injunction to restrain the Hon. C. S. Rolls from infringing in this country the British Motor Syndicate's patents, by using a Peugeot carriage operated by a Daimler motor. In the result it was arranged that the sum of £15 should be paid as nominal damages, each side paying their own costs, leave being given to the defendant to continue to use the carriage against which complaint was made.

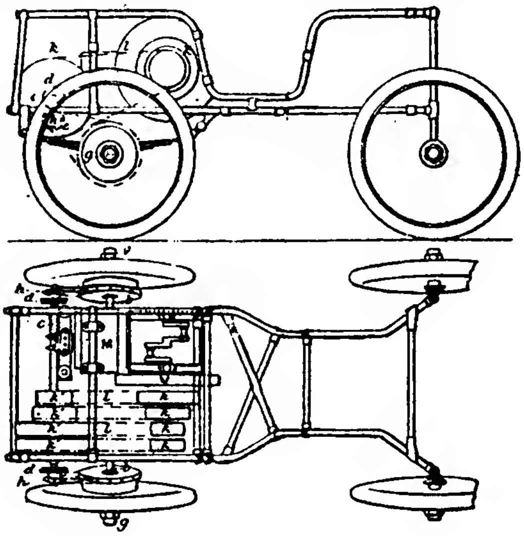
AUTOCAR COMPETITION AT THE BRUSSELS EXHIBITION.

We have in a previous issue given some particulars relating to this, and we give herewith a translation of the municipal conditions of the autocar competition to be held this year. The competition will be divided into two main classes, one for automotive carriages running on ordinary roads, and the other for autocars and locomotives to run on rails. The general conditions are as follows:—The competition for autocars running on ordinary roads is subdivided into two classes: (*a*) for passenger carriages; (*b*) commercial vans. The competition is open to all vehicles propelled by other than muscular means, and has for its principal object to encourage commercial production of the various carriages entered. The commercial production has to be considered from two points of view: (*a*) the cost of the outfit, compared with the capacity for carriage, and (*b*) the actual price per unit carried. The unit for the carriages of the first class to be one passenger, and for those of the second class to be 100 kilogrammes. The competition will open on the 1st of May, and will end on August 31st. The jury in charge of the awards will be elected at the opening of the exhibition, and will commence their duties at once. Each competitor will be called upon to work regularly a course prescribed for him in the trial ground; to declare the price at which he is prepared to furnish his machine and other apparatus in connection with it; to give all information as to its working, cost, the cost of repairs, and the method of working it; and he must also insure himself against the risks run in using his engine, vehicle, and apparatus.

An International Exhibition of Motor-Cars, Cycles, &c., is announced to be held in London from March 25th to April 15th, 1897. The actual location is not publicly stated, but we understand from those responsible that a specially suitable hall has been secured, and that already important support is assured from not only some of the chief French makers, but also by many of the leading British firms who are interesting themselves in the industry The Organising Committee consists of Mr. C. Laroche as foreign delegate, Mr. A. Villers, and Mr. W. M. Paterson will act as secretary, the offices being at No. 23, Pall Mall, London, S.W.

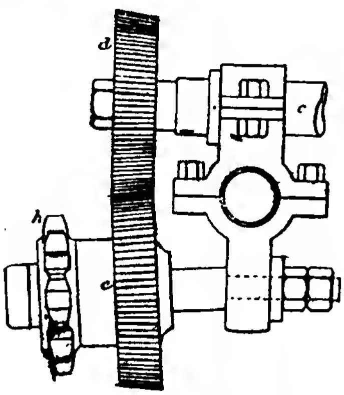
THE FOUCHER-DELACHANAL MOTOR-CARRIAGE.

The accompanying illustrations, Figs. 1 and 2, show a plan and elevation of a motor-carriage made by Messrs. Foucher and Delachanal, of 3, Rue Taylor, Paris. The vehicle illustrated is arranged to carry three persons, two at the back and one in front. The frame of the carriage is built of steel tubing (as will be seen from Fig. 1), in which the seats, the steering-handle, and the speed-changing lever are, however, not shown. A petroleum



Figs. 1 and 2.

spirit motor of three horse-power is employed, but beyond that it is fitted with two horizontal cylinders. The feature of the Foucher-Delachanal carriage is the method employed to obtain the inclination of the wheels usually adopted by carriage builders, this being shown in Figs. 3 and 4. The variable-speed gear is also claimed to be of a special kind. Three rates of speed are provided, a section of one of the pulleys on the engine shaft being shown in Fig. 4. The cones, *m*, which are fixed to the shaft, are made of brass, faced with compressed pulp. The pulleys, *k*, themselves are mounted on ball-bearings, and run loose, when not in contact with the friction cone. Altogether, there are four sets of driving and driven pulleys, three, with crossed belts for the forward motion, and one, with direct belt,



Figs. 3 and 4.

for the backward motion. The different pulleys are brought in contact with their respective friction cones by means of a lever fixed at the right-hand side of the carriage. The power is transmitted to the driving wheel through the intermediary shaft, *c*, the inclined gear wheels, *d* and *e* (Fig. 3), and the usual chain and chain wheels. The vehicle is claimed to be exceedingly light, the one illustrated weighing 270 kilogs. (594 lbs.). The frame-work and propelling mechanism being complete in themselves, any form of carriage body can be fitted to them. We are indebted to *La Locomotion Automobile* for the illustrations.

CORRESPONDENCE.

*** *We do not hold ourselves responsible for opinions expressed by our Correspondents.*

*** *The name and address of the writer (not necessarily for publication)* MUST *in all cases accompany letters intended for insertion, or containing queries.*

BRITISH MOTOR SYNDICATE (LIMITED) v. HON. C. S. ROLLS.

To the Editor of The Automotor and Horseless Vehicle Journal.

Dear Sir,—In response to your request and to those of various persons interested in automobile affairs, I here place before you the true facts relating to the above recent action, which you are at liberty to insert as proposed in your journal.

Being unable to purchase a car from the Syndicate, and having, therefore, the intention of going over to Paris to purchase one, I wrote to Mr. Lawson and the British Motor Syndicate as to who represented the firm of Peugeot in England, but they "regretted their inability to give me the desired information," and mentioned nothing about their patent rights for that firm.

In October last I imported a Peugeot carriage from Paris, and the Syndicate has since sued me for infringement, which they, however, acknowledged was merely technical, and as they also acknowledged that I had acted throughout in good faith, the following terms were arranged by them with my solicitors :—

1. That I should submit to an injunction against infringement of their patents.
2. That they should *pay their own costs*.
3. That in consideration of a nominal payment of £15, they would give me perpetual license to use my car.

It will thus be clearly seen that, not being inclined to incur the trouble and expense of disputing the validity of their patents, I did not contest same, but agreed terms which could have been carried into effect out of court had it not been that, as in all cases where the defendant is under age, the consent of the judge was in this case necessary.

There have been in your contemporary, *The Autocar*, glaring advertisements about patents being upheld, the inaccuracy of which statements is evident from the fact that no discussion as to patents was entered upon, and the case was not fought out for reasons above explained. There are also statements to the effect that "nominal damages were asked for and ordered by the court to be paid"; as a matter of fact no damages were even claimed. Trusting the facts are clear.—Faithfully yours,

C. S. Rolls.

South Lodge, Rutland Gate, S.W., *Feb. 9th*.

THE GREAT HORSELESS CARRIAGE COMPANY.

To the Editor of The Automotor and Horseless Vehicle Journal.

Sir,—Might one inquire what has become of the Great Horseless Carriage Company (Limited)—capital, £750,000, of which £500,000 was paid to the British Motor Syndicate? I am led to ask this question because, as far as can be gathered, little or no reference was made to the concern on the occasion of the London to Brighton run, and now I understand that no mention was made of it on the occasion of the British Motor Syndicate meeting at Coventry. The shareholders who visited Coventry inspected the Daimler Motor Works, the manufactory of the mysterious Pennington motor, the processes of Humber and Company, and apparently the works of the British Motor Syndicate, but from start to finish there was no reference to the Great Horseless Carriage Company. It will be observed, by the way, that the Pennington motor is constructed at the Motor works, though apparently the patents have passed out of the possession of the British Motor Syndicate. If, as is suggested, the works of the British Motor Syndicate and the Great Horseless Carriage Company are identical, it appears to me that possibly shareholders of the Great Horseless Carriage Company may presently be shown the same works as theirs! In fact, the whole arrangement looks somewhat like the cast of an ancient farce:—

Box	....	The Great Horseless Carriage Company.
Cox	....	The British Motor Syndicate.
Bouncer....	....	(His Original Character) H. J. Lawson

The £10 fully-paid shares of the Great Horseless Carriage Company are now valued at £2 to £3 in the open market.—I am, &c.,
A Shareholder.

A REVERSION TO STEAM.

To the Editor of The Automotor and Horseless Vehicle Journal.

Sir,—In your issue of last December you did me the honour to insert a rough sketch of a self-propelled carriage. The motive power proposed was a combination of oil-motor and dynamo; but further consideration of *pros* and *cons* has induced me to follow an illustrious example and look to steam as the most practicable power to employ. In order, however, to minimise vibration, I should be inclined to adhere to the same form of vehicle, the rear portion being mounted on a four-wheeled trolley carrying the steam plant, springs being interposed to absorb as much as possible the shaking due to the engine. An advantage of this arrangement would be that the main weight of the vehicle and motor would be distributed between *two* pairs of wheels, both (it may be added) being driven.

Another advantage perhaps would be that the motor, being quite distinct from the carriage proper, could be detached for repairs and its place taken by another if necessary. The large steering-wheels (shown before) are designed to facilitate the passage of the vehicles over obstacles and irregularities. In conclusion may I suggest that information as to the applicability of the Serpollet system to small powers (such as one-horse) would be interesting?—I am, &c.,

A. J. Allen (Member S.P.T.A.).

London Institution,
Finsbury Circus, E.C., *Jan. 22nd.*

P.S.—One of the numerous advantages of steam is the possibility of applying its pressure directly to the crank of the driving-wheel. Why cannot this be done on such a self-propelled car as well as on a locomotive? Also, is not a pneumatic tyre a refinement quite out of keeping with heavy steam machinery? Personally, I should prefer a good iron tyre capable of standing rough usage, and old-fashioned compression wheels to match.

MR. LORRAIN AND VAPORISATION.

To the Editor of The Automotor and Horseless Vehicle Journal.

Sir,—In your issue of the 18th ult. I notice a letter from Mr. J. G. Lorrain. For the benefit of your numerous readers I will repeat what I have already informed that gentleman, viz., that I did not refer to the method of vaporising he mentions. I experimented with it some time ago and found it of no practical value. This is corroborated by the fact of its not being in use, and I am sure Mr. Lorrain himself cannot have been successful with it.

I should like to know if Mr. Lorrain has yet found his papers. It is a month ago since I asked him to refer to them and correct himself respecting his dates.—Yours faithfully,

Walter Rowbotham.

27, Vittoria Street, Birmingham,
Feb. 8th, 1897.

GREAT HORSELESS CARRIAGE AND NEW BEESTON COMPANIES.

To the Editor of The Automotor and Horseless Vehicle Journal.

Sir,—I think it is a great pity that Lord Winchilsea should resign the chairmanship of the Great Horseless Carriage Company. It would be vastly better if his lordship would remain on the Board and co-operate with the large number of shareholders who would doubtless be willing to try to regain some of their money. The resignation of Lord Winchilsea, like the resignation of Mr. F. W. Shorland from the New Beeston, leaves the management of these companies in the hands of a number of persons who do not appear promising directors. The result of their management is illustrated in the prices. The £100,000 worth of £10 shares of the Daimler Motor Company are now worth, roughly speaking, £40,000. The £750,000 capital of the Great Horseless Carriage Company would now fetch little more than £200,000. The £1,000,000 of the New Beeston Cycle Company is practically unsaleable. The investing public have not benefited much by the methods of Mr. Lawson, and the application of those methods is facilitated when gentlemen in the position of Lord Winchilsea resign.—I am, &c.,

A "G. H." Shareholder.

Feb. 2nd, 1897.

AN OFFER OF LANTERN SLIDES.

To the Editor of The Automotor and Horseless Vehicle Journal.

Sir,—There are but few districts in England where people really know what a motor-car is, and it probably may be a year or more before the new vehicles are common in all our country towns. Lectures on mechanical traction have been well attended, and have doubtless been the means of interesting some people in the carriages of the future.

I have a collection of about forty lantern slides, commencing with Hancock's steam carriage of 1833, and fairly representing what has been done up to the present time. I shall be happy to lend these to any responsible individual for lecture purposes. Unfortunately some of them are rather dense, and require a good light.—Yours, &c.,
John Henry Knight.

Barfield, Farnham, *Feb. 4th*, 1897.

PATENT WHEELS.

To the Editor of The Automotor and Horseless Vehicle Journal.

Dear Sir,—I notice in your journal for January a lecture delivered at the Royal Institute, Liverpool, by Mr. G. F. Thompson, consulting engineer, Liverpool, the subject being "The Motor Wagon Scientifically Considered." Where he speaks about the wheels, their construction and their obstructions, I fully agree. It is rather remarkable that further on in the same journal, pages 167 and 168, I find a letter from Mr. W. P. W. Weatherill, of Manchester, *re* his patent wheel which appears to me to meet Mr. Thompson's views.

Now being a coach builder myself and interested in wheels, I applied to Mr. Weatherill for the particulars of his wheel, with the result that he has supplied me with a bicycle fitted with his patent wheels, which I have gone thoroughly into, and find it does its work well and easy, and really makes a pneumatic tyre a superfluity.

I am so impressed in favour of the wheel that I have placed my show-room at his service, so that anyone calling and producing their card can see it.

It is really a wheel within a wheel, the centre wheel is about one-third the diameter of the larger wheel. In the larger or hubless wheel an adjustable groove is formed, in such groove the small wheel rolls; the said small wheel is supplied with a double cushion rubber tyre, the larger wheel with a solid rubber tyre. The small wheel is also smaller in diameter than the groove it rolls in. When the larger wheels meet with obstruction the small wheels roll forward in their grooves and press the large wheels over the obstruction without a jar, even if the obstruction is a brick.

It does not matter which way the wheel is going, the effect is the same either way, and also when back pedaling the small wheel acts as a brake to the larger wheel. The wheel can be applied to any kind of wheeled vehicle, it is simply a matter of size and strength to be considered for the work intended.

For carriages and autocars I consider the rubber tyre on the smaller wheel (which cannot possibly get out) is quite enough to check jars and vibration, and the usual iron tyre may be used for the larger wheel, which is much cleaner for carriage and autocar use.—Yours truly, JOHN WILLIAMS.

Station Approach Road, Manchester.

MAXIM MOTOR COMPANY.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

SIR,—Having noticed a paragraph relating to the registration of the "Maxim Motor Company," capital £7, for motors, launches, flying machines, &c., and having received several communications relating to the same, I beg to state that neither myself nor my associates have any connection whatsoever with the said Company, neither have we authorised anyone to exploit the motors which we are now making. The seven shareholders whose names appear as organisers of this Company are completely unknown to me.—I am, Sir, your obedient servant,

HIRAM S. MAXIM.

18, Queen's Gate Place, S.W., *Feb. 4th.*

NEW INVENTIONS.

Claiming particularly to apply directly or indirectly to Motor Vehicles, &c.

Compiled for "THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL" by HERBERT HADDAN and Co., Registered Patent Agents, of 18, Buckingham Street, Strand, W.C., London.

Patents Applied For.

Abbreviations: Impts., Improvements in; Relg., Relating to.

1897.		
Jan. 1.	12.	R. and W. NEILSON. Electric motors.
„ 1.	43.	H. F. JOEL. Electric motors for carriages, cycles, and boats.
„ 1.	87.	L. S. D'ISZORO. Impts. cycles and motor-cars.
„ 1.	92.	W. COCHRANE. Chainless gear for motor-cars, &c.
„ 2.	104.	H. AUSTIN. Driving-gear for cycles and motor-cars.
Jan. 4.	152.	D. COOPER. Propulsion of motor-cars, &c.
„ 4.	182.	A. DREW and H. COX. Impts. relg. wheel bearings.
„ 5.	313.	J. MULDARY and H. R. C. PAULING. Driving wheels of motor-cars, &c.
„ 6.	360.	T. SMITH. Improved chain lubricator.
„ 6.	365.	E. DEELEY. Impts. chainless gear.
„ 6.	374.	L. SOAL. Impts. self-propelled vehicles.
„ 7.	442.	J. THOMPSON and others. Impts. driving mechanism.
„ 7.	462.	J. J. DUFFY. Improved axle spring for motor-cars, &c.
„ 7.	492.	L. and A. MYERS and F. R. BAKER. Impts. driving mechanism.
„ 8.	520.	J. HUTTON. Transmission of motive power.
„ 8.	556.	J. W. LEA. Handles for cycles, motor-cars, &c.
„ 9.	616.	H. WARRY. Impts. motor vehicles.
„ 11.	675.	A. H. BECKS. Impts. relg. propelling power.
„ 11.	748.	L. M. POUSARD. Bogie motor-car.
„ 12.	783.	B. ROSE. Impts. in communicating motion.
„ 14.	1,004.	J. FRASER. Improved motive power engine.
„ 14.	1,018.	H. AUSTIN. Impts. driving-gear.
„ 14.	1,074.	A. J. BOULT. Impts. driving mechanism (P. A. Darracq and others).
„ 14.	1,108.	F. A. HOWLES and A. BERENS. Bearings of motor-cars, &c.
„ 15.	1,131.	H. FROST. Impts. driving motor-cars, &c.
„ 16.	1,212.	P. BAGOT. Impts. motor vehicles.
„ 16.	1,237.	W. NORRIS. Convertible autocar.
„ 16.	1,241.	W. WOODLAND. Impts. joints for frames of cycles, &c.
„ 18.	1,258.	H. W. BUDDICOM. Impts. motors.
„ 18.	1,297.	G. R., T. R., and W. J. HARPUR. Impts. relg. bearings.
„ 19.	1,360.	E. WRIGHT. Impts. gas motors.
„ 19.	1,376.	J. BIRTWISLE. Impts. relg. motor-cars.
„ 19.	1,410.	E. TAYLOR. Tools for making frame joints.
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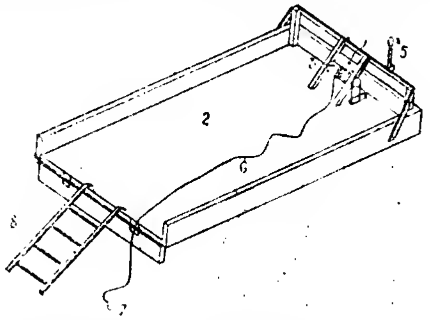
„ 22.	1,707.	F. PARKER. Impts. motor-cars and velocipedes.
„ 22.	1,708.	T. M. PURDEY and W. H. WALLIS. Chainless lever gear.
„ 22.	1,709.	A. J. WAKE. Impts. motor-car carriages.
„ 22.	1,734.	W. P. MAYCOCK. Impts. signalling apparatus for road vehicles.
„ 23.	1,801.	J. T. ELLIS. Impts. cycles, &c.
„ 23.	1,827.	W. E. HEYS. Impts. electric motor-cars (J. J. Heilmann, France).
„ 23.	1,886.	C. CASMAN. Impts. transmitting motion.
„ 23.	1,898.	H. J. DE RIANCY. Impts. automotor-carriages.
„ 25.	1,912.	E. GOULD, jun., and D. ROBERTS. Mudgards.
„ 25.	1,938.	E. TAYLOR. Impts. driving chains.
„ 25.	1,961.	E. D. EVANS. Impts. vehicles having pneumatic tyres.
„ 25.	1,972.	A. DELSEMME. Impts. carbonic acid motors.
„ 26.	2,043.	H. G. WILSON. Impts. variable speed gear.
„ 26.	2,044.	J. L. WILES. Improved motor.
„ 26.	2,049.	A. REBSAMEN. Impts. velocipede, &c., saddles.
„ 26.	2,112.	W. H. WAUD. Impts. motor-cars, &c.
„ 27.	2,217.	J. B. A. BOSANQUET. Impts. relg. horseless carriages.
„ 28.	2,310.	E. DRAULETTE and E. CATOIS. Improved autocar or cab.
„ 29.	2,366.	C. W. and R. LEWIN and T. B. SYDSERFF. Impts. steering forks.
„ 30.	2,487.	J. and J. A. THOMPSON and A. GUYOT. Impts. driving mechanism.
„ 30.	2,498.	R. S. EVANS. Pneumatic cushions.
„ 30.	2,506.	C. H. GAMESON. Impts. relg. motor-cars, cycles, &c.
„ 30.	2,563.	W. T. SHAW and others. Impts. fittings for motor-cars, &c.

Specifications Published.

22,378. November 23rd, 1895. Road vehicles adapted to be propelled by self-contained motors. John James Henry Sturmey, 19, Hertford Street, Coventry, Warwick.

Relates to road vehicles adapted to be propelled by self-contained motors, which vehicles are also denominated horseless carriages or "autocars," and it relates particularly to autocars intended specially for the carrying of goods, and consists in



providing such vehicles with means whereby the motor can be utilised for loading or unloading the vehicles as well as for propelling them. An elevating contrivance is used and connected to the motor in such a manner that the motor may be thrown out of connection with the propelling gear and into connection with the drum, windlass, or other elevating contrivance, and *vice versâ*, at one operation. The figure is a general view, showing the body, 2, of a vehicle adapted to be propelled by a self-contained motor of any suitable description. At the forward end is mounted a drum, windlass, or the like, 3, adapted to be connected to the motor by any suitable gearing, 4, so that it may be revolved thereby when required; any suitable device, such as a lever, 5, being adapted to actuate a sliding clutch, fast and loose pulleys, or other arrangement for throwing the gear into or out of connection with the motor. A chain, rope, or the like, 6, has one end provided with a hook, 7, or is otherwise adapted to be connected to the goods, while the other end may be connected to the drum, or the like, or it may be wound around the same so that it may be drawn thereby, when the free end is pulled, in the well-known manner. The goods may be hauled up or let down, a suitable slide, 8, reaching from the floor of the vehicle to the ground. Several other methods are described.

19,029. October 10th. Road Carriages. H. S. Barrow.

Relates to a mechanically-propelled road vehicle, having a pivoted fore or locking axle and a non-pivoted rear axle wherein the driving wheels on the rear axle are driven by taper or conical band pulleys that are fixed upon hollow shafts or sleeves on the rear axle, and are driven by bands from two similar but appositely arranged taper or conical pulleys fixed on the motor-shaft, or on a shaft driven therefrom, the bands being arranged to be shafted by a band-shifting device adapted to be operated from the hand-gear provided for turning the fore or locking carriage, the arrangement being such that when the two bands are running midway of the length of their respective pulleys, the two driving wheels on the rear axle will be driven at the same speed, and that when the fore or locking axle is turned into an angular position the bands will be shifted so that the relative rotation of the inner and outer driving wheels of the vehicle will be caused to approximately conform to the angle of the fore or locking axle.

15,197. July 9th. Oil and gas motors. W. G. Heys (J. J. Heelmann).

Relates to an explosion-engine of the four-cycle type, in which equilibrium of the parts is obtained by the use of six cylinders and cranks, and in which uniform motion is secured by a succession of six explosions at regular intervals during two revolutions of the crank shaft.

17,777. August 11th. Wheels of motor-carriages. C. GAUTIER and X. WEHRLE.

Consists of a new method of construction for preventing the torsion of the driving chain and allowing the dishing and inclination of the wheels of motor-carriages, consisting of an axle of which the ends upon which the wheels turn are slightly oblique and carry a piece or disc connected to the wheel, and provided with pins projecting at right angles, which pins continually engage more or less in oblong holes in the boss of the chain-wheel, the latter being fitted and revolving freely upon the horizontal body of the axle.

2401. October 29th. Driving gear for mechanical carriages. H. AUSTIN.

Relates to driving gear for mechanically-propelled vehicles, and consists of a rotary drum or drums provided with bevel pinions and frictional devices and brake, so that the vehicle remains stationary when the drum revolves freely, but is propelled when the revolution of the drum is arrested or retarded.

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JUST as we are going to press we have received from Mr. John Philipson a copy of an able work which he has written on coach-building. It is published in the series of technological handbooks published by Messrs. Geo. Bell and Sons. A detailed review shall appear in our next issue, but in the meantime we would advise all interested in the subject to buy the book, which is eminently practical and reliable.

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WITH 4 ILLUSTRATIONS.

CONTENTS of No. 2.

WITH 34 ILLUSTRATIONS.

CONTENTS of No. 3.

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CONTENTS.

THE BRAMBEL ROTARY ENGINE.

LAST November the Press of the country was informed by special telegrams that Mr. Grant Brambel, of Sleepy Eye, Minn., had invented and patented a rotary engine for which he was offered at that time £320,000 (1,600,000 dollars) from an English syndicate. It was reported that the whole amount of the purchase money was paid over in cash and deposited in Chicago banks by the inventor. There are a number of variations of the story, of which the following is an example, the clipping being taken from *The Chicago Daily Tribune*:—

"The engine does away entirely with the crank motion of the steam engine, a most desirable, but to all intents and purposes an impossible, thing to do. The engine uses its own plunger for a cut-off. The engine is steam-tight, and requires no ring packing. It can be made marine type, and, of course, can be either simple or compound.

"It is not a cheap machine, although it costs very much less than the ordinary engine. It weighs less and occupies only a fraction of the space of the old-style engine. Mr. Brambel says:—'When anyone can build a 50 horse-power engine that may be carried around in a hand satchel, he has something that is very valuable, particularly when that engine is adapted to any and all kinds of work wherever power is used. The Brambel engine of 50 horse-power, weighing less than 100 lbs., may be attached to the end of the armature of a dynamo and all the belting done away with, or a Brambel engine not larger than a common saucer could be attached to a creamery separator, and set it whirling at the rate of 6,500 revolutions a minute. The largest of these engines, 250 horse-power in size, is less than a foot wide at the base, and 18 inches high. It is in use in a dynamo room at Trenton, N.J., and the firm say they never had a more satisfactory machine. The patent was obtained a year ago, since which time several machines have been built and put into use.'"

The latest telegram that we have seen proceeds from Sleepy Eye, Minn., dated January 16th, 1897. We quote from *The New York Herald*:—

"The sale of Grant Brambel's rotary engine to the Allen Syndicate, of London, England, has been consummated, and the Sleepy Eye inventor has letters of credit on the Bank of England for 6,700,000 dollars. The amounts paid were: For the English patent, 1,600,000 dollars; for France and Germany, 2,000,000 dollars; for the United States, 3,100,000 dollars.

"These amounts and the fact of the receipt of the letters of credit were verified by the inventor to-day when I called on him."

It is evident that the gentleman from Sleepy Eye is a very wideawake young person, and we take pleasure in publishing herewith an extract from his specification, in which he describes the operation of the device. During the prosecution of the case some four patents were cited, one of which quite closely resembles the Brambel invention, and seems to depend upon the same general principle of operation. The extract reads as follows:—

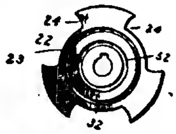
"Having described the construction of the improved motor, the operation thereof, briefly stated, is as follows: When the throttle valve is turned to admit steam or other motive agent to one of the inlet ports, said agent enters the cylinder adjacent to one of the expansion chambers, 25, and is thus admitted to one of the chambers or recesses in the piston. The expansion of the steam gives the impulse necessary to carry the piston in the direction indicated by the arrow (*sic*) in Fig. 2 a sufficient distance to bring the succeeding recess or chamber into the field of the incoming steam, the first-named chamber being meanwhile exhausted at 12. The reversal of the motor is accomplished by moving the lever, 13, to cause the admission of steam through the other inlet port.

F 2

"It will be understood that in practice various changes in the form, proportion, and the minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of this invention.

"What I claim is: In a rotary engine, the combination of a cylinder having opposite heads provided with registering extended bearing boxes, inwardly divergent steam inlet ports communicating with the interior cylinder at their inner ends

Fig. 4.



and a common valve casing at their outer ends, a cut-off and reversing valve arranged in the said casing, a rotary piston arranged in the cylinder and provided with peripheral pockets adapted to communicate with steam chambers at the inner ends of said ports, registering cross-sectionally semi-circular grooves formed in the contiguous faces of the piston and cylinder heads concentric with said bearing boxes, said grooves combining to form cross-sectionally circular lubricating ducts, a shaft mounted in said bearings and fixed to the piston, and lubricating devices in communication with the bores of said bearings, whereby lubricating material is adapted to pass between the ends of the piston and the cylinder heads, and accumulate in said lubricating ducts to form packing to prevent the exhaust of steam or the passage thereof from one pocket to another of the piston, substantially as specified."

It had not been our intention to describe or notice in any way the above-mentioned invention, but we are in receipt of so many inquiries from correspondents, and so many requests for copies of the patent, that we have decided it was best to state the facts of the case and publish reproductions of the patent drawings, and copy the salient features of the specification and the claim.

We have not written to Mr. Brambel for any light on the subject of his valuable patent. We learn, however, that he is a telegraph operator, and we imagine that possibly his vocation may have something to do with the wide publicity which the story has attained. We do not know what object there is in foisting upon the public a story which is in such a high degree improbable. We do not need to go beyond the patent itself, and its very narrow claim, to discover the falsity of the rumour. The principle upon which the engine is operated is by no means new, while the claim confines the design to minute details of construction. If, as it is claimed, an English syndicate has purchased the patent at a price of some 7,000,000 dollars, is it not likely that before investing so vast a sum the patent itself would have been submitted to rigid examination as to scope and validity? We believe, therefore, that the story can be regarded in no other light than a hoax, and desire simply to direct the attention of anyone who may be sufficiently interested in the story to examine into the merits of the case, and they will be satisfied that the whole matter is founded on baseless rumour.

LEEDS MOTOR AND CYCLE SHOW.

A MOTOR and Cycle Exhibition was held in the Leeds Town Hall, from February 27th to March 6th, under the auspices of the Northern Counties Exhibition Company. Many of the large cycle firms exhibited; and the show, which was very well attended, proved a great success.

Messrs. Walker Brothers, of Leeds, had a stand in the crypt, and also showed an assortment of cycles in the Masonic Hall. Amongst them was a New Beeston motor-cycle. This appears to be a well-designed machine, and during a short trial which our representative was able to give it, it seemed to be very easily controlled. It is fitted with an oil-motor of the De Dion type. Petrol is used, and the smell is not noticeable in the open air. Electricity is used for ignition, an accumulator being suspended from the top stay, in front of the rider. A coil fixed on the frame near the motor gives the spark which fires the explosive mixture. A muffler is provided which efficiently deadens the noise of the exhaust. No cooling water is carried, the heat being dissipated by means of a series of flanges cast on the cylinder. The speed control has been well thought out, and is effected by means of a small regulator handle, attached to the top bar of the frame. The starting is accomplished by giving one of the ordinary steering handles—the left-hand one, which is mounted to turn on the handle-bar—half a turn to the right. This completes the battery circuit. The rider pedals the machine for a few feet until the motor catches an explosion, after which he has nothing further to do. The pedals, which are provided to assist in starting, work out the chain-wheel through a ratchet arrangement, and the rider is thus enabled to keep his feet on the pedals after the motor has got to work. The machine is rather heavy—it weighs 150 lbs.—but the makers claim that weight is necessary to overcome the vibration which is inevitable with the oil-motor which develops three-quarter horse-power. The crank-shaft drives on to the wheels through a 7 to 1 reduction tooth-gear. Sufficient oil is carried for a run of 50 or 60 miles, whilst the accumulators are said to hold out for 200 miles. Speed, we are pleased to note, is not made the great feature, although the machine will easily attain the maximum allowed by law.

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To originate and promote improvement in the Law from time to time directly or indirectly affecting self-propelled vehicular and locomotive road traffic, and to support or oppose alterations in such Law, and for the purposes aforesaid to take such steps and proceedings as the Association may deem expedient.

To popularise and assist the development of self-propelled vehicular and locomotive road traffic, and for this purpose to take such steps and proceedings as the Association may deem expedient.

To take or defend any proceedings on behalf or against the Association or its members, which in the interests of the Association or the members thereof may seem to the Association expedient to take or defend. Provided that no such proceedings shall be taken or defended on the part of the members of the Association except in the *bona fide* furtherance of some object of the Association of a public or *quasi* public nature.

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COMPRESSED AIR AS A MOTIVE POWER FOR ROAD CARRIAGES.

[A Paper read by Mr. Rhys Jenkins, M.I.M.E., before the Liverpool Branch of the Self-Propelled Traffic Association at the Royal Institute, Liverpool, on February 16th.]

A detailed exposition of the advantages attending the use of compressed air for carriages would be quite superfluous. Entire absence of smell and of heat and smoke are points that will at once occur to every one.

The compressed-air engine, too, shares with the steam engine an immense range of power, rendering unnecessary the use of variable speed gearing and affording the utmost facility for starting and stopping.

These characteristics render the system particularly useful for urban traffic, and especially passenger traffic. But its application is by no means confined to towns. Wherever there is sufficient traffic to keep compressing stations of fair size in employ, compressed air will answer all requirements as well as or better than any other agency. Probably for heavy, intermittent, or occasional traffic along country roads steam will hold its own. Petroleum, too, judging from present results, will have to be restricted to country roads. It seems quite inapplicable so far for cab and omnibus traffic in the crowded streets of cities, a field which appears to be reserved for Electricity or Compressed Air. Both these being storage systems, are obviously capable of being worked only within certain definite radii of their charging stations, so that they do not present that flexibility of application that attaches to prime movers such as the steam or petroleum engine. But for cab, omnibus, and parcels traffic, or for the conveyance of goods in large quantity along definite routes, this is no disadvantage.

The great point is to apply the system only where there is sufficient work to fully employ a plant constructed on a sufficiently large scale to secure a high efficiency in compression, unless, indeed, as may very well happen in towns, we are prepared to subordinate economy of propulsion in view of the other advantages attending the system. Here it may be remarked that with steam traction an increase in the scale of operations would not perceptibly diminish the expenses per ton, whereas in the case of compressed air it not only reduces the establishment charges, but enables the compressed air to be produced with greater efficiency.

The question of cost has very commonly been regarded as fatal to the application of compressed air for power transmission; that agent has indeed enjoyed a bad name all round in reference to efficiency. But unless a plant is designed with some reference to economy in working and upon correct principles it is useless to expect good results.

Plants are now in use which demonstrate that air can be used for power transmission with very satisfactory results. And even if the compressed-air system in its application to carriages did involve a larger coal consumption than some others, it has to be borne in mind that, after all, coal is but one item among a number of others of equal importance in the total cost of transport.

Historical.

Projects for compressed-air carriages have been brought before the public long since. As far back as the year 1800, Medhurst, the inventor of the pneumatic despatch system, patented a scheme for "a new improved method of driving carriages of all kinds by means of an improved Æolian engine." Medhurst contemplated a general system of coaches and stage-wagons throughout the kingdom and the establishment of air-compressing stations at suitable points all over the country. He described compressors and engines of variable power, a rotary engine to be fixed directly upon the hind axles of light vehicles, and a gunpowder engine, this last in connection with an artillery wagon.

About 1819, Murdock and Gordon are stated to have made some experiments with compressed-air carriages, and from 1827 to 1832 quite a number of schemes were evolved.

William Mann, of Brixton, turned his attention to the subject in 1827, obtained a patent in 1829, and published a pamphlet on the subject in 1830. He advocated compression in stages, now recognised as essential for the production of air at high pressures, and the erection of power stations along the high roads at intervals of 15 to 20 miles, or a continuous iron main with power stations in the coal districts.

Fig. 1 is reproduced from the plate in Mann's pamphlet. The carriage is provided with 15 reservoirs, having a capacity of 75 cubic feet in the aggregate. This supply Mann deemed sufficient for a run of 14 miles with air at 32 atmospheres pressure; with air at 64 atmospheres he held that 34 miles could be covered, and at an average cost for power of about a penny per mile. At this period a good deal was being done in the way of supplying lighting gas in portable reservoirs, much as oxygen and other gases are now sold, and Mann and other inventors make frequent reference to the reservoirs and pumps employed for this purpose. Mann states that the reservoirs in use by the Portable Gas Company for containing gas at 30 atmospheres pressure were $3\frac{1}{2}$ cubic feet capacity, 12 inches in diameter, and $\frac{1}{8}$ inch thick. The inventor suggested a public supply of power by means of compressed air, as has now been carried out in Paris by Messrs. Popp and Conti. He thought, too, that it would be well to make persons confined in Clerkenwell and other prisons earn their dinners by compressing air for the supply of power for propelling His Majesty's mails throughout the kingdom.

Bompass, another inventor of this period, thought the most suitable pressure about 100 atmospheres. He pointed out that the weight of the reservoirs is nearly the same whatever be the pressure adopted.

Wright's project was worked out in greater detail than any of the others. Fig. 2 is reproduced from his patent specification. He had arrived at what is really the root idea in the economical use of compressed air, *i.e.*, heating it or injecting steam into it prior to its entry into the working cylinder. In the drawing, *b* are the storage reservoirs, *e* an intermediate chamber in which the air is heated by the products of combustion of the furnace *f*, *l* cylinders of engine, the shaft, *j*, of which drives the axle, *s*, of the hind wheels by belting.

There is no distinct evidence that any of these inventors carried their ideas into practice. There is, however, some reason for thinking that one Fordham did make a compressed air carriage about 1832, but particulars relating thereto are wanting. The same remark applies to Von Rathen's carriage, which was tried at Putney in 1848.

FIG. 1.—MANN'S PATENT LOCOMOTIVE AIR CARRIAGE, 1830.

References.

1. Case containing Piston and Cylinder working on the axle of the hind-wheels.
2. Case containing Reservoirs of Compressed Air.
3. Fifteen Reservoirs containing 75 cubic feet.
4. A Reservoir taken out of the case.

The first compressed-air carriage of which there is an authentic account was constructed by two Frenchmen, Andraud and Tessié du Motay, about 1840. As will be seen from Fig. 3, it was made for running upon rails; it was adapted to carry eight passengers; had the air stored at a pressure of 17 atmospheres, while the working pressure in the cylinder was three atmospheres. These inventors also contemplated the application of compressed air to road carriages; they proposed to use pressures as high as 60 atmospheres, which were to be attained in stages, and to heat the air before its admission to the cylinder. They were the first to indicate the necessity of a reserve supply of air for use in hill-climbing or for other contingencies when the pressure in the main reservoirs was approaching its lower limit.

But the only really valuable work in connection with the application of compressed air to locomotion has been done in reference to street tramways, and again by a Frenchman, M. Mékarski. The attempts of Scott-Moncrieff, of Beaumont, and more recently of Hughes and Lancaster, in this country, may be passed over as having remained more or less in the experimental stage, whereas the Mékarski system has been at work on the tramways of Nantes for about 20 years, and is now at work in Berne, and upon four lines in and around Paris. In a few words, the essential features of the Mékarski system are (1) high pressures in the storage vessels on the car. Starting with 30 atmospheres at Nantes, this pressure has been increased in each succeeding installation, first to 45, then to 60, and finally to 80 atmospheres, say, 1,200 lbs. per square inch, on the Versailles line. (2) The air on its way from the storage vessels to the cylinders passes up through a vertical cylinder containing hot water, in doing which it becomes heated and charged with vapour; (3) it also passes through an automatic reducing valve, whereby it is reduced to a constant and comparatively low working pressure. The engines work direct on to the car axles.

There seems to be no question that the Mékarski system as applied to tramways is a success both mechanically and financially.

Fig. 2.

Fig. 3.—Andraud and Tessié du Motay, 1840.

Another French system is that of Messrs. Popp and Conti, already mentioned in connection with the Paris compressed air supply. These constructors prefer low pressures, say, from 15 to 20 atmospheres, and are therefore compelled to charge more frequently. Their engine is compound, and geared to the car axle. They heat the air before using it, and on its passage from the high-pressure to the low-pressure cylinder by means of a small coke stove.

Power Required to Propel a Given Load.

There is little doubt that on this point a great many motor-carriage constructors have erred on the wrong side. The subject of the draught of carriages, and consequently of the power required to propel them, is indeed in a somewhat chaotic state. This is partly due, no doubt, to the variation in the condition of the roadways and of the axle friction. Many authorities state that the resistance is independent of speed, but it is easy to see that this cannot be strictly true, although possibly the effect of variations such as occur in practice may not be of importance.

On a good macadam road in ordinary condition it seems safe to conclude that the average pull for a four-wheel van or omnibus will not exceed 45 lbs. per ton when moving at the rate of eight miles per hour. An allowance of 47 lbs. will certainly be ample, and this, at the speed stated, is just equivalent to the exertion of one horse-power per ton at the wheels. Experiments made by the Paris General Omnibus Company give 44·8 lbs. per ton as the pull required. No doubt by the use of modern mechanical refinements, such as ball bearings at the axles, the resistance might be considerably diminished. But as it stands the allowance of one horse-power agrees with the results of Sir David Salomons' experience, as recorded in *The Engineer*, for a speed of eight miles per hour on a good level road.

It will be safe, then, to base the consumption of air upon the expenditure of one effective horse-power per ton. For starting purposes and for various contingencies the engine should be capable of exerting four or five times this power, and this is well within the scope of a compressed-air engine.

Any ordinary steam engine may be worked by compressed air, no alteration whatever is really necessary, and working pressures such as are common in steam engine practice suit best with compressed air also.

Receivers.

For storage purposes, in order to carry the required weight of air within a reasonable compass, we must adopt very much higher pressures than these.

No alarm need be felt at the pressures found to be necessary. An immense trade is now done in compressed gases, and although there have been a few accidents, their proportion in the total number of bottles charged is quite insignificant, and most of the accidents are such as could not possibly occur with compressed air. Beyond this the gas-bottles undergo far more severe usage than the receivers on a carriage need be exposed to.

Air at pressures of from 1,000 to 1,400 lbs. has been used for years in torpedoes, and so far there have been but two cases of the air-receivers bursting, and in each case the accident arose from the impact of the torpedo against rocks. Bursting is, perhaps, not the correct word to employ in this connection—the action when these receivers are tested to destruction is a very gradual and silent one.

Pressures as high as 2,000 lbs. per square inch are now in daily use for tramway work in New York. One of the cylinders employed, selected at random from a number supplied by the German Mannesmann Tube Company, was recently tested by Professor Jacobus, of the Stevens Institute. It measured $9\frac{3}{16}$ inches inside diameter by 5 feet 6 inches total length, and was $\frac{5}{16}$ inch thick. Up to 4,500 lbs. pressure there was no permanent set; at 5,760 lbs. a rent near one end started. All the cylinders had been tested to 4,000 lbs. by the makers.

At Brin's Oxygen Works the gas is stored at a pressure of 1,800 lbs. in 3-inch cylinders $\frac{1}{8}$ inch thick, and in 9-inch cylinders $\frac{5}{16}$ inch thick.

In this paper a pressure of 1,000 lbs. per square inch has been adopted as one that would probably meet the greater number of cases. Higher pressures demand greater expenditure of power in compression, but they enable us to store more energy within a given space. And as far as the receivers are concerned the question is entirely one of space; their weight for a given weight of air or volume of free air remains the same whatever be the pressure adopted. This is easily seen. Imagine a cylinder of a given thickness charged with air; let this volume of air be compressed to half its original volume. A cylinder one-half the length of the former will now enclose it, but as in halving the volume the pressure has been doubled, the thickness of the cylinder must be increased in the same proportion, if the working stress is to remain constant. The statement is not strictly true, as it disregards the effect of the cylinder ends, but this is not very important. The American tramcar cylinders referred to appear to be exposed to a working stress of 13 tons per square inch of metal. Professor Unwin's Committee on Gas-bottles recommended that the working stress should not exceed 8 tons. For carriage receivers a working stress of 10 tons per square inch for weldless cylinders is certainly not excessive. At that figure the weight of receivers (disregarding the ends) works out as $8\frac{1}{4}$ lbs. per lb. of air stored, or 630 lbs. per 1,000 cubic feet of free air. Making allowance for the ends and connections, the total weight of receivers will be ten times that of the air carried. In the Paris tramcars it works out as twelve times.

The weight of the receivers is also independent of their diameter: four 6 inch cylinders will have the same weight and the same capacity as one 12-inch, and will have the same circumscribing rectangle. It will thus be seen that there is considerable room for constructional variation.

Air Compression.

Having thus far cleared the ground, it will be well to deal briefly with the nature of the problems involved in the transmission of power by compressed air. At the power station or point from which power is to be transmitted are a set of compressing pumps driven by steam or water-power, which force the air into magazines, whence it is transmitted to the motor by a line of piping, or in the case of a vehicle it is stored in reservoirs carried thereby.

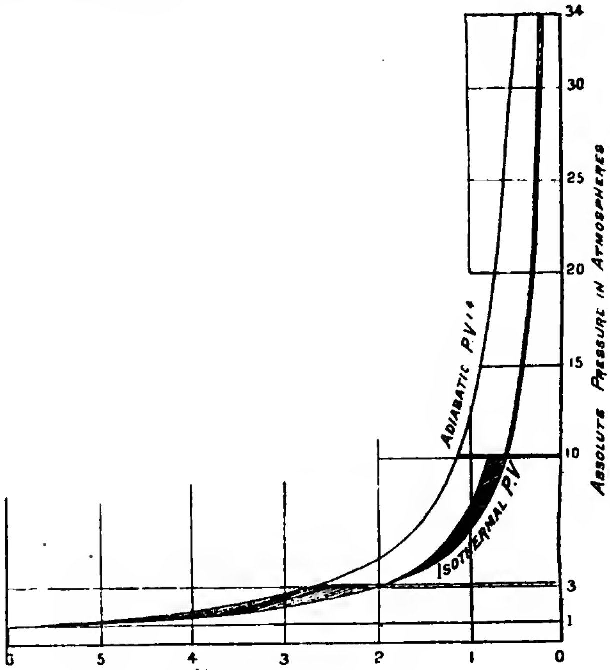
Naturally the object is to get as large a proportion as possible of the work expended in the compressing station exerted at the motors.

In a perfect gas—and air, if dry, is, for all ordinary purposes, a perfect gas—the pressure is inversely proportional to the volume if the temperature remains constant, and the compression or expansion curve is a rectangular hyperbola.

As a matter of fact, however, in compressing air the temperature does NOT remain constant—the work exerted in compression is converted into heat, and this heat acts to expand the mass of air and to increase the work required to compress it to any given pressure.

If we consider the whole of the heat so generated to be retained in the air, the curve of compression is known as an *adiabatic*, in contradistinction to the curve produced by the air at constant temperature, which is termed an *isothermal*. In the isothermal the pressure multiplied by the volume is a constant quantity; in the adiabatic the volume has to be raised to the power of 1·4 to produce a constant when multiplied by the pressure.

At first sight it would appear that no particular disadvantage attended adiabatic compression. The expenditure of a certain amount of work has resulted in the production of a corresponding volume of compressed air at a temperature which may be considerably higher than the initial temperature, and the whole of the work exerted is stored up in the air; and if this air could be transferred directly to the motor cylinder, this would be the case.



Air Compression in Three Stages

FIG. 4.

Unfortunately, however, in all cases that arise in practice, this heat cannot be retained. If the air has to be stored in reservoirs or carried any considerable distance, it must inevitably fall or tend to fall to the temperature of the atmosphere. This fall in temperature is accompanied by a corresponding contraction in volume or reduction of pressure. So that if the compressed air falls to the initial temperature before it is used, all the work expended above that required by isothermal compression is thrown away; and so, setting aside any mechanical questions, it is essential that the compressing process be accompanied by the production of as little heat as possible.

To this end it is now usual for all high pressures to adopt compression in stages, with intermediate cooling; that is to say, the air is compressed up to a certain point in one cylinder, passed into a cooling chamber, where it is cooled down to the initial temperature or as near to it as possible, then led into the second compressing cylinder, and so on. The effect of this step-by-step action is very important, as is apparent from the diagram Fig. 4, which represents compression to 34 atmospheres pressure in three stages. The shaded areas represent the lost work.

In addition to this, the compressing cylinders may be jacketed with water, and may be provided with a cold water spray injection. As to the efficacy of these methods there is some difference of opinion. Many think that the water-jacket is of very little value, and others hold that the undoubtedly powerful cooling action of a fine spray of water in the cylinder is more than balanced by the excessive wear of the cylinder due to the action of the water; it is also somewhat difficult to maintain a really fine spray, and without great watchfulness it may happen that the water is cut off completely by the choking of the orifices.

In any case it is quite safe to say that the compression curve is invariably below the adiabatic line to a small extent in consequence of the equalising action of the cylinder walls, of radiation into the atmosphere, and of the moisture naturally carried by the air.

Cost of Compressed Air.

Now as to the cost of compressed air. In Paris the Compressed Air Company supplies its customers at the rate of 4½*d.* per 1,000 cubic feet of free air. In the ill-fated Birmingham scheme the price was 4*d.* per 1,000, but it was admitted that with the plant and mains in proper order it could have been sold at a profit of 1½*d.* per 1,000. An American authority considers that 2½*d.* per 1,000 would be a most remunerative price for a public supply of air at 100 lbs. pressure.

These figures relate to the supply of air by mains laid in the public streets, and at comparatively low pressures. In charging vehicles directly at the power stations the price should be considerably less, as the cost of the mains and the loss by leakage is saved. On the other hand, the increased pressure required for carriages demands increased expenditure for power.

Possibly the most efficient compressors yet constructed are those of the Paris Compressed Air Company, designed by Professor Riedler, in which a pressure of seven or eight atmospheres is attained in two stages. The plant comprises four sets of 2,000 horse-power triple-expansion condensing engines, Figs. 5 and 5A. The low-pressure air cylinders, A and B, mounted above the low-pressure and intermediate steam cylinders, compress atmospheric air into a receiver, D, from which it is taken by the high-pressure cylinder, C, mounted above the high-pressure steam cylinder. The engine shaft, I, carries fly-wheels, H, H, and drives, by bevel-gearing, J, and vertical shafts, a lay-shaft, K, which operates the valves of the steam cylinders. This shaft also carries cams by which the valves of the compressor are closed mechanically at the required periods. Fig. 6 shows the general arrangement of the cams, rock-shafts, and connections for the high-pressure air cylinder, and Fig. 7 represents the valve chest at the top of the same, U and V being respectively the inlet and delivery valves, and O, O, their rock-shafts. The inlet valve of the low-pressure cylinder is shown in Fig. 8; the valve seat Y is prolonged to form a cylinder Y¹, which, with a piston formed on a prolongation of the valve X, forms an air spring. According to a report by M. Popp, the cost in ordinary working, including coal, water, lubricants, rents, salaries, and wages, is 1⅛*d.* per 1,000 cubic feet, that is about 1½*d.* per 100 lbs. of air. The coal consumed was 5½ lbs. per 1,000 cubic feet, or, say, 13·6 lbs. of air per lb. of coal. Per I.H.P. in the steam cylinder 2·14 lbs. of coal were burned per hour, and the lbs. of air per I.H.P. were 28.

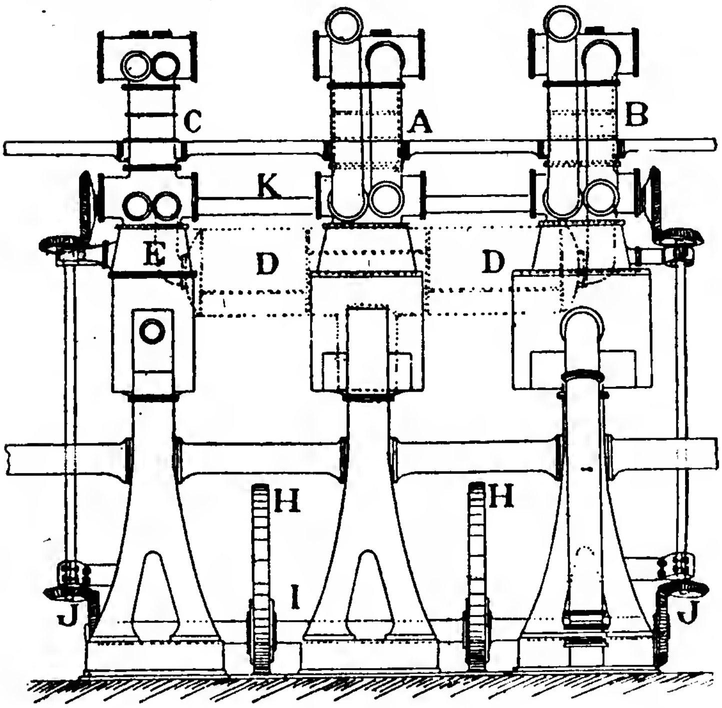


FIG. 5.

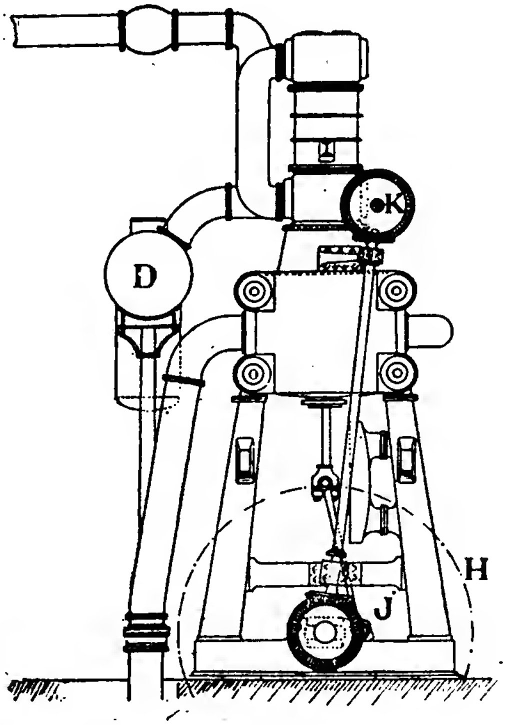


FIG. 5A.

Of the total cost, coal at 25*s.* per ton takes up about two-thirds, salaries and wages about one-fifth.

With a duplicate set of such machinery the air could be compressed to a pressure of 68 atmospheres at a little more than double the expenditure of power, say 12 lbs. of coal per 1,000 cubic feet or 7 lbs. of air per lb. of coal.

In practice, however, unless with very large undertakings, we should probably not go beyond three steps in compression. The St. Augustin-Vincennes Tramway in Paris, on the Mékarski system, is operated by three stage compressors, Figs. 9 and 9A, consisting of four single-acting air cylinders, arranged in couples, tandem. The two low-pressure cylinders are 12 inches diameter, the intermediate 10 inches, and the high pressure 5 inches; the stroke of each is 16 inches. The crank-shaft of the compressor is coupled direct to that of the steam-engine. These compressors in ordinary work produce 9 lbs. of air per I.H.P., or say 4½ lbs. per lb. of coal, the pressure being

60 atmospheres. But on the whole there appears little reason to doubt that with well-designed engines, boilers, and compressors, in a plant of a fair size, 1 lb. of coal would be a liberal allowance for producing 5 lbs. of air at 68 atmospheres pressure, and would even cover the small consumption of fuel required for preheating and intermediate heating at the motor.

Air Motors.

Turning now to the consideration of the Air Motor. The old plan was to send the air direct into the working cylinder, where the converse action takes place to that which occurs in the compressor; the work performed during expansion has to be supplied from the heat in the air itself, which accordingly falls in temperature and contracts in volume relatively to isothermal expansion. This fall of temperature causes trouble in consequence of the freezing of the moisture carried by the air, so that in most cases it has been found expedient to relinquish the gain due to long expansions and to cut off comparatively late in the stroke. It is now generally recognised that the efficiency is vastly increased by heating the air before using it, or by heating and mixing steam with it. The system, of course, ceases to be a storage system pure and simple. In some cases this might be an objection; on a carriage or tramcar, the objection, if any, appears to be infinitesimal.

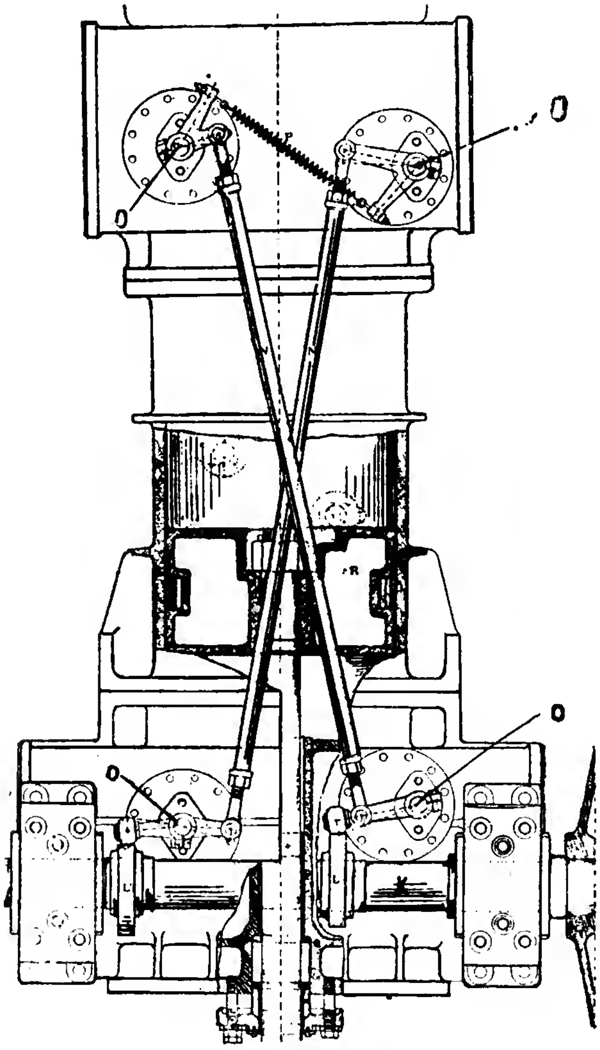


Fig. 6.

The addition of steam has the effect not only of raising the initial temperature, but of also supplying heat to the air as the expansion proceeds; the expansion curve is thus kept well up to the isothermal. The amount of steam required is very small, and the exhaust is quite imperceptible, even in the winter. M. Popp's system of passing the air through a coke stove is perhaps simpler and lighter than the Mékarski plan, although doubtless not so efficient. Fig. 10 represents a stove which may be used in connection with a 15 horse-power engine. It is 2 feet 6 inches high by $6\frac{1}{2}$ inches diameter, and consists of a series of vertical tubes, E, coupled in pairs at their upper ends by ∩ pieces, F, and mounted upon a hollow-base ring, A, formed with radial partitions and inlet and outlet branches. The air

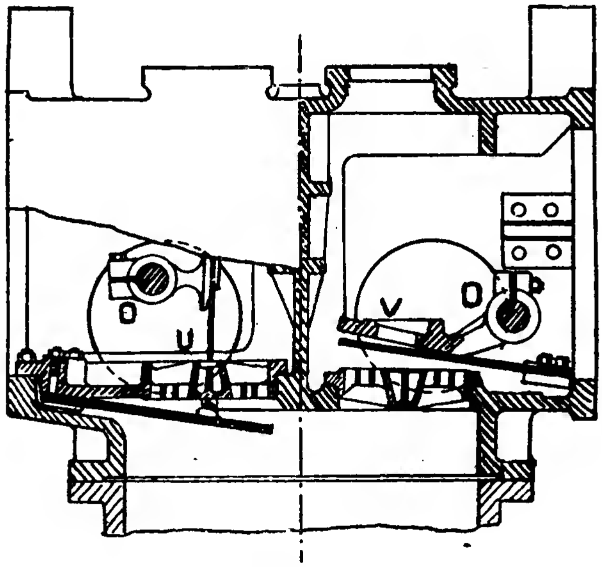


Fig. 7.

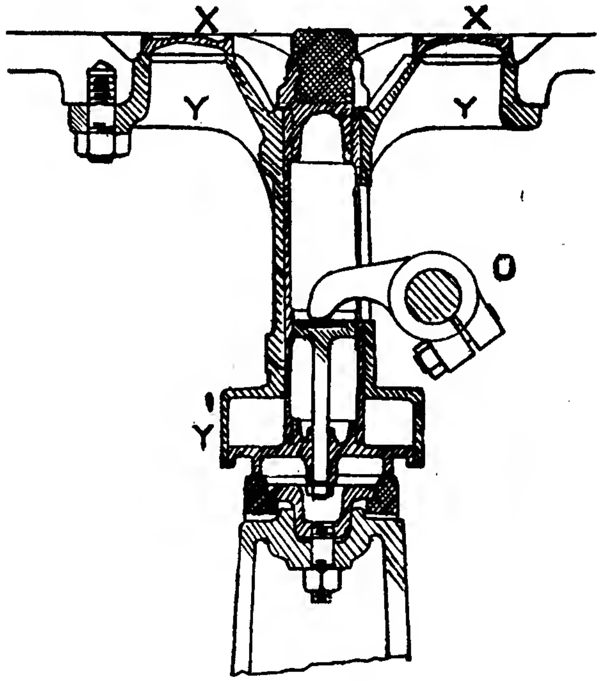


Fig. 8.

passes up and down through the entire series of tubes. The casing is provided with a chimney branch, S, and with a lid, P, for charging the fuel into the fire-clay hearth which surmounts the grate, H. A coil of tubing, N, may be provided to generate steam, a jet of which may be directed into the air delivery pipe. The same stove is employed for preheating and for intermediate heating in compound engines. The coke stove might be replaced by an oil stove, or by a petroleum lamp in the air-pipe itself, as has been done in America.

Now obviously, as the air is used, the pressure in the receivers will gradually fall until it drops too low to be usefully employed for our purpose. The volume of air then remaining in the receivers is dead, and as we have to carry not merely the weight of the air, but what is far more serious, the corresponding weight of receiver, it behoves us to adapt our motor for

We must, it appears, decide to throw away some of the advantages attending the high pressure at which the receivers are charged in the first instance, and pass the air through a reducing valve on its way to the cylinders. There are several constructions of these valves in use. That of M. Mékarski (Fig. 11) is said to be very reliable in its automatic action; it is mounted above the hot water chamber. The stem of the valve, S, carries at its upper end a disc, P, in contact with a rubber diaphragm, A, placed between the chamber, C, and the hydraulic press, H, the bottom of which is perforated. The valve opening is controlled by increasing or diminishing the pressure in the press by means of the hand-wheel. When once set to deliver the air into the chamber, C, at a given pressure, the device automatically adjusts itself to maintain that pressure constant in spite of the fall in the receiver pressure.

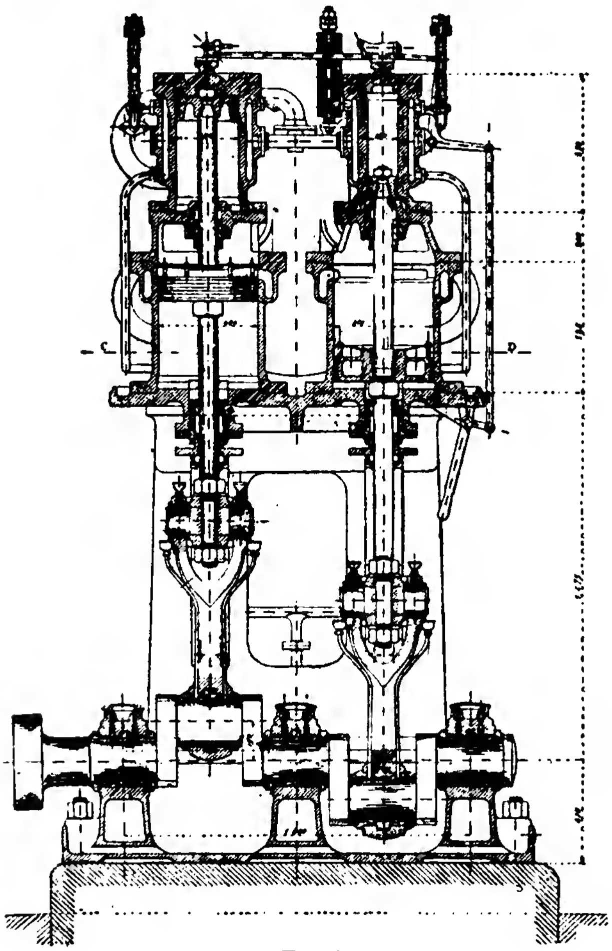


FIG. 9.

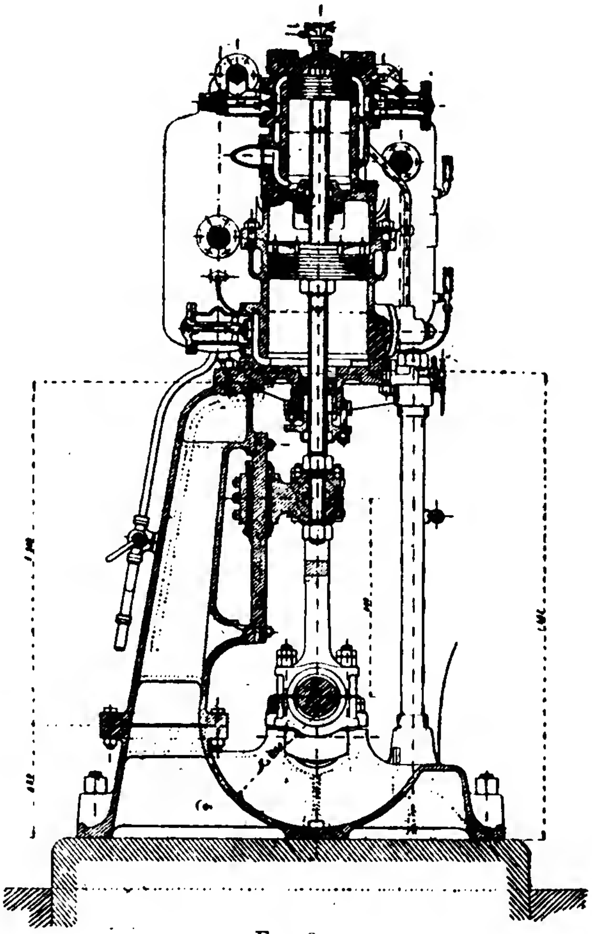


FIG. 9A.

working at as low a pressure as possible. On the other hand, there is a vast difference in the amount of work which any given weight of air may give out at different pressures. A pound of air at atmospheric temperature, 60° F., and at a pressure of 1,000 lbs. gauge, would in expanding, without addition of heat, down to the atmospheric pressure be capable of doing 67,000 foot lbs. of work, whereas at 60 lbs. pressure the same weight of air would perform 35,500 foot lbs. only—a loss of 47 per cent.

But the use of air direct from the receiver is attended with serious difficulties; it is impossible to obtain the requisite range of expansion for maintaining the work output constant without employing a multi-cylinder compound engine and other complications which are entirely out of place on a vehicle.

Let us assume a working pressure for ordinary conditions of 165 lbs. gauge, or 180 lbs. absolute. It is a pressure well within the range of ordinary engineering experience, and calls for no special conditions of construction. At that pressure the work which a pound of air at 60° F. is capable of doing in expanding down to the atmospheric pressure without the addition of heat is 49,000 foot lbs., which represents a loss of 26 per cent. as compared with air at 1,000 lbs.

It must be noticed, however, that this pressure of 1,000 lbs. obtains only at the start; the average pressure during a run until the receiver pressure falls to the working pressure of 165 lbs. would be 600 lbs., the work corresponding to which is 62,000 foot lbs.

When the receiver pressure has fallen to 180 lbs., 18 per cent of the original charge is still left. By a step-by-step regulation of the working pressure and a corresponding adjustment of the point of cut-off, this remnant may be reduced by, say, one-half, corresponding to a working pressure of 90 lbs. But this portion of the charge will be less efficient than the main portion, for, as the working pressure is reduced, considerably more air is required to do the same work in the same cylinders. Thus, at 90 lbs. pressure, $1\frac{1}{2}$ lbs. of air are required to do the work of 1 lb. at 180 lbs. pressure. If, on the average, the air is used with four-fifths its former efficiency, the additional 9 per cent. of the total charge which may be used in working down to 90 lbs. is equal to 7·2 per cent., reckoned at the original working pressure. That is to say, 91 per cent. of the charge does work which counts as 89·2, taking the work per lb. as 49,000 foot lbs.

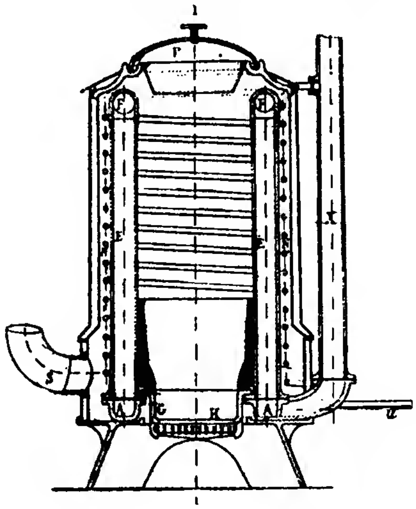


Fig. 10.

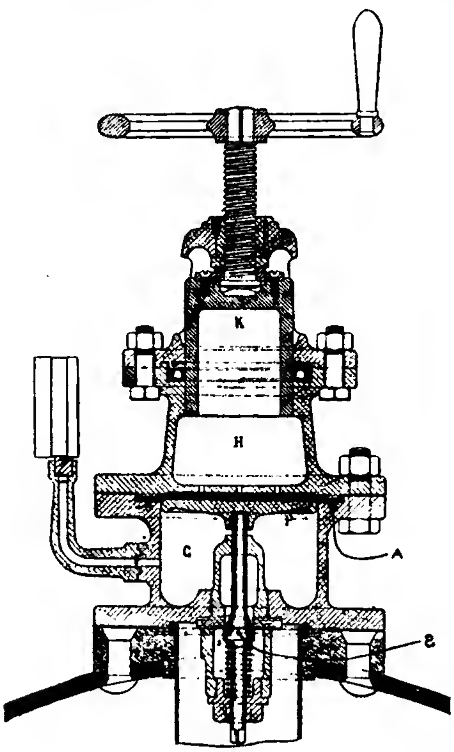
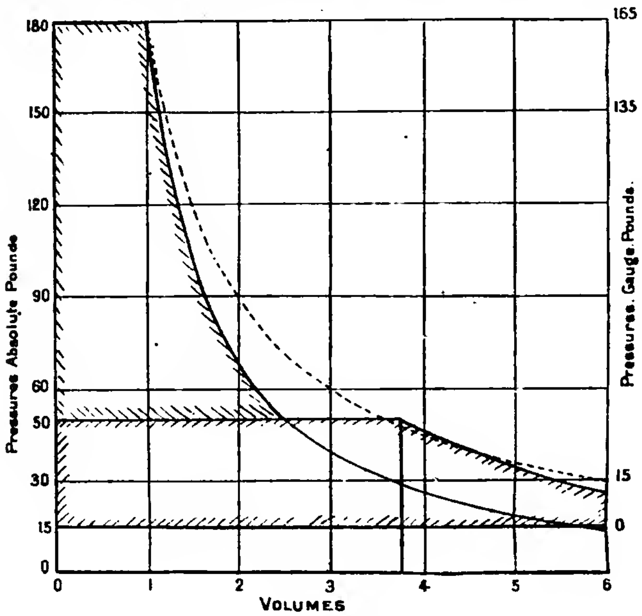


Fig. 11.

This 49,000 foot lbs. per lb. of air represents, it must be understood, the work shown on an ideal indicator diagram, in which the expansion curve is an adiabatic line; *i.e.*, it is based on the assumption that the air we are using is a perfect gas, and that no heat is supplied to it during any part of the stroke.

In practice the expansion curve invariably lies somewhat above the adiabatic line. This is due to the presence of moisture, to radiation, and to the equalising and conducting action of the cylinder walls. Thus the actual indicator diagram in the case of air, with its rounded corners and other defects, would probably not show perceptibly less work than the ideal diagram. However, to allow for valve and piston leakage we may deduct one-seventh; this will reduce the 49,000 foot lbs. to 42,000, which is equivalent to an expenditure of 48 lbs. per I.H.P. per hour. This result may be compared with an experiment made in Paris by Professor Kennedy. A small Davey-Paxman steam engine was worked with air at 67 lbs. gauge pressure. When indicating about 10 horse-power the consumption of air was 68 lbs. per I.H.P. per hour. Allowing for increased pressure and expansion, the consumption of air at 180 lbs. should be one-third less, *i.e.*, 45 lbs. per I.H.P. per hour, as against the 48 obtained by calculation.



Compound Air Motor

Fig. 12.

By heating the air before sending it into the cylinder the consumption may be considerably reduced. At a temperature of 320° F., which is that of saturated steam at 75 lbs. pressure, the volume of the air is increased by one-half, and the work done in the same proportion. Further, if, as is certainly desirable, the air be worked in a compound engine, it may in passing from one cylinder to another be again heated up to the same temperature; a saving of one-half is thereby easily effected. This brings the consumption down to 24 lbs. per hour per I.H.P. Fig. 12 represents the theoretical indicator diagram of such a motor with intermediate heating. The dotted line is the isothermal.

The heating may be effected at a trifling cost. Professor Kennedy, in the engine already referred to, found that the expenditure of one-third of a pound of coke per I.H.P. per hour sufficed to heat the air up to 315° F., and thereby to effect a saving of 25 per cent. in the consumption of air.

A larger engine, indicating about 70 horse-power, required 34 lbs. of air at 80 lbs. pressure, and 300° F. per I.H.P. per hour. A small engine, giving off about two horse-power on the brake, used per hour per brake horse-power 55 lbs. of air at 300° F. Small rotary engines consume 65 lbs. per brake horse-power per hour of air heated to 150° F.

The frictional losses between the cylinders and the wheels will amount to 40 per cent. or thereabouts of the I.H.P. So that the consumption of heated air used at 180 lbs. working pressure and a temperature of 320° F. per effective horse-power per hour will be 40 lbs. In an hour, if working continuously, a distance of eight miles would be covered, so that per mile the consumption would be 5 lbs. per effective horse-power, and it has already been shown that one effective horse-power is required per ton per mile. The consumption is really independent of the time consumed upon a journey. As many and as long stops as may be desired may be made without affecting the consumption, except in regard to the increased power required to start the vehicle from a state of rest.

Here again the figures may be compared with the results of actual practice. M. Barbet has published the results of working the Nogent tramways, a line upon the Mékarski system, with the engines on the cars. The engines are not compound, and the working pressure is considerably below 180 lbs. On the other hand, the advantage of the admixture of steam with the air is secured. The receiver pressure is 45 atmospheres. The cars carry 55 passengers, and weigh 12 tons. The air consumption taken over a long period does not exceed 35½ lbs. per car mile; *i.e.*, it is under 3 lbs. per ton mile. M. Barbet takes the resistance as 33 lbs. per ton, so that with a resistance of 45 lbs., as on ordinary roads, the consumption should be a little over 4 lbs.

Probably 33 lbs. is too high; the figures arrived at by our best authorities for tramway resistances are 22½ lbs. per ton. At this rate, the consumption for an ordinary road carriage would be 6 lbs. per ton per mile.

Evidently then, under the conditions of working assumed, the estimate of 5 lbs. of air per ton mile is fairly accurate.

We have already seen that, upon the basis of 2 lbs. of coal per I.H.P. per hour, the expenditure of 1 lb. of coal is sufficient for the production of 5 lbs. of air, so that 1 lb. of coal is sufficient to move a gross weight of one ton one mile.

For a 10-mile run 50 lbs. of air are required, and allowing for dead air and a reserve supply of, say, one-sixth, we require a charge of 64 lbs. per ton gross.

The receiver will weigh ten times as much as the air. Thus the total weight of air and receiver for a 10-mile journey amounts to 700 lbs. per ton; for an eight-mile journey it is 560 lbs., just one-fourth of the total weight moved. By reducing the length of the run or by increasing the working stress upon the metal of the receivers, as there is ample margin for in case of emergency, the figures may be still further reduced.

Then we have to consider the weight of the engine, gearing, and stove, as well as that of the vehicle itself, which would need to be strengthened on account of the machinery. It is not possible to give definite statements here, so much would depend upon the kind of vehicle and the amount of load, but, roughly speaking, the paying load would work out to one-third the gross load.

Cost of Transport.

On this basis the consumption of coal per mile per ton net would be 3 lbs., which at 12*s.* per ton would cost something less than ⅛*d.* For rough purposes we may double the cost of coal to get the total cost of the compressed air. This gives us something under ¼*d.* per ton mile as the cost of power. For vehicles making the return journey unloaded an addition would have to be made of two-thirds. So that the cost per ton of paying load would amount to ⅜*d.* To this must be added driver's wages, superintendence, interest on cost of the carriage, depreciation and repairs, lubricants, &c.

We are now in a position to consider the application of the system in particular cases, and here we must keep in view the Government regulations as to weight and speed. The limiting weight of the empty vehicle, excluding fuel, water, or accumulators, is three tons. It is quite reasonable to expect that storage vessels should be deemed to be on the same footing as the storage cells of electric carriages; it might, in fact, in some cases be expedient to place them in the carriage ready charged and to replace them by others when exhausted. We must, therefore, see that the carriage, with engine, gearing, and stove, does not exceed three tons. But here the speed question comes in: a carriage weighing three tons empty is limited to five miles per hour, whereas if the weight does not exceed two tons, the speed limit is eight miles per hour.

Now, if we assume that the earning capacity is in direct proportion to the weight of the carriage and to its speed, we find that there is very little difference whether we use the three-ton or the two-ton carriage—the proportion is as 15 to 16.

For the transport of goods over a distance of 30 miles, the lighter carriage has a decided advantage in that the higher speed would enable a round journey to be made with ease in a working day, so that a driver would return at night to the point, not necessarily a terminus, from which he started in the morning.

A vehicle weighing 30 cwt. would be capable of carrying a load of two tons and 36 cwt. of receivers. The engine, stove and gearing need not exceed 10 cwt., which makes up a total of two tons for the vehicle, or 5 tons 16 cwt. gross.

The round journey, unloaded one way, would cost for—

	s.	*d.*
Power	3	3
Driver	5	0
Oil, &c.	0	9
Interest on first cost, depreciation, and repairs	1	0
Total	10	0

or 5*s.* per ton—2*d.* per ton mile. If a return load can be arranged for, the price would of course work out still lower.

To work a run of this length three power stations would be required at intervals of 10 miles, the first and last stations at five miles from the respective terminals.

A plant of 500 I.H.P. at each of these stations would be capable of dealing with the transport of 200 tons per day. The cost of the stations would vary very much, in accordance with local conditions, situation, &c.

The efficiency of the entire system, from the engine cylinders of the compressor to the road wheels, is rather less than one-third (·28). A large proportion of the loss is due to the necessity of high storage pressures and comparatively low working pressures. It may be reduced by charging the receivers first from one of the intermediate receivers of the compressor and then completing the charge from the high-pressure receiver, or the main compressing engines may be arranged to work up to say 34 atmospheres, and a supplementary compressor employed to force this air direct into the receivers until the requisite pressure is attained therein.

The charging of the receivers is a work very rapidly accomplished. It is stated that some of the tramcars in New York are charged in two minutes. This is very smart work indeed. In Paris the cars on the St. Augustin-Vincennes Tramway are charged with steam and air from stand-pipes in the street—one for the up and the other for the down line—and the average stop is four minutes. A friend was good enough to time the stops a week or so ago. His log for one of them is:—

4.33 arrive; chock wheels; screw on junction; turn on steam; screw on junction.
4.34 turn on air.
4.35½ turn off steam; unscrew junction.
4.36 turn off air; unscrew junction.
4.37 start.

The cars run every 10 minutes, so that the men in charge are kept pretty fully employed.

For road vehicles the charging would, of course, be done at the power stations, which would be provided with a carriage-shed having a range of pipes and adjustable connections to allow of two or more vehicles being simultaneously charged. Fig. 13 illustrates the adjustable pivoted connections in use for tramway purposes.

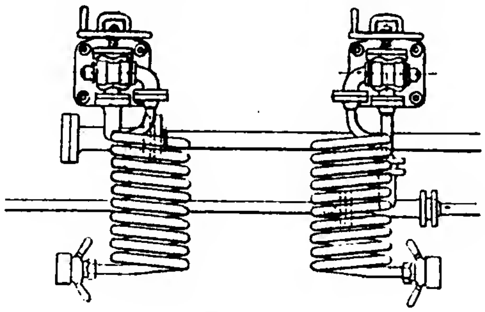


FIG. 13.

To recapitulate, it is possible with 1 lb. of coal to produce 5 lbs. of compressed air. Five lbs. of air are capable of moving one ton one mile. Allowing for receivers, &c., the paying load is one-third the gross weight, so that 3 lbs. of coal are required per ton mile.

SIR DAVID SALOMONS, Bart., will read a paper before the Society of Arts on the 12th of May, entitled "Motor Traffic: Technical Considerations."

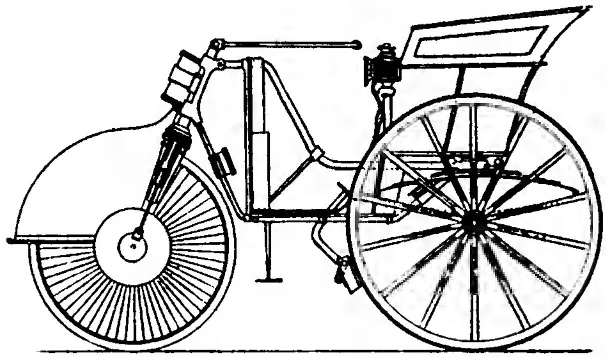
MR. DUGALD CLERK'S paper on "Oil Engines for Motor Vehicles," which was to have been read before the Self-Propelled Traffic Association this month, has been postponed till November next; and we regret to hear that Messrs. L. A. Legros and George Hopkins have—on the plea of unpreparedness owing to lack of data—requested the postponement of their papers, announced to be read before the Liverpool Branch of the Self-Propelled Traffic Association for the 16th and 30th instant respectively.

MESSRS. NEW AND MAYNE (LIMITED).

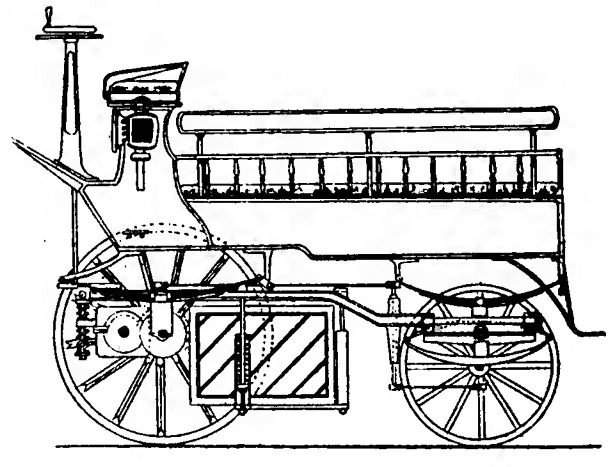
THIS firm has long been known for excellent workmanship, combined with enterprise in adapting themselves to any new thing which may come forward. It is, therefore, by no means surprising to outsiders to find that they are in the very front rank of motor-carriage builders—while to those who know how keenly the members of the firm have followed the introduction of automotors into this country it seems only in the "eternal fitness of things" that they should take a foremost place in catering for an appetite which they have done much to create. In order to standardise work the under-frames of the carriages are made to the firm's patterns, and with these as a foundation any modifications or additions can easily be made to suit the convenience of the customers. We have examined some of these frames, and unquestionably great care has been taken in designing all the parts in order that the stresses shall be properly distributed, and sufficient motive power has been allowed to negotiate the steepest hills. All the carriages run at 12 and 4½ miles an hour, the latter speed being obtainable without reducing the speed of the motor. The hand-wheels, levers of brakes, &c., are placed in positions readily accessible by the driver of the carriage, and vibration is guarded against by the employment of powerful springs between the under-framing and the carriage body. The Ricksha and dog-cart patterns have three wheels, the single front wheel being employed for steering. All the other carriages have four wheels, and steering is effected by the hind axle and turntable. The front axle carries the motor, reduction and differential gearing, and the driving road wheels. It will be seen from the above that the motor-cars are pulled along by the front wheels, an arrangement which gives several important advantages over vehicles which are pushed along. In order to keep the weight down an aluminium alloy is used wherever possible.

The oil engines employed run at a high speed, and are fitted with special spray and exhaust valves, and ignition arrangements, which they have been at great expense to work out. They work with the ordinary Tea Rose or Daylight Oils, and a gallon, costing about 7*d.*, is sufficient to propel the lighter vehicles at a speed of 12 miles an hour for several hours.

The electrically-driven carriages, which are got out to the designs of Mr. Ekilburn Scott, have the accumulators suspended from a very strong under-framing between the front and hind



axles, thus keeping the centre of gravity low down and enabling the box containing the cells to be unshipped in a few minutes. Springs are interposed between the accumulator-box and the under-frame. The motors are specially designed for lightness and accessibility, and are suspended on riding springs in the same way as the motors used for tramcars. Each motor is completely enclosed, but the commutator and brushes can be readily inspected. The brushes are built up of carbon and copper, and special arrangements are made for annulling the lead. A char-à-banc to carry 22 persons is being made, and designs for electric omnibuses are in hand.



Messrs. New and Mayne usually employ the I. E. S. Accumulator Company's special traction or A cells, as they have found that they withstand vibration and heavy discharges very succcessfully.

A 52-page diary, printed on excellent paper, is one of the features of THE AUTOMOTOR AND HORSELESS VEHICLE DIARY AND POCKET-BOOK for 1897, which contains over 100 pages of information. Price 6*d.*; post free, 7*d.*, of Messrs. F. King and Co., 62, St. Martin's Lane, London, W.C.

MESSRS. PHILIPSON AND TOWARD'S "No. 1 STEAM MOTOR-CARRIAGE."

On the last Saturday in February there was a semi-private assembly at the carriage-building factory of Messrs. Atkinson and Philipson, Newcastle, to inspect a new motor-carriage, locally invented, designed, and built, and, as to parts, patented and registered. The new autocar is the joint production of two well-known Tyneside firms—Messrs. Toward and Co, engineers, St. Lawrence, and Messrs. Atkinson and Philipson, the eminent Newcastle carriage manufacturers. The latter firm have supplied the carriage and wheels and the former the motor. The joint production is a smart wagonette, well designed, and of compact appearance, while the motor is apparently equally satisfactory, and in actual trial in the yard gave promise of performing effic:.ntly on the road. As the first product of its designers and builders, however, it was interesting mainly as giving a concrete illustration of the ideas which will probably prevail for some years in regard to the new mechanical road locomotion. In the north of England there have not been many motor-cars seen in public at all, and the majority of those that Northumbrians have hsd an opportunity of seeing in public have not been such as to inspire much confidence or hope for the future of motor traffic; they have been chiefly gasoline-motors of French or American pattern and manufacture, snd have been unpleasantly odoriferous. For the purposes of French autocar competitions, oil seems to have been a greater favourite than steam as a motive power, electricity not yet being a practical competitor; but in England the gasoline-motors have not found so great favour as steam is likely to receive when the numerous inventors who are busy with steam road-carriages show what are the capabilities of the older power. Messrs. Toward and Co.—there are three partners who have interested themselves in the design of the motor exhibited, and one of them, Mr. Meek, is a fairly old hand at the game, for he made for himself 20 years ago a very workable steam tricycle—and Messrs. Atkinson and Philipson have designed a very strong and neat frame for their autocar, all the parts of which are admirably fitted for their purpose. Instead of taking a normal carriage or trap and storing the motor somewhere about it, they have taken the motor and built the carriage round it. Mr. John Philipson, and his two sons, Mr. Wm. and Mr. John Philipson, are adepts in their art, and, while not abandoning the old principles of carriage construction, they have designed a special framework which admirably supports the motor, while at the same time carrying passengers somewhat after the style of a four-wheeled dog-cart or wagonette. As to the motor, no one who saw it at work could doubt for a moment the immense preference it must possess, other things being equal, over any kind of oil motor. Smoothness of motion, absence of vibration and smell, and simplicity of handling were at once evident. Probably something else than the rubber-tyred wheels will be required to save the motor itself from the effects of the shock and concussion of rough roads, and perhaps in futnre carriages a similar arrangement of springs to that which protects the body of the carriage will be fitted to the motor. In the carriage now made the fuel used is coke, but the intention is to employ petroleum. The boiler is of the water-tube type, and superheated steam is obtained somewhat after the same style as in the Serpollet generator, thus dispensing with ordinary boiler fittings, such as water gauges, valves, air gauges, thermometers, &c. Before starting the furnace is lighted, and the boiler tubes—which, however, are not flattened, as in the case of the Serpollet generator — arranged spirally reach a red heat. A hand pump is employed to force into the boiler just sufficient water to supply the requisite amount of steam—which is instantly generated — and, when once a start is made, the water is pnmped automatically in fixed quantities into the generator. From the time of lighting the furnace steam can be got up in about 20 minutes. Once the furnace is going, however, a few seconds' pumping suffices to start the engine. The engine is of the compound type —the two cylinders being placed on each side of the boiler between it and the hind wheels—and drives a shaft from which the power is communicated to the axle of the rear wheels by a roller chain of bicycle pattern. Here a very ingenious differential gear is fitted. The engine is three horse-power, and the weight of the whole carriage, motor included, is considerably under 10 cwt., so that it does not err on the side of excessive weight. The engine works at a pressure of about 140 lbs., and a speed of 12 or 13 miles an hour, it is estimated, can easily be maintained. The driver has few complications to attend to; once a start is made, the machinery runs automatically, with none of the multitudinous handles and levers to be turned that are found on some motor-carriages. The one lever for turning on steam regulates the speed of the carriage to a nicety, and the steering handle acting on the fore-carriage and the foot-brake (which it is intended to supplement by a screw brake) acting on both driving wheels are the only things to claim his attention. A very clever arrangement permits of stoking from the top of the boiler case, without losing heat; in fact, all the details have been thought out with great ingenuity. The trial was only an initial one, but it showed enough to demonstrate that Newcastle has at last what promises to be a very efficient autocar, serviceable for both town and country use, for rough roads and smooth, for hilly districts as well as level. It would serve for purposes of pleasure as well as for commercial uses, and, what is of the greatest importance, is not apt to get out of order, while it is simplicity itself to manage. The inventors and makers are to be congratulated upon having been the pioneers on Tyneside in the manufacture of autocars, and upon having at their first attempt turned out so satisfactory a machine. It needs improvements in details, but we feel sure that it is all right in the main.

MUNICH MOTOR EXHIBITION.

On the occasion of its jubilee, the General Industrial Association of Munich, in co-operation with the Polytechnic Association of Munich, is organising an exhibition of motors and machine tools with special regard to the requirements of small manufacturers. The exhibition is under the patronage of H.R.H. Prince Luitpold, Regent of Bavaria; it enjoys the support of the Bavarian Government as well as that of the Municipality of Munich, and the outlay is guaranteed by a special fund. The engineers' machinists of all countries are invited to send machines or models. The programme, which has been placed before us by the Consul-General in London, states that the object is to exhibit such machines and auxiliaries as tend to improve industry and the arts, as well as to instruct and encourage manufacturers, and make them acquainted with the value and importance of making the best use of the forces of nature by means of the scientific and technical inventions and improvements of our day. With this object, the exhibition will contain motors, machine tools, hand tools, implements, apparatus and machinery in motion, as well as the materials to be worked up, and the manufacturing processses in operation; accordingly, motors over 10 horse-power, and tools or machines requiring greater driving power, such as steam hammers, lathes, rolling machines, and the like, will be excluded. Popular lectures on special scientific and technical branches will be delivered, and technical literature on these subjects will be exhibited. The exhibition will be held on the so-called Kohleninsel, which belongs to the Municipality, and is near one of the most crowded thoroughfares of the capital. It will be opened on June 11th, 1898, and closed on October 10th. The exhibition comprises five groups, divided as follows:—

Group I.—Motors, gas, petroleum, benzine, steam, and hot-air engines, machinery driven by water and wind power, and electro-motors up to 10 horse-power.
Group II.—Machine tools, hand tools, and implements.
Group III.—Auxiliary machines, as pumps, ventilators, presses, cranes, clocks, parts of machines, electrical arrangements, safety appliances, apparatus, and auxiliary materials.
Group IV.—Manufacturing processes in operation and machinery in motion.
Group V.—Special technical literature.

The Board of Directors is made up as follows:—Honorary President, His Excellency Baron Max von Feilitzsch; Honorary Vice-President, Wilhelm von Borscht, Mayor of Munich; President, Max Nagler; Vice-President, Georg Leib; Deputy Vice-President, Egbert Von Hoyer. For further particulars, application should be made to M. Nagler, or the directors, 1½, Färbergraben, Munich, Bavaria.

GAS TRACTION ON TRAMWAYS.

In a paper recently read before the Paris Society of Civil Engineers, M. A. Lavezzari gives particulars of the system of gas traction on tramways, which, originating at Dresden, is now being tried at Dessau, Blackpool, and Paris. The motor used is of the Otto type, having two cylinders, and located under the seat on one side of the car. Access for cleaning, &c., is obtained through suitable doors. For ignition, electricity is used, it being thought undesirable to keep naked lights burning amidst the inflammable material of which the car is built. To change speed or direction, gearing is employed, two different speeds being available at will. The speed lever and reversing lever are both fitted on the car platform. When the former is in mid position the engine runs free, though, as at the same time its gas supply is throttled, its speed falls to 80 revolutions per minute. Pushing the lever to right or left places either the high or low speed in gear with the engine, simultaneously fully opening the gas-valve and causing the engine to run at its normal speed of 220 revolutions per minute. The gas is carried in three reservoirs, two of which are fixed under the opposite seat to that concealing the motor. These reservoirs have a capacity of about 35 cubic feet, and are charged initially to a pressure of 140 lbs. to 170 lbs. per square inch. The cooling water is carried in tubes placed in the roof of the car. At the compression stations a small gas-engine is used to drive the pumps which charge reservoirs connected to a standpipe near the track. When a car requires recharging, its tanks are connected to this standpipe and the valve opened, when about two minutes is sufficient time to completely recharge the car. At Dresden the line is about 2·2 miles long, and includes one grade of 4 per cent. The cars are small, and consume about 36 cubic feet of gas at ordinary pressure per car-mile, including that used at the compression stations. At Dessau the line was opened at the end of 1894, and is nearly four miles long. It comprises one 5 per cent. grade about 200 feet long, and a curve of 50 feet radius. There are 13 cars on service, four of which are supplied with 10 to 12 horse-power motors, and nine with those of 7 to 10 horse-power. The motor-cars weigh six tons empty and eight tons loaded, and there are, moreover, seven-ton cars. The gas is stored at a pressure of 142 lbs. per square inch in tanks of 28·25 feet capacity. With this supply a run of 10 to 12 miles can be made without recharging. The cooling water carried is only about 18 gallons. The speed is limited to a maximum of 7½ miles per hour. The consumption of gas is 30 cubic feet per car-mile, 10 per cent. of which is used at the compression stations. At Paris the experimental car tried weighed seven tons empty and 10 tons when loaded with 42 passengers. The motor of 10 to 15 horse-power was designed to run at 100 revolutions when the car was stationary, and at 250 when the latter was moving. The tanks were of 44 cubic feet capacity, and were charged to a pressure of 142 lbs. per square inch. The water carried was 19 gallons. The speed attained reached 10 miles per hour, the gas consumption, exclusive of that used in compression, being 31 cubic feet per car-mile, and about 14 miles could be run without recharging.

With reference to our description, with illustration, in January issue, of the "Damon" tyre, we understand that the tyre is Wood and Armitage's patent, which has been specially designed for carriage and automotor work, and is manufactured by the W. and A. "Safe" Tyre Company. Mr. L. Broughton Wood, of Stoke on-Trent, is the special agent of the Company, and will supply full particulars on application. The address of the London agent is 19, Dashwood House, E.C.

THE ROOTS' PETROCAR.

THE Roots' Petrocar, the newest type of which is illustrated on this page, uses ordinary oil in place of the benzoline spirit generally employed in the French and other motor vehicles. This spirit is stated to be two and a half times the running cost of oil, and cannot be obtained as readily in villages as ordinary oil, as used in the Roots' Motor, and it is calculated about 10 per cent. more power is obtained from a pint of oil than from a pint of benzoline. This motor is therefore not a benzoline motor but a true oil-motor, with a flashing-point above 73° F. (Abel's flash test).

The Roots' Petrocar is constructed with a double steel-tube frame, round which the jacket water is pumped by the motor, which so cools the water that about half the usual quantity is carried. The motor, of three horse-power, is fixed at the back of the frame and gears directly by chain on to the axle of the vehicle from the countershaft of the motor, which runs at half the motor speed. The valves are also operated by this shaft. The motor runs at 500 revolutions per minute. While pneumatic tyres are fixed to the carriage illustrated, Messrs. Roots and Venables intend in the future to fit solid rubber tyres to all Petrocar wheels. The weight of the car, as shown, is 5½ cwt. It will travel at about 11 miles an hour for level roads and 4¾ miles for hills. Many projecting parts and all nuts are nickel-plated, while the steel-tube frame is enamelled. Messrs. Roots and Venables two or three years ago, foreseeing what was coming, protected as a trade mark the words "Petrocar" and "Petrocycle." They exhibited, even as far back as 1893, a vehicle motor using oil.

The firm are making their motors up to 11 brake horse-power, and amongst their special patterns are the following Petrocars:—

Two-seat tandem car with three wheels, "hansom cab" pattern, solid rubber tyres, 1½ horse-power motor, weight about 3½ cwt.

Two-seat car, similar to "new style" car illustrated, having four wheels with solid rubber tyres of the "hansom cab" pattern, 3 horse-power motor, two speeds, weight about 6 cwt.

Four-seat car with the same specification as the foregoing, except that the weight unladen is about 6½ cwt.

A three-wheeled carrier of similar specification to the tandem car, but fitted with a carrier box instead of the front seat. This will carry about 2 cwt. of goods or parcels in addition to the driver.

Oil-motor van with four wheels, 3 horse-power motor, to carry, in addition to the driver, about 5 cwt. of parcels or goods.

The running cost of the 1½ horse-power motor is about 1*d*. for each 10 miles run; and of the 3 horse-power motor, 2*d*. for each 10 miles run, and any kerosine or paraffin of 73° F. to 150° F. (Abel's flash test) can be used.

MOTOR-CARS AT BRIGHTON.

LAST week a cycle and motor-car exhibition was held at the Brighton Aquarium. The number of motor-cars on view was not overwhelming, but Brighton is much enamoured of the new vehicles, and already has several firms and companies established ready to take advantage of any good carriages or vans placed upon the market. The Girling Cycle and Motor-Car Company (Limited), 185, Western Road, Brighton, can claim to have one of the finest shows in the whole exhibition, and Messrs. A. and E. Kessler and Co., 27, Trafalgar Street, Brighton, include in their collection a motor-tricycle. A feature at the Brighton Cycle and Motor Company's stand is a motor-tricycle and a motor-tandem, and they have also in the exhibition a Daimler motor-carriage, on which visitors were able to take frequent trips.

The opening ceremony took place in the theatre in the presence of a large audience. Sir Joseph Ewart, M.D., J.P., presided, and was supported by Alderman Brigden, J.P., Alderman Davey, J.P., Alderman Farncombe (Lewes), Messrs. R. Clowes, W. H. Baseden, W. Ling, G. J. Lenny (Chairman Sussex Centre N.C.U.), C. J. A. Rumbold, A. J. Kessler (Secretary), and W. Nicol Humphreys.

Sir JOSEPH EWART pronounced the exhibition one of the finest he had seen anywhere, and warmly congratulated the promoters upon it. He pointed out that the cycle industry was one of the many enterprises initiated and developed during the Queen's reign, and said that whereas 10 years ago there were only 70 factories in the country for this particular industry, there were now 700 in Great Britain. The motor-car industry had also come to stay, and both would add materially to the prosperity of the country. He looked upon cycling as a great sanitary invention, and believed the motor-car would create a great industrial revolution for the benefit of the country.

At the conclusion of the ceremony, Sir Joseph Ewart, Dr. Marcus Allen, and Mrs. Braithwaite were driven to Montpelier Hall in a motor-carriage. The experience, all agreed, was unaccompanied by smell from the motor, and there was comparative freedom from vibration, while the carriage was under perfect control. The ride in the brilliant weather may be well expressed in one word—delightful.

NOTICES.

Contributions and articles likely to prove of interest to our readers will receive due attention, but in all cases the name and address of the writer must be given, not necessarily for publication.

All matter intended for publication should reach us not later than the 10th of each month. Stamped envelope must be sent if the manuscript is required to be returned. The Journal is published the middle of each month.

All Advertisements should be sent to the Advertising Department, F. King and Co., Limited, 62, *St. Martin's Lane, London, W.C., where Advertising Rates may be had on application.*

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SPECIAL NOTICE.

The Automotor and Horseless Vehicle Journal *can be obtained from all* Messrs. W. H. Smith and Son's *bookstalls, and the following Agents :—*

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When any difficulty is experienced in procuring the Journal from local newsvendors, intending subscribers can obtain each issue direct from the Publishing Office, by forwarding remittance of 7s. for 12 months' subscription, post free (or at the rate of 7d. per copy).

The Automotor and Horseless Vehicle Journal.

A RECORD AND REVIEW OF APPLIED AUTOMATIC LOCOMOTION.

MARCH 17th, 1897.

ANSWERS TO CORRESPONDENTS.

J. P. (Stockport).—(1) As already announced, the Exhibition at Olympia opened on February 20th, but we believe practically no motor-cars have been visible so far. (2) You had better apply to Mr. Hopkins, 30, Parliament Street, S.W.

Pittsburg (H. M.).—We think you are mistaken—our recollection is the reverse. A full report will be found in the "Journal of the Transactions of the American Institute of Electrical Engineers."

Steam (Cheltenham).—(1) A company was registered some little time back to work the Serpollet patents in Great Britain. (2) Your ideas are far too crude at present, but we think a good patent agent would save you much trouble, and probably point out the weak point of your patent.

Progress (Leeds).—Mr. Ward, of Tottenham Court Road, London, W.C., is making electrically-driven invalids' chairs. We gave in our January issue an illustration and particulars of one of his, fitted with a Britannia motor.

G. W. KOEHLER (Berlin).—We thank you for your letter and expressions of praise. Your frank criticisms we appreciate, and we hope in time many improvements will be made in our Journal.

COLONIES (Coventry).—No doubt the rules of the Sydney Exhibitiou, 1897, will embrace motor-cars. Yon will be able to get fnll particulars from Mr. Edward Noyes, 34, Gracechurch Street, London, E.C.

WILLIAM DIGBY (Gravesend).—It appears to us yonr own carelessness was the cause of the accident. The legal expenses you might incur renders the risk too great. For the future it would be wise to insure against such accidents.

GEORGE McP. (Aberdeen).—We admire your foresight, and an application to any engineering firm would give you the required information.

ELECTRIC (Newcastle).—The motor you refer to we have arranged to fully deal with in our next issue. Until then you must be content to wait.

GEORGE SLADE (Colchester).—The vehicle is a French electrically-driven carriage, and has only just arrived in this country. The claims put forward seem to us excessive, but we are inquiring into the practical details, and shall probably give particulars in an early issue.

W. GIFFARD (Salford).—You cannot do better than apply to the Anglo-French Motor-Carriage Company (Limited), of Digbeth, Birmingham.

J. J. (Teneriffe).—The chief engineer is Monsieur Esteve, and the offices of the Company, 2, Rue de Compeigne, Paris. Your agent, we believe, can see the carriage at Messrs. Sutton and Co., 22, Golden Lane, Barbican.

A.E.M. (Tonbridge).—Thanks for the cutting. It is hardly worth our while taking any notice of paragraphs of this description. The source is too obvious to deceive anybody.

INFORMATION (Swansea).—The leading firms for your requirements are Romeike and Curtice, 359, Strand, W.C., and Durrants, of 57, Holborn Viaduct, E.C.

THE FORTHCOMING COMPETITIONS.

TIME flies with snch rapidity that few will realise that within a few months the great automotor trials for 1897 will have taken place, and success or failnre will have to be written against the first year's work of attempting to introduce these vehicles into this conntry as au additional indnstry. In fact, so close are we to the commencement of these trials that *The Engineer* announces that on the expiry of the last day of this month no fnrther entries will be received for their 1,100 Guineas Competition. The Royal Agricultural Show contest will take place in June, and be immediately followed by the international trial of motors and vehicles to be held under the auspices of the Antomobile Clnb of France.

The greatest difficnlty attends any attempt to foreshadow whether the English mannfacturers have had time since November to feel sufficient confidence in their prodncts to snbmit them to public competition. It is sincerely to be hoped that all English-built carriages and motors which are in working order will be sent in, as it is only by trial and comparison with other makes dnring a test condncted by competent judges that weak points can be noted and the survival of the fittest parts obtained.

Which motive power will win, depends very much npon the maker; for the moment we are inclined to think that in a rigid test, covering all the points which an engineer of eminence may be expected to reqnire, steam will win. The makers of the engines have no difficnlt points to cope with, and with Continental experience of water-tube boilers and liqnid fnel to help them, the only problem to tronble is that of weight, which can be dealt with in connection with power.

Oil motors, with many natnral advantages, also possess decided disadvantages which need hardly be pointed out here, and it is to remedy these, and to place oil as a motive power in the high position it should hold, that some thousands of more or less skilled inventors are ceaselessly working in this and other countries. Electrical motors—except for ont and home—are impossible in the absence of some arrangement of charging stations, which wonld render this comfortable method of transit certain and convenient. What the makers will do is "wrapped in the womb of Time," bnt we trust that they will at any rate make an effort to sustain the credit of this conntry for mechanical skill and ingenuity.

⁂ Just as we go to press, we understand that Messrs. Roots and Venables have had the hononr of receiving a solicitor's letter on behalf of the British Motor Syndicate, stating it has been determined to take proceedings against them for iufringement of the Syndicate's patent rights. We can only hope, in conjunction with Messrs. Roots and Venables, that this threat is meant seriously, as that firm welcomes being able to have the opportunity of thrashing ont and finally settling the claims of the British Motor Syndicate to dictate terms to all British nsers of motor-cars. So far from Messrs. Roots and Venables' patent being an infringement of any patent owned by the Syndicate, we understand that the firm claims that the facts are absolntely reversed, and that they have snbstantial canse of action for infringement of their patents. This opinion is, we believe, backed up by eminent counsel's opinion npon the subject, and we trnst that for the general good of all those interested in the motor-car industry, the pretensions of the British Motor Syndicate to the ownership of so-called "master patents" may be disposed of once and for all. Whatever the result, a legal decision would be welcomed by everybody and clear the way for increased efforts on the part of engineers to place all kinds of motor vehicles on the market. At present the industry is suffering by reason of a number of engineering firms, who have a natural dislike to complicated legal actions, holding back nntil a decision has been arrived at one way or the other.

INTERNATIONAL EXHIBITION OF MOTOR-CARS AT THE ROYAL AQUARIUM.

WE are glad to know that this exhibition is being energetically engineered to what looks like a successful result. Mr. A. Villers, whose portrait we produce below, is the mainstay of the executive, and, although still quite young in years, has already earned an excellent reputation for practical work in organising and carrying out various schemes which require a man of strong character to pioneer to a commercially successful end. Mr. Villers has gained most of his practical knowledge at several of the best known Polytechnic Academies of Europe, and a pleasant personality assists him very greatly in obtaining the co-operation of leading gentlemen in connection with the various undertakings with which he associates himself. At the present time Mr. Villers is applying his very best energy to organise and ensure the future success of the International Exhibition of Motor-Cars, which will be inaugurated on May 1st next at the Royal Aquarium, and it is very satisfactory to hear from the promoters that they have received the most encouraging promises of support from various firms and gentlemen who are associated with the motor-car business, and their prospects of being able to let the public see some practical results of the working of several leading British engineering firms seem in a fair way of being realised. A number of private owners are also inclined to come forward and assist in making a good display, and we trust that the work which has now begun so well will be carried out to a successful conclusion with the co-operation of the makers and gentlemen who have already undertaken to accord it their active support.

THE NEALE CAR.

THIS car is the invention of Mr. Douglas Neale, of Edinburgh, who has for some time past been giving a great deal of attention to motor-car building. The car is electrically driven, with a range of speed from 3 to 12 miles per hour, the type of cell being Planté or pure lead, and the number of cells 15, the duration of charge 35 miles, and the commercial capacity of each cell 115 ampere hours = 3,450 Watts total output, or 4·62 E.H.P. hours, for a total weight of 405 lbs. The motor is 1 B.H.P., and weighs 100 lbs., the car itself totalling up to 448 lbs. For a run of 35 miles the total weight of the car fully charged is 9 cwt.

Mr. Neale's system of electric traction is covered by seven patents, and the following advantages are claimed for it:—(1) Owing to the direct drive from the armature shaft on to the wheel of the vehicle all necessity for intermediate shafting and gearing is obviated and a considerable amount of energy is saved. (2) The arrangement of steering gear is such that it is not necessary to multiply the motion of the handle, so that the axle is moved at the same rate as handle; this renders the steering quicker and more under control than in methods necessitating multiplied motion. (3) Besides the steering lever there is only one switch, which enables the driver—

(1) To go ahead at any desired speed.
(2) To go astern at any desired speed.
(3) To apply the brake, which is electric.
(4) To ring the electric gong.
(5) To stop.

All of these effects can be obtained at will by the one switch handle without removing the hand from it. The electric brake is a great convenience, especially to ladies, as no muscular exertion is required in stopping the vehicle quickly. An ordinary brake operated by the foot is also fitted to comply with the Board of Trade regulations.

ANY of our readers who are desirous of acquiring a very excellent motor-car would be well advised to communicate with "Automobile," who advertises one for sale in the present issue. As we have had an opportunity of personally testing its capabilities, we can speak very highly of its powers, and as we notice that it has the privilege of carrying the perpetual license plate of the British Motor Syndicate, any purchaser need have no fear of incurring unlimited liability in respect to possible damages, confiscation, and other little pleasant surprises promised by the Syndicate to purchasers of motor vehicles through any other channel than that of 40, Holborn Viaduct.

A "BIN GHORA-KA-GHARRY."

ONE of the earliest English Companies to put motor-cars on the market was the Anglo-French Motor Carriage Company, of Digbeth, Birmingham, and from the business-like catalogue which they have now issued, containing every sort of motor vehicle, it looks as if they meant to maintain their position as one of the leaders in the new industry. Some of the work which they are turning out is excellent in every detail, and we have very much pleasure in reproducing the accompanying illustration of an autocar manufactured by this enterprising Company, and supplied to Mr. J. B. Foster, of Bombay.

The photo was taken in Bombay, just after the car had completed a most successful trial trip, during which it was followed by a crowd of interested natives, loudly calling attention to the "bin ghora-ka-gharry" (carriage without horses). This car has now been sold to an Indian Prince, who has evinced his complete satisfaction with it and frequently uses it for long rides, and we are not surprised to hear that since this event the makers have received several valuable orders from this part of the globe.

We hope to give in another issue a more extended notice of this Company's doings and the enterprise being displayed by Mr. Gascoine, the able director of the Company's undertaking.

THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL DIARY contains over 100 pages of information. Price 6*d.*; post free, 7*d.*, of Messrs. F. King and Co., 62, St. Martin's Lane, London, W.C. See it for the Irish and Scotch Regulations of Motors.

CARDIFF STILL WANTS MOTOR VEHICLES.

AT a meeting of the Cardiff Health Committee held on the 10th inst., under the chairmanship of Alderman T. W. Jacobs, Councillor T. Andrews moved a resolution, notice of which he had given, to the following effect:—"That in consideration of the large and continually increasing amounts paid by that committee for the maintenance of horses, and with a view to facilitate scavenging and watering and cleansing the streets, a small sub-committee be appointed to report (1) as to the practicability and possible economy of employing carts and vans driven by electric, steam, or other automatic motors; (2) as to the advisability of fitting suitable motors to the water-carts and other vehicles; and (3) as to the advisability of the purchase by the Council, for experimental purposes, of a motor-van of the most approved pattern, designed for the collection of refuse and scavenging; and that the sub-committee be authorised to obtain the necessary estimates, plans, and all information." Councillor Andrews considered the time had arrived when they should move in the matter in the same way that other towns had done, and argued that there would be no expense in altering the wagons if several were drawn by one motor. He understood the committee spent £800 a year in horses, whilst feed and harness cost another £5,000 per annum. If the matter was taken up in a proper spirit they would save £5,000 a year. Councillor Ward seconded the resolution, which received the approval of the entire committee, several members agreeing with Councillor Andrews that the matter was one well worth going thoroughly into. The sub-committee appointed consists of Alderman Jacobs and Councillors Hughes, Andrews, and Allen.

DOINGS OF PUBLIC COMPANIES.

Daimler Motor Company.

An extraordinary general meeting of the Daimler Motor Company (Limited) was held on the 4th inst. at the Motor Mills, Coventry, for the purpose of making certain alteratious in the articles of association, chiefly those required by the Stock Exchange Committee, with a view to an official quotation of the shares. Mr. Harry J. Lawson, the Chairman of the Company, presided. Previously a large number of shareholders were shown over the works, and inspected the extensive machinery with which the buildings are equipped.

Mr. J. J. H. Sturmey (Director) said he had been deputed by his colleagues to lay a few facts before the shareholders in reference to their undertaking. If they were to believe the statements which had been made about the Company by a certain newspaper, they would conclude that the Company was a ghastly failure; but he thought that after what they had seen that day in going over the works, and when he had stated the position of the Company, they would agree with him that the criticism he had referred to had been made with absolutely no knowledge of the facts. It was true that the shares had gone down on the market, but market prices were regulated by supply and demand, and, as a result of the attacks, there had been but few buyers apart from the directors themselves. It would be a consolation to the shareholders to know that not only had the directors not sold a single share, but they had, he believed, in every instauce largely increased their holdings. (Hear, hear.) That should prove to the shareholders that, at any rate, the directors believed in the Company. He honestly believed in it himself, and he hoped to have a still larger holding before he was finished with it. It was necessary that he should look a little into the history of this Company, in order to show them some of the trials and tribulations they had had; and in doing so he was practically giving them the history of every other company of the kind in the kingdom. He believed this Company was at least six months ahead of any other company in the country. It had been formed just over a year, having been registered in February, 1896. Those who had had experience in such matters knew that it was impossible for a company to begin work immediately it was formed. An entirely new company, having to establish a new business, had many things to consider. The first week or two was occupied in legal preliminaries, the allotment of shares, completion of contracts, and so on. The directors were also handicapped from the fact that they had to learn the business themselves, and their first study had been to gain full information about the industry. They went to Paris, where they inspected the Daimler works of MM. Panhard and Levassor, and MM. Peugeot Frères, and were also shown over the works of the Count de Dion aud Bouton, and other autocar manufactories, by which means they got a very fair idea of what was required of an autocar company. They then took a journey to Germany, aud inspected the works of the Daimler Motoren Gesellschaft, near Stuttgart, the parent company of all the Daimler coucerns, and where Herr Daimler was in charge. The knowledge they thus gained had proved very useful to them, aud they were more convinced than ever that they had the best motor for horseless carriages in existence. When they got back they looked about with a view to purchasing works, and by a lucky fluke the magnificent works they were uow in came into the market, and were offered them on what they considered reasonable terms. They purchased the works in April, and proceeded to orgauise a staff. It was impossible to find a man who was used to the trade; but they looked about for a thoroughly practical and scientific engineer. They were fortunate in securing the services of Mr. J. C. Critchley, of Bradford, and that gentleman had worked most assiduously in the interests of the Company. Moreover, they had gradually built up a staff which was secoud to none in the autocar world, amongst them being one or two who had occupied prominent positions in the German works for some two years. Their next duty had been to obtain machinery. All these industries had been during the past year exceedingly busy, and the result had been that the makers of machine tools had been equally busy; so that there was great delay in the execution of their orders. However, they had now got pretty well organised, and equipped the factory with most of the tools. Mr. Sturmey proceeded to detail further changes which arose in connection with the designs and drawings. Then they were disappointed in the matter of the delivery of cars from Paris. Two cars were to be delivered every month until September, when six were to be delivered. As a matter of fact, they got nothing until September, when two cars were received. They had not received one since. As soon as they found they were relying on broken reeds they set to work and built four carriages on experimental lines, but there were further delays in obtaining castings.

They had now not only completed their factory, but finished the first of their commercial carriages, which shareholders had seen that day. They were very well satisfied with their first efforts (Hear, hear.) They had started building them with a view to a regular supply, and had now completed in their works nearly all the parts and fittings for 50 carriages. To-day they had work in hand for a regular output of motor-cars; so that, practically speaking, the actual work of the Company, so far as trading was concerned, commenced from now. In addition to motor-cars, they were making motors for stationary purposes, and also for launch building. They supplied about 35 launch motors last year. That was fairly satisfactory, but now they were started on a regular output from the factory. He believed their capacity would be something like 250 carriages this year. If they could increase it they would do so but they were already cramped for space. They were commencing work at once for the extension of the factory, specially with a view to the building of the carriages and frames, which was a very bulky business. When they got that at work, in six or eight weeks' time, they expected to nearly double their weekly output of complete carriages. So far as their busiuess prospects were concerned, he had not the slightest doubt they could sell three times the number of cars they could produce. They had actually on order between 200 aud 300 motors, frames, and carriages, and had a contract with a firm in the north of Scotland for 50, amounting to about £13,000; that was for a part of the frames and carriages. He might mention, too, that they had not really looked for orders; but the secretary had something like 10,000 applications for catalogues aud prices and particulars of their motors, with a view to purchase. They were first in the business to-day, and hoped to keep in that position. (Applause.) With regard to the financial position, they would remember that the Company was started with a capital of £100,000. Statements had been made that the capital was not subscribed, but they were incorrect. The actual amount of capital subscribed was in the neighbourhood of £110,000; consequently they had to return about £10,000. Having got all their capital, they were pledged to £40,000 for the licenses. That was certainly a large sum, but he ventured to assert that even if the patents were uot worth a cent—which he did not believe for a moment—he considered that the position they were in, of being six months ahead of any other company, was worth every penny of the money; it was equivalent to buying a goodwill.

Although the directors had been greatly delayed in actual trading, they had been looking after the interest of the Company in other ways. They purchased the mills—the estate covered 12½ acres of ground—and had sold the four-storied building close by these works for more money than they gave for the whole estate. (Applause.) He thought that was something to begin with, and showed that the directors had not been unmindful of the interests of the shareholders. (Hear, hear.) They had a factory which had been valued at £8,500. They had in addition some 10 acres of unoccupied ground, the ground rent of which was more than covered by rents received, and that, taken at a low estimate, should be worth another £2,500. That made £11,000 clear profit in the assets of the

Company. Then they had £12,000 worth of machinery, and they had finished stock ready for making up into carriages, the work of 160 men for four or five months, which could be put at £17,000, taken at factory cost. Furthermore, they had made other deals which were not trading deals in the ordinary sense of the term, and which had netted to the Company £2,000 in shares in other companies and something like £3,500 in cash; so that altogether, although they only to-day commenced their trading profits, they had made profits in cash and shares, by the use of their capital in other ways, and by taking advantage of opportunities which occurred, of £16,500. (Applause.) Thus they had done a very good year's work for the Company without actual trading. The board had left of the capital nearly half of that which was placed at their disposal. They had in the bank and elsewhere a sum of close upon £30,000. (Applause.) It would be seen the Company was not crippled for capital, but, on the contrary, had sufficient with which to go on trading under very satisfactory conditions. (Applause.) In conclusion, he explained that application had been made to the Stock Exchange Committee for an official quotation, and certain alterations in the articles of association had been required. It would be observed that the qualification of a director was put at £100; but, as a matter of fact, not one member of the board held so small an interest. Three or four of the directors had between £2,000 and £3,000 each in the Company, and he himself had nearly £3,000. For that interest—which amounted altogether to over £10,000—they had paid in cash. (Applause.) He then moved the formal resolution approving the alterations in the articles in accordance with the notice sent to the shareholders.

Mr. JAMES A. BRADSHAW (Director) seconded the motion.

A discussion followed as to the alterations in the articles proposed, and the board accepted two suggestions from shareholders, one fixing the amount of a director's qualification at £500, and the other substituting the following words for those providing for an additional remuneration of 7½ per cent. on the net profits to the directors after the shareholders received 10 per cent. dividend, "such additional remuneration as the shareholders present in person at the general meeting shall determine."

Mr. B. NICHOLSON proposed a vote of thanks to the Chairman and directors and staff for their services during the past year.

Mr. W. B. AVERY seconded the motion, which was carried unanimously, and, after a brief acknowledgment from Mr. Sturmey, the proceedings closed.

The London General Electric Omnibus Co.

THE London General Electric Omnibus Company (Limited), says the *Financial Times*, has yet to win its spurs. So far it has done nothing except to take an omnibus occasionally on an experimental tour through one or two streets. We are asked to believe that these trips have been wonderfully successful, and that they fully demonstrate the superiority of the electric omnibus over all other omnibuses. That may be so for all we know, but the Company has yet to prove itself a financial success, and the mere assertion that the omnibus is a good one is hardly sufficient inducement for the shareholders to subscribe for another £50,000 in £1 shares at par. This they have been twice asked by circular to do during the past ten days. There is an uncalled liability of 10*s*. per share on the shares already issued, but it is suggested that shareholders would rather increase their holding than get rid of this liability. In our opinion that is the wrong way to go to work, and the directors are making a mistake in endeavouring to commit their shareholders more deeply in a new and untried undertaking. Prudent shareholders would, we should say, prefer to have something more tangible to go upon before planking down another £50,000 for electric omnibuses.

The following are the circulars of the London Electric Omnibus Company (Limited), marked "Private," referred to above:—

"Broad Street House,
"New Broad Street, E.C.,
"*February 26th*, 1897.

"Dear Sir or Madam,—You are probably aware that one of the Company's omnibuses of the latest type has been running with marked success on many occasions through the streets. The omnibus has been re-designed, and the construction being entirely novel, there has been some difficulty in getting it built. The time has, however, come when the directors, having satisfied themselves that they have the best, smoothest running, and most comfortable omnibus which has ever been built, and which can be steered through crowded traffic without difficulty, are desirous of placing a number of them on the streets for the use of the public. You are aware that the ordinary shares of the Company carry a liability of ten (10) shillings per share, which the directors can call up in sums of £5,000, but it has been suggested that several of the shareholders would rather avail themselves of the opportunity of increasing their holding in the Company by applying for a fresh allotment of shares, than pay up the whole outstanding liability on the shares which they now hold. Before, therefore, determining whether to make a call or to go to the public for capital, it has been resolved to give the shareholders and their friends an opportunity of subscribing amongst themselves for an additional 50,000 ordinary shares of £1 each at par. When the Company is fully working, and paying a good dividend, the shareholders who avail themselves of this opportunity will thus reap the advantage. I enclose a form which, in the event of your wishing to take any additional shares, please fill up and return with cheque to the Company's bankers for an amount of 10*s*. per share. This offer will only be open until the 5th March, 1897. I enclose extracts from several of the leading London newspapers, showing the success of the Company's latest type of omnibus. The directors have now under consideration the acquisition of a freehold site, admirably adapted for the Company's purposes, and are also negotiating with several gentlemen who are desirous of establishing local subsidiary companies in large towns, from which the parent Company will derive considerable financial profit. As this letter might be considered a notice inviting persons to subscribe for shares within the meaning of Section 38 of the Companies Acts of 1867, it should, therefore, technically specify the dates and the names of the parties to all contracts; subscribers will be held to have had notice of all contracts, and to have waived their right to be supplied with particulars thereof. —I remain, your obedient servant,

"ALFRED CAILLAT, Secretary (*pro tem.*)."

"Broad Street House,
"New Broad Street, E.C.,
"*March 2nd*, 1897.

"Dear Sir or Madam,—With reference to my circular letter to the shareholders of the 26th ult., regarding the proposed issue of 50,000 shares to the shareholders and their friends, of the unallotted capital of the Company, I am instructed to inform you that the directors to-day received a deputation representing several influential shareholders, and afterwards, in accordance with the wishes of the deputation, passed the following resolution:—'That should the directors make any further issue of the present unallotted capital, they will issue such shares at a premium, provided that at the time of such issue the already issued shares are saleable above par.' In consequence of this change, the time for receiving the applications from the shareholders, referred to in the circular letter of the 26th ult., is extended from the 5th inst. to Saturday, the 20th inst.—I remain, your obedient servant,

"ALFRED CAILLAT, Secretary."

WE understand, in regard to the organisation being formed among the shareholders of the British Motor Syndicate, that nearly 40 holders have now signed the agreement undertaking to bear the costs of the law proceedings, and that it is expected some 50 further signatures will be obtained. The action has already been commenced.

New Companies Registered.

[Under this heading we give a full list of new Companies registered which take power to make, deal, or become interested in any manner in automotor vehicles. We shall be pleased to reply with detailed particulars to inquiries through the "Answers to Correspondents" column. All communications should be addressed to the Editor. The only stipulation which we make is that where the inquiry involves a search of the records at Somerset House—as in the case of information on the subject of the holdings of shareholders—a postal order must be enclosed to cover the Government stamp of one shilling which is charged before a search is allowed to be made.]

	Capital. £
Albert Eadie Chain Co., Worcester	65,000
Alfred Appleby's Twin Roller Chain	40,000
Anglo-French Pneumatic Compensation Cycle Co.	120,000
Argier Chemical Co.	5,000
Baker Brothers	6,000
Balmoral Cycle Co.	3,000
Beeston Motor Co.	1,000
British Cycle Manufacturing Co.	50,000
Cheshire Cycle Co.	5,000
Clarkson and Capel Steam-Car Syndicate	20,000
Clyde Cycle and Motor-Car Co.	25,000
Columbia Manufacturing Co.	3,000
Components Tube Co.	150,000
Cycle Stampings	20,000
Darlington Cycle and Motor-Car Co.	5,000
Emu Cycle and Manufacturing Co., Birmingham	10,000
French Company, H. Miller (Limited)	10,000
Gloucester City and County Cycle Co.	6,000
Great Eastern London Suburban Tramways and Omnibus Co.	50,000
Hygienic Heating and Lighting Syndicate	3,500
James Lawrence (Limited), Manchester	10,000
Jandus Arc Lamp (Continental Patents) and Electric Co.	100,000
Kronand Metal Co., Birmingham	60,000
Leather-Shod Wheel Co.	300,000
London Motor-Van and Wagon Co.	300,000
Loughborough Cycle Hub and Pedal Co.	5,000
Midland Motor-Carriage Syndicate, Birmingham	13,000
Midland Sports Agency, Birmingham	5,000
Motor Attachment Syndicate	10,000
National Gas-Engine Co.	50,000
New British Rubber and Wearwell Hosepipe Co.	50,000
New Buckingham and Adams Cycle Co.	70,000
New Centaur Cycle Co.	125,000
New Cooper Cycle Fittings Co.	50,000
Newcombe Brake Syndicate	4,000
New Triumph Cycle Co., Coventry	130,000
New Vanguard Cycle Co.	25,000
North European Cycle Export Co.	75,000
Ormonde Cycle Co.	100,000
Peto and Radford (Limited)	10,000
R. F. Hall (Limited)	125,000
Rudge-Whitworth (Foreign, Limited)	200,000
Sheffield Cycle and Motor-Car and Accessories Exhibition Co.	1,000
Stanbury's (Limited)	10,000
Starley (Russia), Limited	100,000
Thrupp, Holmes, and McNaught (Limited)	1,000
Trench Tubeless Tyre Co.	200,000
Victory Cycle Manufacturing Syndicate	7,500
Woodhead Manufacturing Co.	25 000

Australian Cycle and Motor Co. (Limited).

THE first ordinary (statutory) meeting of the shareholders in the Australian Cycle and Motor Company (Limited) was held on the 4th inst. at Worcester House, Walbrook, the Chairman (Mr. William Calcott) presiding.

The CHAIRMAN said:—I am pleased to see such a large company present, which is an intimation to me and my fellow-directors that you are taking an interest in the business. I need scarcely remind you that this meeting is called to comply with the Act of Parliament—"that every company shall hold its first meeting within four months of its registration"; and much as I should have liked to have waited a little longer before calling you together, I found that I could not postpone the date longer than to-day. You will be glad to hear that some 34,837 shares were subscribed for in this Company, and 21,500 fully-paid shares were allotted to the vendor in part payment of the purchase consideration, making together a total of 56,337 shares allotted out of our capital of £75,000; so that, you will observe, you have a working capital of nearly £35,000, which your directors consider should be ample for the purposes of this business. We lost no time in despatching the managing director to Australia, and that gentleman (Mr. Edward Whitten Rudd) sailed on December 6th last, and from that date we have been forwarding large consignments of cycles and cycle fittings of the best makes to him; and we have no doubt, as he has wide experience of this class of business, and is fully cognisant of the colonial taste with regard to cycles, &c., that he will be able to develop a very profitable business for this Company. I regret that the time that has elapsed since his departure has not given him an opportunity of letting us know by mail what business he has done; but I may tell you that, from the letters that we have had from him, he is as confident as when he started that a very large trade can be done, and will be done by him for this Company. He is opening up as rapidly as possible depôts in the large towns, making the headquarters of this Company in Melbourne. I may advise you that we have applied to the London and other Stock Exchanges for a special settlement in our shares, and the same will, we have little doubt, be very shortly granted. We have also taken steps to have our shares quoted in the daily papers, and I feel quite confident that before long they will be in great request.

London Electrical Cab Co. (Limited).

THE statutory return to February 12th has been filed. 62,523 shares have been taken up out of a capital of £150,000, in £1 shares, and the full amount has been called, and £61,223 has been received, leaving £1,299 10*s.* in arrears.

Ernest Scott and Mountain (Limited).

THE annual return to November 12th has just been filed. The whole nominal capital of £70,000 has been subscribed for and allotted, and 2,200 shares have been issued as fully paid. The full amount has been called on 1,982, and £6 5*s.* on each of the remaining 2,818 shares.

NOTES OF THE MONTH.

A PARIS correspondent says that a marriage which aroused considerable interest on the 2nd inst. was that of a couple who drove to the Batignolles Town Hall in an open autocar. The bride was Mdlle. Ponson, daughter of an autocar manufacturer, who was seated with her bridesmaid and the best man in a landau driven by petroleum. After the ceremony and lunch at a neighbouring restaurant, the autocar marriage proceeded to the Bois de Boulogne. The landau was, of course, decorated with white ribbons. Crowds ran along beside the vehicles, or stood outside the Town Hall and restaurant, cheering the bride. A great sensation was created in the Bois de Boulogne.

ELECTRIC cabs are promised in Paris by the summer by M. L. Krieger. An experimental cab constructed to perform a journey of 60 kilometres (37·2 miles) without recharging the battery has already travelled 2,500 kilometres (1,552 miles) in Paris at a mean speed of 10 kilometres (6·2 miles) per hour.

IN connection with complaints which have been sometimes made of unpleasant smell and excessive vibration of the motor-car, it is interesting to recall Mr. Charles Greville's description in his "Memoirs" of his first train journey. He says nothing of any jolting or vibration. "The first sensation," he writes, "is a slight degree of nervousness and a feeling of being run away with, but a sense of security soon supervenes, and the velocity is delightful." Mr. Greville mentions, however, certain "occasional whiffs of stinking air which it is impossible to exclude altogether." They have, nevertheless, since disappeared, and presumably means will be found to banish the perfume of paraffin from the motor-car.

A SPECIAL committee appointed by the Cardiff City Council to consider the desirability of establishing a system of electric tramways in the borough met on the 20th ult. Referring to what was being done in other towns, the chairman remarked that a private company working electric tramways at Bristol had just paid 6 per cent. on its capital and carried over £2,000 to the reserve fund. He thought Cardiff should not be behind in providing the public with the most up-to-date-facilities for travelling. It was decided to ask the borough engineer to prepare a plan of desirable routes.

THE *Velo* states that the French War Office is considering the advisability of adopting autocars for the Army. The present idea is to use them for ambulance purposes only, although it is, nevertheless, proposed that each autocar should be armed with a light quick-firing gun.

THE Paris correspondent of the *Weekly Sun* writes last week:—"On the Bois on Tuesday I noticed Mrs. Crawford, the correspondent of the *Daily News*, in a new, easily-moving motor-car. She looked very much absorbed, and the gentleman accompanying her was gesticulating, and, I fancy, explaining the working of the car to her. I have not seen her yet to ask her opinion. A number of these cars ply up and down and Bois, moving quietly among the horses, who now seem to have lost all fear of them."

THUS *The Echo*:—

"Shareholders in motor-car companies are looking in vain for the gradual appearance in the streets of these vehicles. According to various Press statements—or mis-statements—and prospectuses, the leading tramway and omnibus companies were going to sell up their stock of horses, and quickly replace old 'buses with new motor-cars. Were time only required there would be no need for premature comment. But on Monday last the London Tramways Company, which for years past has run a service of single-horse halfpenny omnibuses over Waterloo Bridge, opened a new service of well-equipped and well-built double-horse omnibuses, whose yellow wheels and scarlet bodies could not but attract considerable attention."

"This movement, or, perhaps, this reversion to last century methods of transport, on the part of a leading tramway company must deal a blow at the so-called advantages of the motor-car business, seeing that the entire equipment is new throughout. The old and somewhat odorous single-horse vehicles have disappeared. If motor-cars are so economical and handy, it is nothing short of extraordinary that the directors of the London Tramways Company should not have moved with the times and used steam in lieu of horseflesh. We prefer to believe that the Company knows its own business best, and that there must be many and serious drawbacks to the efficient working of a line of motor-car omnibuses in the crowded streets of London."

WE can only assume that the directors of the London Tramways Company are not keeping themselves in touch with what several of our leading engineers are doing in the motor-car line, or we think they would have postponed making the change recorded. It is possible before long they may have substantial reason to regret their action.

A TRIAL was made last week in London of a new electrically-driven carriage, which, however, will not be on the market for some time yet. The new system is an invention of a French engineer, M. Darracq. From particulars supplied by the inventor, we understand that the accumulators, to the number of 44, are carried in two boxes, with a gross weight of 600 lbs., and sufficient power obtained for a run of 50 miles, whilst the cost of recharging does not exceed 4*s.* for a similar distance. Any speed can be acquired, from a quarter of a mile up to 20 miles per hour, if need be. Furthermore, all the accumulators discharge at the same time, and, in descending an incline, to some extent recuperate themselves. It is claimed the extra power which is required to maintain the same speed uphill is regained coming down.

DURING a run through Oxford Street and other crowded thoroughfares, the carriage, which is at present in the hands of the Gladiator Cycle Company, ran most smoothly. The body of the vehicle itself is shaped like an ordinary brougham, with the exception that the driver is perched behind, as in the case of a hansom cab. A long handle does the steering, whilst the customary switch regulates the speed. The wheels and mechanical portions are so arranged that a carriage of any shape can be slung on them, and changed at pleasure. The brougham itself presented a neat appearance, and afforded comfortable riding, besides being fitted throughout with electric light, and the result may certainly be regarded as an indication that another forward step has been achieved in the progress towards the ideal of the motor-car.

AN application has been made to the Board of Trade for the registration of the Tramways and Light Railways Association without the addition of the word "limited." The Association is being formed for promoting, encouraging, and facilitating the construction, extension, and working of tramways and light railways, and the development of electric and other modes of mechanical traction.

A CARDIFF paper states that there is a movement in that town to abolish horse wagons and introduce motor-carts for scavenging purposes. According to our contemporary "the new method of locomotion has been successfully adopted by several of the London Vestries." This is hardly correct, although several of the London local Vestries are seriously considering the matter, and we understand one or two contracts are likely to be shortly signed. In the meantime the Chiswick Urban Board can claim the distinction of being the first official body to start motor dust carts, three of those vehicles being ordered, as we recorded in a previous number, from Messrs. Thornycroft, of Chiswick Mall, delivery to take place about the end of this month. We have little doubt that the economy which this innovation is likely to effect, will speedily cause all the other London Vestries to follow the lead of the sensible and practical members of the Chiswick Board.

SEVERAL of the London Tramway Companies are also seriously considering the possibility of mechanical traction in place of horse-power. At last week's meeting of the Highways Committee of the London County Council a request was reported from the London, Deptford, and Greenwich Tramways Company for permission to use experimentally the "Ribbes" electric accumulator car on a portion of the Company's lines in Rotherhithe New Road. Permission was granted for one year.

THIS departure emphasises our suggestion in another paragraph that tramway and omnibus companies should exercise judicious caution during the next year in increasing their ordinary car stock in case they should find it advisable to adopt or obtain powers to use mechanical traction in order to hold their own in the competition for the patronage of the riding public.

MESSRS. BROWN AND BUCKTON, cycle makers, &c., of Hipperholme, are just completing a motor-car, which is their own invention, and very shortly the same will be on view in their Halifax shop in Crossley Street. The car, which is made to carry two persons, is constructed on a frame of weldless tubes. The wheels are placed similarly to those of a tricycle, the two on either side being pneumatic with tangent spokes. The motor, which is about one horse-power, containing two cylinders, is at the back of the car, and this, together with all the gearing, is enclosed in a wooden case. The car is worked by petroleum, which is fed to the lamp near the motor from a can which is placed at the end of the carriage. The can will contain a sufficient supply of oil for a two days' journey, and it is computed that the cost of working it will be about ¾d. per hour. The motor-car can be started in about three minutes after the lighting of the lamp. The steering, starting, and brake appliances are within easy reach of either rider, and the machine can be run at four different speeds for different gradients. The whole weight is about 3 cwt., and the cost will be between £80 and £100.

TRULY, there is nobody like your thorough-going retrograde Russian, says the *Westminster Gazette*, for going "full steam ahead" once a so-called advanced idea has taken possession of him. Here is Prince Oldenburg, the uncle of the Czar, preparing for a tour through the Caucasus on board a caravan which is to be drawn by an automotor! This autocar is to be a veritable *train de luxe*, for trust a Russian noble for inventive genius when his own comforts are concerned! There is to be the automotor, and attached to it a couple of vans, the first of which is to be in turn the dining-room, the *salle de jeu* (which is as indispensable to a Russian Prince as is his tub to the Britisher), and the bedroom of his Serene Highness. The second car is to combine all the culinary and domestic offices, including a safe in which the Prince's roubles and raiment are to be stored. We wish him joy in seeing the beauties of the Caucasus under such original conditions.

THE last of the series of lectures arranged by the committee of the Science and Art School, Camborne, was given this month by Mr. J. C. Keast on "Motor-Cars" before a large audience. The lecturer gave a concise history of motor-carriages, and went on to speak of the improvements made in France, of the races in that country during the last three years, and also the recent run in this country from London to Brighton. The lecture was well illustrated by the lantern.

FASHIONABLE Leamington does not believe in progression. The motor-car movement seems especially to have upset this exclusive town. Last week the Town Council occupied considerable time in a discussion on motor-cars. It appears the Coventry manufacturers send their motor-cars over to Leamington on experimental trips, and residents in the more fashionable town have come to regard them as constituting an unmitigated nuisance. To fashionable nerves they seem to whizz along the principal streets at incredible speed, with a tremendous clatter, and emit in many cases an abominable effluvium of paraffin. Councillor Purser described them as "ugly stinking machines," and another councillor said that in their present state of development they were neither comfortable nor pleasant. It is fortunate all people are not like unto Leamington folk.

ABERDEEN is unlike Leamington. In the former city the advent of the motor-car is regarded as likely to favourably affect the interests of the inhabitants than otherwise. At the Annual Social Meeting of the Aberdeen cabmen last week in the Albert Hall, Baillie Brown, who presided, was accompanied by several leading members of the Council, and in the course of his speech referred to the probable effect of the introduction of motor-cars upon cabs and cabmen. He did not think the prospect was at all a gloomy one; he was not one of those who believed that the motor-car would drive the cabmen out of existence. There had not been wanting croakers who imagined that railways, and after railways tramways, would result in the extinction of the cab as a mode of conveyance, but their pessimistic forebodings had been falsified, for instead of cabs having entered upon a period of decline they had increased in numbers and embarked, as it were, on a sea of greater prosperity than ever. In the same way he believed that the cab, in whatever way motor-cars might be developed, had nothing to fear in the future. Councillor Gray was not quite so much in their favour, but thought that the wives of cabmen might rest assured that their husbands would not lose their situations because of the motor-car; and in the same way the sweethearts of cabmen need have no fears on the ground of the insecurity of their lovers' employment.

A CONTEMPORARY states that recently one of the American electrical papers published a lively rumour to the effect that trolley-cars and bicycles had caused such a revolution in means of transit that a small army of horses (100,000, we believe, was the number stated, but a few odd thousands more or less don't matter) was practically running wild in one of the States alone, and that the farmers, after disposing of all they could sell at any price from 5*s.* to 10*s.* each, were hoping for a hard winter to kill off the rest. No doubt this is a trifle exaggerated, but as feathers show which way the wind blows, so, even after allowing for Yankee "hatchet-throwing," rumoured acts of this sort should act as a timely hint to keep well in touch with the motor-car movement, so as to take full advantage of the improvements and economies which will presently be daily in evidence.

DUBLIN is great'y concerned at the prospect of that city being made one of the leading centres for motor-car building. The Dublin papers state that Mr. Pennington has arrived with the object of extending his manufacturing business in Ireland. His motors are to be seen running around Stephen's Green at the rate of 12 miles an hour, and not in the slightest degree interfering with the public traffic. This is evidently only the beginning of the introduction of a number of similar machines. Already arrangements have been made for the adoption of auto-cars to carry passengers and to make a connection between railway termini and the steamboat lines in different parts of Ireland. A company has been organised to erect in Dublin an immense manufacturing place for the purpose of building cars, and will be known as "The Irish Motor-Car and Cycle Company (Limited)." This factory is to be run on American lines for the manufacture of motor-cars, cycles, &c. Mr. Pennington is at the present moment considering a number of sites for the purpose, and his mind will be made up in the course of a few days. He wants a site with acreage sufficient for the establishment of a huge series of workshops, with plenty of space for future extensions. The necessary tools, lathes, &c., for the works are now on their way to Ireland from America.

THE first factory will employ 2,000 hands, who will be chosen from amongst the skilled and unskilled workers of Ireland and placed under trained Americans, who will act as managers of departments. They will start the concern with orders in hand for cars, &c., to the value of £140,000. When the motor-car business extends, as it must extend as surely as night follows day, an industry will exist in Ireland second only to the great brewery of the Guinness firm.

A HORSELESS steam fire-engine of great size and power is in course of construction for the Boston (U.S.A.) Fire Department. The contract capacity is 1,350 gallons of water per minute, but the builders are confident that the engine will throw 1,850 gallons in the same time. Very little machinery in addition to the ordinary mechanism of a fire-engine is necessary for the propulsion of the engine. The road-driving power is applied from one end of the main crank-shaft to an equalising compound, and two endless chains running over sprocket wheels on each of the main rear wheels permit the latter to be driven at varying speeds when turning corners. The driving power is made reversible. When it is not necessary to use the power of the engine for driving purposes, the driving mechanism can be disconnected by the removal of a key, so that the pumps may be worked with the engine standing still. An extra water-tank is carried at the rear of the engine to supply the boiler until connections can be made with a hydrant. The engine can travel on a fair level road at a maximum rate of 12 miles an hour. From the ground to the top of the engine the height is 10 feet, its length over all is 16 feet 6 inches, and the width 7 feet 3 inches; the weight, equipped for service, is 17,000 lbs. Steam-propelled fire-engines are by no means novelties. Among the first was one constructed by Captain John Ericsson, of *Monitor* fame. In the main his engine was a success, but the opposition was so strong against it that, after a brief period of service, the engine was abandoned.

INTERNATIONAL MOTOR-CAR COMPANY.

THIS Company has opened offices at 369, Edgware Road, London, W., and is now prepared to deliver their "Parisian" carriages and vans almost immediately on receipt of order. These carriages, which have had a considerable test in France, are driven by oil-motors, and it is claimed that they fully meet all the requirements of the new Locomotives on Highways Act, are not liable to get out of order, are run at a very low cost, and are particularly suitable as hill climbers. The prices also seem reasonable, starting from £150, and we shall have the pleasure of referring again to the vehicles turned out by this Company when we have had an opportunity of personally testing their power and quality.

REVIEWS OF BOOKS.

"Coachbuilding." By JOHN PHILIPSON. (London: Geo. Bell and Sons.)

THIS volume, which forms one of the admirable series of technological handbooks edited by Sir H. Trueman Wood, is an excellent example of the manner in which such works should be prepared. The author is one of the best known carriage builders in the United Kingdom, but, not being content to rely on his own extensive knowledge, he has called in the assistance of some five or six friends to correct his proofs, who, like himself, enjoy the distinction of being past-masters of their craft; the result is, that the accuracy of this text-book cannot be questioned, and the student, the practical man, or the general reader may refer to it with complete confidence. The arrangement of the book—which is carefully illustrated throughout—is such that the reader is led by easy stages from a consideration of the general principles of carriage construction and design to the various stages involved in producing the highly finished modern carriage of to-day. At every successive step full particulars are given, to enable the reader to thoroughly follow all the details involved, and to obtain a complete mastery of the subject. It is just the book which engineers interested in road motors should obtain, for in a short time they will obtain from it all the information they require, and get it, too, from a practical and trustworthy source. A very valuable appendix is given, containing many useful tables on standard sizes and dimensions, while it concludes with a useful list of text books on carriage building.

"Modern Cycles: their Construction and Repair." By A. J. WALLIS TAYLER. (London: Crosby Lockwood and Co.) Price 7*s.* 6*d.*

THIS is a capitally compiled book on a subject which must necessarily attract the attention of very many readers, as the number of followers of the wheel is ever on the increase. We have no desire to intrude into the cycle world, which has a literature distinctly its own. This book, however, is written by one who is eminently qualified for the task, and much of the matter will be of as much use and interest to those concerned in automotors as it is to bicyclists. More particularly does this relate to such chapters as those relating to repairs, the sections, construction, and method of holding together the various parts constructed of tubes. The book will be found to be of great practical utility to all interested in the design or manufacture of motor-carriages.

"Costing: as Applied to the Carriage-building Industry." By JAMES BOARLAND. (London: John Kemp and Co.)

"The Best Method of Ascertaining Prime Costs." By WM. STRACHAN. (London: John Kemp and Co.)

THESE are reprints of the first and second prize essays on the subject of taking out the true cost in each department of carriage building, and the subject matter is well worthy the consideration of those concerned. The reprints are from *The Saddlers', Harness Makers', and Carriage Builders' Gazette.*

A NEW work by Mr. A. J. Wallis Taylor, C.E., A.M.I.C.E., entitled "Motor-Cars, or Power Carriages for Common Roads," will be published shortly by Messrs. Crosby Lockwood and Sons. The work will be fully illustrated, and will contain descriptions of the most notable early and modern examples of self-propelled vehicles.

LAW REPORTS.

Koosen v. Rose.

THIS was an appeal heard on the 4th instant, from a judgment of Mr. Justice Wright at the trial of an action without a jury. The action was brought to recover a sum of £150, the price of a motor-carriage, which the plaintiff alleged he had sold to the defendant. The plaintiff having taken out a summons for summary judgment under Order 14, Mr. Justice Day at chambers made an order giving the defendant liberty to defend, and directing that the action should be put into the Short Cause List, and that the costs of the application should be costs in the cause. At the trial Mr. Justice Wright gave judgment for the plaintiff with costs, but, thinking that the case was not a proper case to be dealt with under Order 14, he disallowed the plaintiff all the extra costs incurred by the application for judgment at chambers. The plaintiff appealed from that part of the judgment which related to the costs of the application at chambers. It was argued on his behalf that Mr. Justice Wright had no jurisdiction to interfere with the order of Mr. Justice Day, which directed that the costs of the application should be costs in the cause.

Mr. Wheeler, Q.C., and Mr. W. H. Nash appeared for the plaintiff; Mr. C. W. Mathews for the defendant.

The Court allowed the appeal.

The MASTER OF THE ROLLS said that Mr. Justice Wright at the trial had assumed to himself the power of altering a decision which had been come to by Mr. Justice Day at chambers with regard to the cost of an application heard by him. The rule must be that a Judge could not interfere with an order made by a Judge of co-ordinate jurisdiction unless some statute expressly gave him the power of reviewing that order by way of appeal. Therefore, the order made by Mr. Justice Wright with regard to the costs of the application at chambers was without jurisdiction and void, and must be overruled.

LORD JUSTICE LOPES said the question was whether Mr. Justice Wright had jurisdiction to interfere with the costs of the application at chambers. In his opinion he had no such power. The costs of an application under Order 14 were provided for by Rule 9 of that order, which said that they should be dealt with by the Judge on the hearing of the application, who should order by and to whom and when they should be paid, or he might refer them to the Judge at the trial. The defendant relied on Rule 9 (*b*), which said that, if the plaintiff made an application under the order where the case was not within the order, the application might be dismissed with costs, to be paid forthwith by the plaintiff. But that applied to proceedings at chambers, and not to what took place at the trial. The appeal must therefore be allowed.

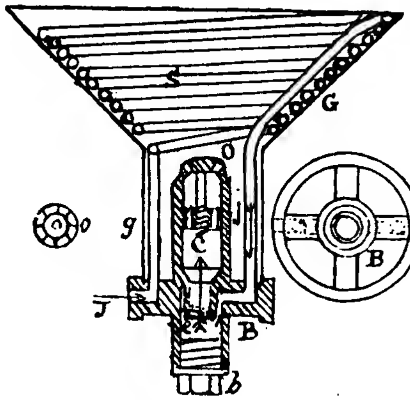
LORD JUSTICE CHITTY delivered judgment to the same effect.

AMERICAN MOTOR VEHICLES.

BEFORE the New York Electrical Society, receutly, Mr. Joseph Sachs lectured ou "Horseless Carriages." He referred to the history of the development of motor-cars, and spoke on the questions of speed, weight, and construction. After dealing with steam and gas in connection with such vehicles, the electric motor was referred to. Mr. Sachs considered the advantages of the electric system were simplicity, ease of control, and facility of connection of power with driving wheels. The steering devices and brakes can be operated by electric power, and such a machine cannot be stalled. Since it is necessary to depend upou the storage battery for supply of power, tho disadvantages of the electric system were the great weight of the battery, the limited supply of energy, the mechanical disintegration of the plates, and the lack of facilities for charging the batteries. The horseless carriage service, the speaker stated, was harder on storage batteries than traction work. He thought that a vehicle *par excellence* would be one combining the electric system with an outside source of supply. A dynamo operated by a gas motor, *à la* Heilmann locomotive, wonld probably produce effective results. With all its disadvantages, however, the electric vehicle was superior to either of the other types.

THE LONGUEMARE BURNER.

AT the request of several correspondents we reproduce a sketch of the Longuemare burner from "Voitures a Petrole," par Louis Lockert, and the following freely translated description:—The lower part is a cross-shaped bronze casting (shown on



plan to the right), of which two of the arms are pierced with ducts. By one of these, J, the oil enters under a pressure ½ to 5 kilogrammes per square centimetre, circulates through the coil S, and returns by tube *j* to the burner. The oil is vaporised in S by the heat of its own burning vapour. The oil vapour strikes on the exterior and the capsule *e*, so as to deposit any foreign matter, which can be removed by the plug *b*. It passes through layers of gauze at *e* to chamber C, and then through eight holes at top of C to the burner O. This is formed of an opening closed by a copper cone, on the periphery of which are cut eight very fine grooves, seen in plan at O, to the left of the figure. From these grooves the vapour issues, producing eight blue and vibrating flames of 50 to 60 centimetres long, which spread over the sheet-iron coue G. A cylinder, *g*, also of sheet-iron, serves as a duct for the air supply coming through the cross-piece B. The heat is greater, the greater the pressure in the oil reservoir. One of these burners is sufficient for the steam tricycle of M. Serpollet. Neither dimeusions nor scale are given.

THE KRIEGER ELECTRIC ROAD CARRIAGE.

A PAPER was recently read before the Société des Electriciens, in Paris, by M. L. Krieger, giving a descriptiou of some electric carriages recently brought out. The first carriage, converted from an ordinary horse-cab, has for some time past been driven about Paris. In this vehicle the driving power is applied to the fore-carriage by means of an electric motor geared to each wheel. To the armature shaft of each motor is attached a pinion with helical teeth engaging with a similar wheol rigidly attached to the corresponding driving wheel. The ratio of gearing is as 1 to 10. The field magnets of the two motors are coupled in series, and the two armatures in parallel. The use of an independent motor to each driving wheel enables the steering to be effected electrically. For instance, if the armature of the motor on the inside of the curve it is desired to traverse be short-circuited, the fore-carriage will turn to that side. The short circuiting is brought about by means of a special commutator arrauged for this purpose. The fore-carriage turns to an angle equal to that made by the steering handle. Hand steering gear of the usual type is also fitted to the carriage. The second carriage was made by transforming a cab belonging to the Compagnie l'Abeille. It weighed 1,150 kilogrammes (2,535 lbs.), and has taken trips of 30 kilometres without recharging the battery of "Fulmen" accumulators, which in itself weighed 285 kilogrammes (628 lbs.). M. Krieger very naturally points out that the ancient build of the carriage, constructed 10 years ago, for horse traction, shows his system at a disadvantage, owing to the great strain on the fore-carriage, which was not designed for such a purpose. Another carriage, especially constructed for electric traction, weighs, when empty, 1,880 kilogrammes (4,144 lbs.). This includes the weight of the fore-carriage, which is 1,630 kilogrammes (3,593 lbs.), and it is possible to travel a distance of 80 kilometres without recharging the batteries. This battery, especially designed by M. H. Meynier, commercial agent for the Julien accumulators, has a capacity of 450 ampere-hours, with a total weight of 640 kilogrammes (1,410 lbs.). It consists of 16 cells, each weighing 33 kilogrammes, and enclosed iu an ebonite case having three compartments. Each compartment contains 13 plates, 6½ millimetres in thickness, that is to say, 39 plates per element. The capacity being 450 ampere-hours, one obtains about 15 ampere-hours per kilogramme of plates. The ebonite cells are protected by thin oak boxes. A layer of special luting is poured on to the surface of the liquid of each cell. This compositiou, once dried, performs the function of a thin sheet of slate, sealing the cell hermetically, and preventing splashing over, which is one of the serious drawbacks in the carrying of accumulators by road. Two motors of 150 kilogrammes, running at au angular velocity of 600 revolutions per minute, give a maximum couple of 13 kilogrammes, the normal couple being 1·5 kilogrammes. The rate of discharge of the accumulators is from 60 to 80 amperes, at 30 volts on the level, at a mean speed of 10 to 12 kilometres per hour, and the same speed can be maintained over such gradients as those on the road from St. Cloud to Garches. With a load of five passengers this carriage has run 65 kilometres at an average speed of 11 kilometres per hour. It has also covered a distance of 2,500 kilometres in the suburbs of Paris at an average speed of 10 kilometres per hour. M. Krieger is having constructed an ordinary brougham with two seats, which is to travel 125 kilometres without recharging, and is to weigh only 800 kilogrammes (1,723 lbs.), 350 of which are for some new accumulators, the name of which M. Krieger does not divulge, a single charge being sufficient during the night. This is notable, as the price of the kilo-watt hour of electric energy is very high in Paris.

CORRESPONDENCE.

*** *We do not hold ourselves responsible for opinions expressed by our Correspondents.*

*** *The name and address of the writer (not necessarily for publication)* MUST *in all cases accompany letters intended for insertion, or containing queries.*

MASTER PATENTS.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

DEAR SIR,—I see in your Journal a discussion *re* Horseless Carriages, Master Patents, &c. I cannot see why the British Motor Syndicate may not have good master patents, but some of the gentlemen who are writing on the subject seem to be well up in it. A Mr. Sennett says the foreigner has not advanced the horseless carriage in this country; but, if it had not been for the foreigner, he and others would not now be discussing the subject as they are. He says there is a vast field in store for petroleum motors when they are able to fulfil the conditions required. He does not say what those requirements are, but as I have had a hand in the erection of steam engines up to 15,000 I.H.P., marine, locomotive, and stationary, and have been making and experimenting on oil and gas engines for about 16 years, I might be able to guess what he requires the petroleum motor to do. I think he will require it to stop, start, and reverse the same as a steam engine; if that is all, the petroleum motor will fulfil his demands with ease. As Mr. Sennett seems to know a great deal of the past, present, and future of the horseless carriage, I wish he or some of your readers would try and dispel the delusion that I am troubled with, that I was the first person to design and make a horseless carriage with engine gear, the same as is now employed by Daimler and other petroleum engine makers; and a patent specification of mine some years ago will show belts, chains, ropes, and engine as employed by these people. I would like to know the earliest date they claim to have made a horseless road carriage driven by an internal combustion engine. I have now designed an oil engine which will start and reverse the same as a steam engine; no extra gear is employed for that purpose.—Yours truly, J. M.

[With a desire to give "J. M." all the publicity we can, in order that he may reap the advantage of any substantial improvements he may have made, we have inserted his letter with some modifications. If he wants information or assistance, however, he must write less in the shape of riddles.—ED.]

A DISCLAIMER.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

SIR,—We have just noticed a Company being brought out for £300,000 as "The London Motor-Van and Wagon Company (Limited)." Now some months ago we registered in the name of the London Motor-Car Works Company (Limited), our memorandum of association specially providing for the manufacture of vans, wagons, &c.

It is only fair to us to state that we are in no way, directly or indirectly, associated with the London Motor-Van and Wagon Company (Limited), and shall take the necessary steps to stop them using a colourable imitation of our title.

Thanking you in anticipation.—Yours truly,

THE LONDON MOTOR-CAR WORKS CO. (Ltd.)
(James Rickard, Managing Director.)

The Albert Mills, Hammersmith, W.,
Feb. 17*th* 1897.

A QUESTION TO MAKERS.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

SIR,—May I ask how makers of self-propelled vehicles provide for their being turned in a narrow road? A rear-driven carriage can only turn in a circle of some considerable diameter, whereas a horse-drawn vehicle can be turned on its axis. Driving on to the front axle (this being also used for steering) would make the conditions of turning the same as in an ordinary carriage. Query, then: Why not rest the fore end of the carriage or wagon on a four-wheeled bogie carrying and driven by a compact steam plant? Load up forward.—I am, &c.,

March 6th. LOCO.

THE ELECTRICAL CAB COMPANY.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

DEAR SIR,—In your issue of February 17th you give a report of a meeting of shareholders of the Electrical Cab Company. One hesitates to say anything to discourage such a venture as putting electrical cabs for the use of the public on the streets of the metropolis, but surely the claim Mr. Mulliner makes to the exclusive right of use of "the most valuable improvement" is somewhat exaggerated. I may be wrong, but I know of nothing special in the Johnson Lundell Series Parallel Controller beyond the magnetic blow-out. For this feature other makers have devices which they contend are more satisfactory, but this does not seem to come into Mr. Mulliner's calculations. I therefore am compelled to assume that the controllers made by the Westinghouse people, the Walker Manufacturing Company, and others, are equally as serviceable for this purpose. Personally, I know of one carriage that is being built and fitted with a series parallel controller, about which the makers are, I suppose, equally comfortable as to its satisfactory working as the London Electrical Cab Company are about their cabs.—Yours faithfully,

March 9th, 1897. F. H. SOMERVILLE.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

DEAR SIR,—Referring to the report in your last issue of the statutory meeting of the London Electrical Cab Company (Limited) and the statements contained in other reports that after the meeting several shareholders had the opportunity of riding in an electrically-propelled carriage, equipped by Mr. W. C. Bersey; after the prominence given in the report to the name of the E.P.S. Company, we think it only fair the fact should be made public that the cells used in the carriage referred to were manufactured and supplied by the I.E.S. Accumulator Company (Limited), and that it is this Company that has supplied Mr. Bersey with the cells used by him during the last twelve months with very satisfactory results.—Yours faithfully,

For the I.E.S. ACCUMULATOR Co. (Ltd.),
(Herbert Woodfield, Secretary.)

3, Delahay Street, S.W.,
March 12th, 1897.

THE DAIMLER AND HORSELESS CARRIAGE COMPANIES.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

SIR,—Will you allow me, as a shareholder in the above two Companies, to state, for the benefit of any of your readers who may be interested, the result of my experience gained by a personal visit to the works of these Companies? I must confess that I went to Coventry with a certain suspicion in my mind produced by reading the many adverse criticisms on the promoters of these ventures which have appeared in the public Press—that I had, to say the least, made a bad investment.

Dealing first with the Daimler Company, I was courteously received by the deputy-manager and conducted all over the works, which are very spacious and convenient, and filled with machinery of all kinds, most of which was busily running. I saw several completed motors—I mean the engines, not the carriages—which were then being tested, and was informed that 50 had been already made, though not yet put together. I also saw the frames and bodies of certain vehicles which are ready to have the motors fitted. The first complete motor-car had been turned out and tested the previous day and I had the opportunity of seeing it running, and was very much pleased with it. I was especially struck by the fact that the great vibration noticeable in the foreign cars exhibited last year had been very much reduced. I was told that there were about 200 men employed in the works, and on all sides things looked like business.

The Horseless Company has, of course, been at work a much shorter time, but I found they were rapidly getting things into "ship-shape." The bottom floor of the large mill, which was temporarily let to the Humber people, had just been vacated, and is fitted up with benches, &c., ready for active operations. On a higher floor, I found a number of men engaged in making the bodies and wheels of carriages and carts of all descriptions, and was shown over the other departments, which space forbids me to particularise, by Mr. Crowden, the courteous manager.

Might I suggest that others who are interested in the progress of the above concerns should, instead of making or accepting random and hysterical assertions, pay a visit to Coventry and qualify themselves for forming an opinion on the subject?

With best wishes for the success of your useful and well-written Journal.—I am yours, &c., EDGAR SOAMES.

Bromley, Kent, *March 13th*, 1897.

MOTOR-CAR CLUB SPRING TOUR.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

DEAR SIR,—I send you a programme of this Club's first motor-car tour of the season. Already 60 of our members have expressed their intention of taking part in the run, which has been postponed in order that several English-made motor-carriages now approaching completion should be displayed in actual running for the benefit of members.—Yours obediently,

C. HARRINGTON MOORE,

March 10th, 1897. Hon. Secretary.

This tour, which has been postponed to secure settled weather and a good display of English-made motor-cars, has been arranged to enable members of the Motor-Car Club to inspect the various motor factories at Coventry and observe the progress that is being made, and also to enable them to take part in a short motor journey between Coventry and Leamington and neighbourhood.

PROGRAMME.

The train leaves London (Euston) for Coventry at 9.20 a.m., and a special first class saloon carriage will be attached for members journeying to Coventry and returning, should the number exceed ten.

The train arrives at Coventry at 11.12. Motor-cars will, if possible, meet this train and convey members at 11.30 to the Coventry Motor Mills.

At 12, members will assemble at the Motor Mills and inspect the works of the British Motor Syndicate, the Daimler Motor Company, the Great Horseless Carriage Company, and Mr. Pennington.

At 1 o'clock the motor-cars will start for Kenilworth, where a light luncheon will be served at the Abbey Hotel at 2 o'clock.

At 2.30 the motor-cars will leave Kenilworth for Leamington. On arrival at Leamington, members will have about two hours either to visit places of interest in the neighbourhood or to test the various motors.

"ARNOLD'S" MOTOR-CARS.

WE understand that, to meet the special requirements of the British public, Arnold's Motor Carriage Company, of 59, Mark Lane, E.C., and East Peckham, Kent, has arranged to offer an entirely new pattern of motor-carriage fitted with the well-known "Benz" motor. This improved type may now be obtained with double cylinders, and is made in three sizes, giving 3, 5, and 8½ horse-power respectively. The motor, which is placed horizontally on the carriages, and therefore easy of inspection, is run at the reduced rate of 300 revolutions per minute, this reduction of speed minimising wear and tear, and practically doing away with unpleasant vibration, when travelling at full speed.

The engines are fired by the electric spark from an induction coil worked by a two-volt accumulator. The connecting up of the coil is done in a very simple manner: one wire from the coil runs direct to the sparking tube, which is fixed in the end of the cylinder, and the return wire from the tube is led to an insulated spring, and makes and breaks contact by the action of the engine, the framework of the engine being used as a return for the current.

The exhaust box is placed directly under the engine, and the carburettor, being fixed at the back of the carriage, is easily accessible. The shaft of the engine is fitted with a conical pinion or cam, working a small shaft, which revolves at half the speed of the engine, and the cams put in and out of gear the exhaust valve, whilst the air valve works automatically.

The intermediate shaft, which carries the balance gear and two speeded pulleys, is driven by means of belts from the English shaft, this means of transmitting power being found to be very suitable for motor-carriages, as the slight slip in the belt causes the carriage to start very gently.

The motor is fitted with a tank holding sufficient water for cooling the engine for three or four hours.

THE MOTOR-CAR AND RELIGION.

HOW PROVIDENCE INSPIRED MR. H. J. LAWSON TO FLOAT COMPANIES.

IN the *Protestant Echo* of December 1st last, there appeared the following amusing article, which ought to have wider circulation than it obtained in the pages it originally adorned :—

HORSELESS CARRIAGES AND THE TRIP TO BRIGHTON.

Let God in all things be glorified. It has often been said that "necessity is the mother of invention." Granted. But we would look higher and give unto the Lord the glory due unto his name. When the Tabernacle and its furniture were required God gave wisdom and understanding to Bazaleel and Aholiab, "and in the hearts of all that are wise hearted," said God, "I have put wisdom, that they may make all that I have commanded thee" (Exod. xxxi, 2, 6).

Motor-cars, or horseless carriages, have now become as much the necessity of this age as the locomotive engine was the necessity of the age when God inspired the pit-engine boy—George Stephenson—with wisdom to invent and skill to construct his first locomotive, the "Rocket," which is now to be seen as a relic of antiquity in the South Kensington Museum.

Before the commencement of the present century neither the population of England nor that of other nations required the locomotive to run 50 or 60 miles an hour. But what should we now do without it? When, therefore, a bountiful Providence saw the growing necessity for the peoples of the world to be brought into closer commercial touch with each other, and their congested towns to be relieved of their dense populations, He anointed with wisdom and instructed the boy who was working for twopence a day in the coal pit. And by him God gave the world the idea which has developed into our railway system.

"OLD LONDON."

Those who have known our great metropolis for 60 years can remember "Old London," with its narrow streets, and now look upon "New London" with its marvellous improvements.

It is a singular circumstance that on the very spot where 40, Holborn Viaduct—the offices of the Motor-Car Company—now stands, was in the time of Old London Holborn Hill, of which all the horses in London had a dread. It was steep, slippery, and narrow. There every day in the week, and often several times in the day, might be seen the busy and eager crowds of spectators who witnessed the struggling horse, or helped to hold his head down while he was unharnessed, and the poor animal raised from his perilous situation. Busy times they were. Yes, the Jews of "Fee" Lane, who bought and exhibited for sale all the silk pocket-handkerchiefs which the thieves "found" in those crowds, drove a brisk trade in those days. Cheapside also was then a narrow street, with its long team of omnibuses moving as fast as the police could make room for them. About one mile an hour was perhaps the average rate.

NEW LONDON.

Now, new and widened streets, underground railways, Thames Embankment, river steamboats, cheap postages, electric telegraph and telephone all help to lessen the traffic of our great city, and other congested towns.

Yet the ever-increasing population still cries, Give us room. And

THE AUTOCAR

may be regarded as the gift of a Divine Providence to meet the want of the age. Prejudices against every improvement may be expected, but they are not worth noticing. While the motor-cars were in Brighton, on November 16th, we had the pleasure of about two hours' ride on the best of them, up and down the front and through the town. Our car was provided with pneumatic tyres, and could travel, we were told, at 30 miles an hour. At what rate we went it is not possible for us to say, but all that we could compare it to was a bird resting upon his pinions and gliding through the air.

LONDON TO BRIGHTON.

On November 14th an Act of Parliament came into operation which emancipated our roads and road locomotion from a singular law, which compelled the drivers of autocars to have a man walk in front of them with a red flag. To commemorate this event the leading spirit in this great movement organised a procession from London to Brighton, in which about 52 cars took part. Thousands of bicyclists determined upon accompanying the inventor of the "safety" in this bold undertaking.

The weather was wet, and a mercy it was, for such was the interest of the people in this movement that no motors would ever have reached Brighton that day had the weather favoured outdoor sight-seeing. As it was, the leading car arrived about 4.30 p.m. The Mayor, on behalf of the Corporation, met its driver, took a seat by his side, gave him a welcome, and presented a gold medal in commemoration of the event.

A feeling of overwhelming gratitude for safe arrival of all the cars under his command filled the heart of the leader, and many other hearts, too. This he testified by giving £20 as a thank-offering to the poor.

NEW INVENTIONS.

Claiming particularly to apply directly or indirectly to Motor Vehicles, &c.

Compiled for "The Automotor and Horseless Vehicle Journal" by Herbert Haddan and Co., Registered Patent Agents, of 18, Buckingham Street, Strand, W.C., London.

Patents Applied For.

Abbreviations: Impts., Improvements in; Relg., Relating to.

1897.			
Feb.	1.	2,666.	C. M. Johnson. Impts. transmission of power.
"	2.	2,704.	W. H. Denison. Gear for propelling motor-cars, &c.
"	3.	2,839.	J. T. Roberts. Driving gear of cycles, motor-cars, &c.
"	3.	2,846.	W. E. Heys (C. Terrot). Impts. relg. bevel gearing.
"	3.	2,902.	G. F. Gautier. Impts. driving chains for motor-cars, &c.
"	3.	2,924.	C. T. Crowden and W. L. Webb. Variable speed-driving gear.
"	3.	2,925.	C. T. Crowden. Impts. relg. driving gear for self-propelled vehicles.
"	4.	2,938.	J. R. Garner. Impts. driving mechanism.
"	4.	2,946.	Hodoson and Smith. Impts. cycles, motor-cars, &c.
"	4.	2,951.	J. R. Garnier. Impts. driving mechanism.
"	5.	3,058.	H. F. Joel. Impts. in propelling auto vehicles.
"	5.	3,072.	A. W. Brightmore. Impts. steering motor vehicles.
"	5.	3,089.	F. A. Pyke. Impts. relg. cycles and road vehicles.
"	8.	3,248.	D. Neale. Combined switch and brake lever.
"	8.	3,249.	D. Neale. Method of steering electric motor-cars.
"	8.	3,274.	Dunlop and Dougherty. Steering lock for cycles, &c.
"	8.	3,279.	C. T. J. Oppermann. Supporting cells in electric motor vehicles.
"	9.	3,365.	J. H. Ball. Impts. relg. motor-driven vehicles.
"	9.	3,378.	A. W. Brightmore. Impts. connection of motors to vehicles.
"	9.	3,380.	H. Clarke. Impts. motor-cars, cycles, &c.
"	10.	3,493.	T. Toward and others. Impts. self-propelled vehicles.
"	10.	3,494.	A. Bagshaw. Impts. driving chains.
"	10.	3,509.	Lawson and Scott. Impts. brakes and frames for motor cars, &c.
"	10.	3,560.	P. Auriol. Impts. transmission of power.
"	10.	3,562.	N. Vincke. Steering mechanism for auto-cars, &c.
"	10.	3,599.	C. E. Henroid. Impts. motor and horseless carriages.
"	10.	3,602.	Roser and Mazurier. Starting and steering mechanism.
"	11.	3,647.	Kenyon and Pogson. Improved joint for cycle, &c., frames.
"	11.	3,685.	G. T. Harrap. Impts. hauling devices for motor vehicles.
"	12.	3,778.	Leutz and others. Impts. relg. oil or gas motors.
"	12.	3,812.	Hensch and Brandt. Current collector for electric motor vehicles.
"	13.	3,862.	A. W. Brightmore. Impts. motor vehicles.
"	13.	3,911.	E. Taylor. Impts. handles, motor-cars, cycles, &c.
"	13.	3,929.	F. J. Cox. Improved driving chain for cycles, &c.
"	15.	4,077.	C. and J. Richardson. Steering mechanism.

Feb.	16.	4,142.	PARKER and SMITH. Impts. handle-bars of motor-cars, &c.
„	16.	4,157.	G. H. BOND. Impts. driving of cycles and motor-cars.
„	17.	4,284.	L. REDMOND. Impts. cycles and motor-cars.
„	17.	4,290.	R. M. PATERSON. Impts. engines for motor-cars, &c.
„	17.	4,345.	F. G. GRIFFITH. Variable and reversible gear.
„	18.	4,360.	C. R. WEBB. Cotterless crank attachment for motor-cars, cycles, &c.
„	18.	4,384.	G. E. LARDER and others. Propelling motor vehicles.
„	19.	4,500.	J. R. COOPER. Impts. cycles, motor-cars, &c.
„	19.	4,505.	C. W. HOLLIS. Impts. driving mechanism.
„	19.	4,531.	J. H. BARRY. Multi-cycles or auxiliary motor-coaches.
„	19.	4,548.	W. C. JOHNSON. Controlling and steering autocars, &c.
„	19.	4,554.	A. OLLIVER. Impts. motor vehicles.
„	20.	4,598.	J. C. REEVES. Handle for cycles and motor-cars.
„	20.	4,640.	H. VALLÉE. Autocar with special petroleum motor.
„	20.	4,660.	H. A. LAMPLUGH. Impts. cycles and motor-carriages.
„	22.	4,693.	W. P. BRUCE. Impts. driving gear.
„	22.	4,729.	E. A. ALLEN. Impts. driving chains.
„	22.	4,755.	MORRIS and SALOM. Electric motor-propelled vehicles.
„	23.	4,787.	B. F. WRIGHT. Impts. gear for motor-cars, cycles, &c.
„	23.	4,908.	L. BROWN. Impts. automotor vehicles.
„	24.	4,954.	J. J. DILLON. Covering for chain gear.
„	24.	5,016.	BOURDON and WEIDKNECHT. Impts. automotor vehicles.
„	26.	5,212.	A. J. THOMPSON. Impts. transmitting power.
„	26.	5,237.	Hon. R. T. BROUGHAM and W. C. BERSEY. Suspension of electrical accumulators.
„	26.	5,258.	L. EPSTEIN. Impts. electrically-propelled vehicles.
„	27.	5,359.	W. S. SIMPSON. Automatic shut-off for steam or gas engines.

Specifications Published.

19,468. October 16th, 1895. Motor-driven road vehicles. THOMAS NIXON DARE, 13, Monmouth Road, Westbourne Grove, London, and CHARLES DIXON, of 5 and 6, Downing Street, Cambridge.

The principal object is to convert existing vehicles with as little interference as possible with their present construction.

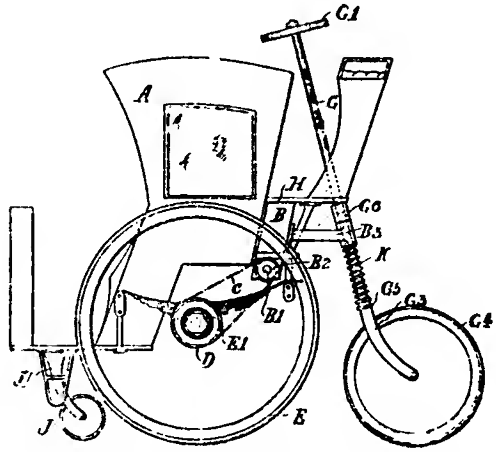
The figure is a side elevation of a hansom cab to which the invention is applied.

The motor, B, is fixed to the rear of the vehicle and geared to the road wheels, E, by chain wheels, B^2, D, and a chain C.

A small wheel, J, carried at the end of a readily-detachable bracket, J^1, is fixed under the front of the hansom to prevent any possibility of its tilting too far forward.

The steering arrangements in the hansom are as follows:—At the rear of the vehicle there is a rod, G, in two parts, with a hand-wheel, G^1, at its upper end in proximity to the driver; this rod is journalled in a bracket B^3, extending from the motor casing. At its lower end it has a fork, G^3, in which is a rear wheel, G^4, preferably fitted with a solid rubber or pneumatic tyre. Between the head G^5 of the fork G^3 and the bracket B^3, a spring K is interposed to permit the rod G, with its wheel G^4, to rise and fall in running over inequalities in the ground. Preferably the rod, G, is made in two parts, so that in putting it in place the driver's seat need not be disturbed; the upper part can be passed through a hole in the foot-board, H, of the driver's seat into a socket, G^6, on the lower part of the rod below that platform; this, however, is only for convenience, and is not essential.

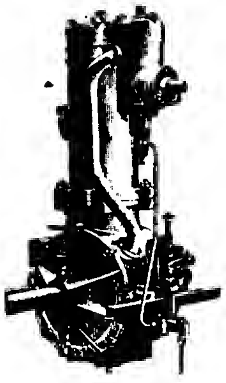
In four-wheeled vehicles the motor may be carried upon the fore-carriage instead of being attached to the vehicle body; or it may be slung to the underside of or otherwise carried on a fixed axle if desired. An extra wheel or wheels such as J, arranged as a castor or otherwise, can be fitted to the motor casing, or to the vehicle if found desirable, as it might be in certain cases; for instance, those in which it is found that the



addition of the motor to the vehicle would otherwise affect the trim or the running of the vehicle.

Brake power may be applied to the periphery of the wheels, and to any required number of the wheels, or to the hubs, or to special drums provided upon the wheel or axle for the purpose.

MISCELLANEOUS TRADE ADVERTISEMENTS.



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Ch. II.—Modern Safety Bicycles.	Ch. VIII.—Manufacture of Cycles.
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Ch. IV.—Carriers.	Appendix, Verbatim Copy of Thomson's Specification, No. 10,990. 1845. the first Patent for a Pneumatic or Air Tyre.
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Circulates amongst Makers and Users of Autocars, Cycles, etc., in the United Kingdom, the Colonies and the Continent.

VOL. I. No. 7. APRIL 14TH, 1897. PRICE SIXPENCE.

CONTENTS.

AN ELECTRIC HANSOM.

DURING the past year, says the *Scientific American*, we have received hundreds of letters either anxiously inquiring whether the automobile vehicle was in reality a practical means of transportation or where such vehicles could be purchased.

The number of American-built motor carriages which have been offered for sale has been small, and the few manufacturers who have pretended to do any business have been somewhat reluctant to put carriages upon the market. In this respect they have been wise, and their action will only result in doing good to the motor industry. In its present state of development the horseless carriage can hardly be trusted in the hands of those who have not some acquaintance with machinery or those who may not be favourably disposed toward the new vehicle. The three races which have been held in America have had the effect of awakening public interest in the subject. If the manufacturers had greater capital at their command the perfecting of their machines would have proceeded at a more rapid rate, but the results would probably not have been more satisfactory. We are glad to be able to chronicle the fact that for the first time in America the horseless vehicle has now entered into competition with the public cab in the city of New York.

The Electric Carriage and Wagon Company, which has offices at 66, Broadway, and a depôt where cabs may be hired at 140, West Thirty-ninth Street, has now several electric hansom cabs which can be hired at the legal rate of the public cabs. In a short time 12 of these vehicles will be at the disposal of the public and an electric brougham will probably be added. It will be little wonder if the public does not take favourably to these handsome vehicles, which seem the perfection of the carriage-maker's art.

Unlike the ordinary hansom cab they are mounted on four wheels. It will be seen by our illustration that to an ordinary cab body a battery box is attached, forming an extension in the rear. Upon this is situated the seat for the driver. The weight of the carriage is about 2,500lbs., the weight of the batteries alone being from 800 to 900lbs. The diameter of the large wheels is 43 inches, while the diameter of the small wheels is 32 inches. The wheels run on ball bearings, have tangent wire spokes, steel rims, and thick pneumatic tyres. Each of the front wheels is connected with a motor of the Lundell type, of nominal 1½ horse-power. Each motor is inclosed in an iron case and drives each wheel independently. The pinion from the armature shaft meshes with the internal gears of the wheels The internal gears permit of turning corners with ease. The storage batteries which are used are supplied by the Electric Storage Battery Company, of Philadelphia, Pa. They are chloride accumulators of 70 ampere hours capacity. It is arranged so that automatic connection is made when the batteries are run into the battery container, by means of contact plates, and fuses are provided as a safeguard. The controller is situated at the left side of the driver's seat, so that it is easily manipulated with the left hand. There are three speeds forward and one speed backward. The first notch of the controller gives a speed of five miles per hour; the second notch, eight to 10 miles; the third, 13 to 15 miles. Fifteen miles may be regarded as about the maximum speed which is desired or can be obtained with the hansoms. These speeds are obtained by various groupings of the batteries and motors in series and parallel.

Directly in front of the driver is a lever which controls the steering mechanism, which is extremely ingenious. The steering is accomplished by turning the rear wheels parallel with each other from a point directly over the tread of the wheel. The wheels are connected by rods to a vertical lever of a convenient height to be operated from the front seat of the carriage. In reality the steering mechanism looks like an enormous hollow hub which turns freely, horizontally, upon the vertical rod which supports the body of the carriage. The steering mechanism enables the carriage to be turned completely around in a very short space.

A powerful roller brake adds to the safety with which the carriage can be driven, but one of the things that is remarked by persons who ride for the first time in the horseless carriage is the ease with which it may be stopped. In this respect it compares very favourably with any horse vehicle. From the driver's seat the doors of the cab are also opened and shut and the electric light is turned on or off. An electric bell under the footboard gives warning of the approach of the almost noiseless vehicle, and when used with discretion will add very much to the safety of the carriage.

Each of the carriage lamps has an incandescent lamp, and there is also an incandescent lamp in the cab, so that the passenger can sit and read if he desires. A speaking tube runs from the interior of the cab to the driver's seat, where the mouthpiece is secured by a holder, connection being made with a flexible tube. The attention of the driver of the carriage is attracted by a whistle which is actuated by a rubber bulb in the inside of the cab. This bulb forms the mouthpiece of the speaking tube, a plug being removed when conversation is to be held with the driver.

The motion of the cab is pleasant in the extreme. There is no vibration such as is often found in carriages driven by one of the petroleum products. The ease with which the electric carriage can be started and stopped, the absence of vibration and disagreeable odours, are points in its favour. The batteries afford power sufficient to propel the carriage from 18 to 25 miles on the level, depending upon the state of the road. With a private plant the batteries may be charged at an expense of from 10 to 12 cents. The cost is increased where the electricity must be purchased. It is estimated that the carriage can be run at an expense of about a cent per mile. Riding in a hansom cab of this kind is pleasurable in the extreme. There is nothing whatever to interrupt the view of the passenger.

An Electric Hansom.

The carriage proper was built by the Charles Caffery Company, of Camden, N.J., and the motors were built by the Interior Conduit and Insulation Company, New York City. The carriage was invented by Messrs. Morris and Salom, of Philadelphia, Pa.

SYDNEY ENGINEERING AND ELECTRICAL EXHIBITION.

The exhibitions held in 1883 and 1886 having proved so successful in affording exceptional opportunities for useful and instructive recreation, the Engineering Association of New South Wales, in conjunction with the Electrical Association of New Wales, have decided to hold a similar exhibition during the months of June, July, and August, 1897, and cordially invite the co-operation of manufacturers, engineers, electricians, mechanics, and others interested, in order that it may be carried out with success. In view of the great success attained by the previous exhibitions, and the vast strides that have been made during the past few years in engineering, and more particularly electrical science, it is anticipated, says *The Engineer*, that the proposed exhibition will considerably surpass the previous ones, and prove worthy of the engineering enterprise of the colony. By the courtesy of his worship the Mayor of Sydney and the City Council, the use of the exhibition building, Prince Alfred Park, has been granted free of charge for a period of three months. It is proposed to open the exhibition on June 26th, and for it to remain open during the months of July and August. The exhibition is intended to embrace engineering in all its branches, and the exhibits will consist of raw materials, manufactured articles, machinery and models (in motion and otherwise), drawings and photographs of all kinds relating to scientific, mechanical, and educational works, in classified sections. No charge will be made for space allotted, but the executive committee reserves the right to limit the space of each exhibitor. The object of the exhibition being solely for the advancement of engineering science, and the promotion of a general and practical education therein, it will be non-competitive, but prizes and certificates of merit will be awarded to apprentices and students. Among the various groups we notice —Group IV—prime movers, comprising steam engines, gas, electric, hydraulic, hot air; water-wheels, turbines, wind-mills, steam generators, accessories of engines or boilers, &c.; and Group VI comprises railway, tramway, and vehicular appliances, and embraces rails, switches, signalling apparatus, locomotives, goods wagons, carriages, &c., tramway cars, rails, permanent way brakes, couplings, ticket-checking apparatus, bicycles, tricycles, and auto-cars. Further information may be obtained from Mr. Edward Noyes, 34, Gracechurch Street, London, E.C.

A Motor-Car and Motor Cycling Engineering and Machinery Exhibition is announced to take place at the Royal Agricultural Hall, Islington, from Monday, August 23rd, to Saturday, September 4th, of this year, under the auspices of Messrs. Cordingley and Co., from whom full particulars can be obtained at 39 and 40, Shoe Lane, London, E.C.

DESIGN FOR AN ELECTRICAL OMNIBUS.

(Illustrations Copyright.)

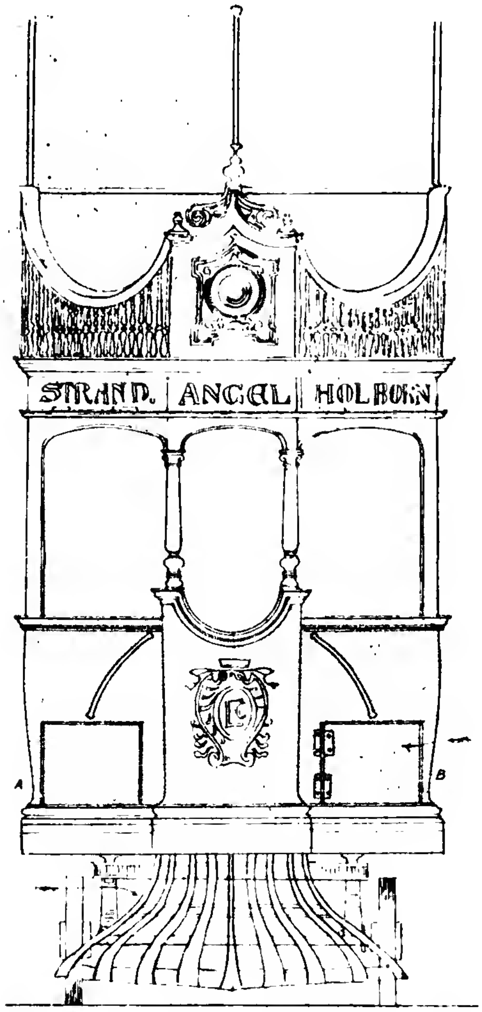
By the HON. A. McGAREL-HOGG and MR. J. T. MURRAY.

THIS design was submitted in a recent competition for an electrical omnibus of artistic design.

The conditions required that the vehicle should appear complete in itself, without any suggestion of horse traction, and be thoroughly expressive of its self-contained power of locomotion. How well these terms have been complied with is at once apparent on reference to the design, which also shows that the structure does not present any special difficulties over the ordinary construction of a modern omnibus, the points specially aimed at being adaptability to the purpose required and general attractiveness.

Several entirely original features are embodied, such as the destination indicator in the front, in the bus illustrated the "Elephant and Castle," and the road indicator at the back, and by including the driver's car in the main design space is gained for luggage above, while by combining the front and rear platforms with the main passenger portion the whole structure is given the appearance of a self-contained car independent of animal traction.

Structurally the car is held together longitudinally by a lower and upper frame, the lower one being immediately above the under carriage, and the upper one constituting the roof. These frames are connected together by slightly curved posts, five along the main structure, and one on the driver's platform, an intermediate upright subdividing the central subdivision on either side. The frames and posts are of hard wood, braced and strengthened where required by iron straps. The lower sides of the car may be of thin wood or canvas, the floor and roof being of 4½-inch ploughed and tongued boarding. The outer roof covering is of canvas stretched on steel ribs, supported at intervals by adjustable struts. The car is ventilated throughout by ordinary hit-and-miss ventilators arranged



behind the frieze, and lighting is effected by means of two circular roof lamps, one on either side, a large circular lamp being provided in the front above the driver, and a smaller one at the end of the car above the conductor. The destination and road indicators are placed as shown in the drawings, and we understand that the latter device forms the subject matter of a patent by the designers.

While due provision has been made for ample strength in every detail, the design is light and neat in appearance, and its authors are to be congratulated upon having so successfully complied with the requirements of the competition.

MOTOR VEHICLES FOR ROADS.*

By W. Worby Beaumont, M. Inst. C.E., M. Inst. Mech. E.

So much has been said and written concerning mechanical road-vehicles,† their motors and gear, that I cannot avoid some repetition in dealing with the subject again, especially as there is not yet much to be said concerning the recent and pending advances. It is unnecessary now to occupy space on the history generally, and I will only refer to those vehicles which, though made 60 years ago, are of interest now as still affording some indications of what may be usefully done to-day. At the time (1831) when the Select Committee of the House of Commons was appointed to inquire into and report upon the tolls and prospects of land carriage by means of wheeled vehicles propelled by steam and gas upon common roads, there were numerous coaches and other steam vehicles which had achieved a considerable degree of practical success, and would have been of great commercial value had not powerful influences been brought to bear against their adoption, or acted so as to render their use less necessary. Between the years 1824 and 1831 so much had been done to prove the possible value to the community at large of steam vehicles on common roads, that not only was the powerful organised opposition of various interests and of the ignorant classes directed against the steam carriage, but the rapidly-growing importance of the railroads caused every other method of mechanical transit to sink into comparative insignificance. The opposition which was successful as against mechanical vehicles running on the common high roads, public property, was impotent as against the locomotive running on rails and on land the property of the railway company. The one could be subject to the vexatious interference of everybody, and to extortionate demands for tolls, while the other was protected by being on its own ground; hence the arguments levelled against the road carriage as to the ill effects which would result from the displacement of a large part of the 2,000,000 of horses then in use for transport uses, were powerless against the railway locomotive running under statutory powers. The steam coach, therefore, which had reached a high state of development between the years 1825 and 1832, came at an unfortunate time, and died of inanition. By the year 1830, however, England had acquired the right for ever to the credit of originating the greatest blessing man ever conferred on man, namely, the means of locomotion on high roads and railroads by mechanical power.

We may glance at the results of the work of Gurney, Hancock, Dance, Summers, Ogle, Church, and others, with a view to extracting therefrom some useful hints after the lapse of 65 years.

Goldsworthy, Gurney, and Walter Hancock were, amongst those who achieved success, perhaps the best known, but Maceroni and Squire, Summers and Ogle, and Hill, must also receive credit for very successful construction and working, while Sir Charles Dance, Church, and others should not be forgotten. When we remember the difficulties as to materials and as to machine tools, and as to the complete absence of precedent under which those men worked, our admiration of the great things they did is much increased.

Hancock made a number of coaches, including the "Autopsy," the "Enterprise," the "Era," and others, all of which were fitted with powerful engines and a remarkable high type of boiler, working at a very high pressure, and containing points of great interest to us at this day. It is, moreover, quite probable that his method of constructing wood wheels will yet be found worthy of imitation. The "Automaton," for instance

* Two papers, one read on the 27th ultimo, before the Manchester Association of Engineers, and one on the 29th ultimo, before the Cleveland Institute of Engineers, the two papers being here combined.

† See The Automotor and Horseless Vehicle Journal, December, 1896, and February, 1897, Cantor Lectures, *Society of Arts Journal*, 2nd, 9th, and 16th December, 1895, and 27th November, 1896. Also Lectures to Liverpool Chamber of Commerce, 9th September, 1896, to Self-Propelled Traffic Association, 19th January, 1897.

(Fig. 1), was constructed to carry 10 or 11 passengers and conductor and driver on seats in the front part of the vehicle in char-a-banc fashion; the rear part of the vehicle carried the engine and boiler, and contained between them a place for some inside seats. The engine was vertical, placed nearly midway in the length of the vehicle, and it had two cylinders of 9 inches diameter and 12-inch stroke, and with a crank shaft which was which would be adopted to-day if gearing of any kind, or a chain such as Hancock used, were employed.

The boiler which Hancock invented, and with which he was very successful (Fig. 2), provided steam for his engines ordinarily at a pressure of from 60 lbs. to 100 lbs. on the square inch, with an ordinary safety valve load of 70 lbs., but he had used pressures as high as 400 lbs. The boiler consisted of 10

Fig. 1.– Hancock's Steam Carriage "Automaton" (1827).

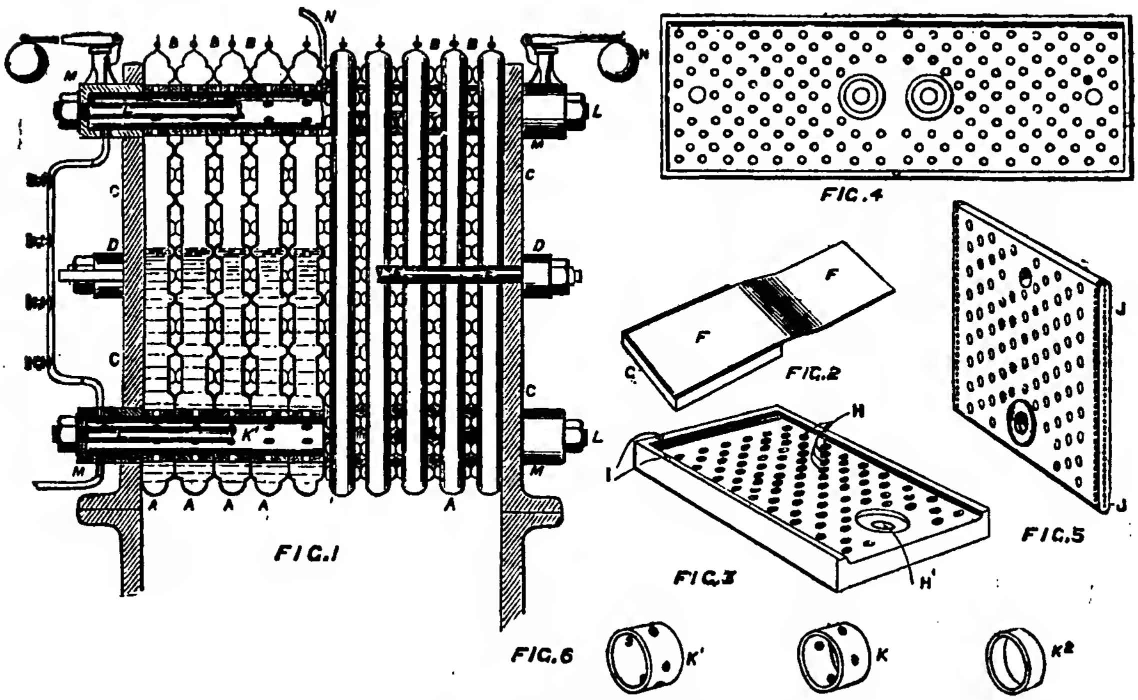


Fig. 2.—Hancock's Boiler (Group Fig. 2).

geared to the driving axle by means of a stout common chain, running on grooved and pocketed chain wheels 10 inches in diameter. The coach in working order weighed about 3½ tons, and the driving-wheels were 4 feet diameter. Running at 10 miles an hour the engines would thus make only about 70 revolutions a minute, and hence the necessity for the large dimensions of the engines as compared with the dimensions chambers, each about 30 inches by about 20 inches and 2 inches in thickness, made of charcoal plate ⅛-inch thick. The sides of these chambers were embossed all over, so that when the chambers were assembled the bosses met and acted in the place of stays to prevent the distortion of the chambers under pressure, and at the same time leaving ample space for the passage of the products of combustion between them. The heating surface in one of these boilers was about 100 square feet and the grate surface 6 square feet. That is about 3 square feet of heating surface, and 0·3 square feet of grate surface per horse-power, taking an average pressure of 35 lbs. per square inch in the cylinder. The chambers were riveted together at the vertical edges and the top, each chamber being formed of a single plate bent up in the middle, the bend forming the bottom edge without a seam. Towards the top and bottom of each chamber holes about 3 inches in diameter were made in the

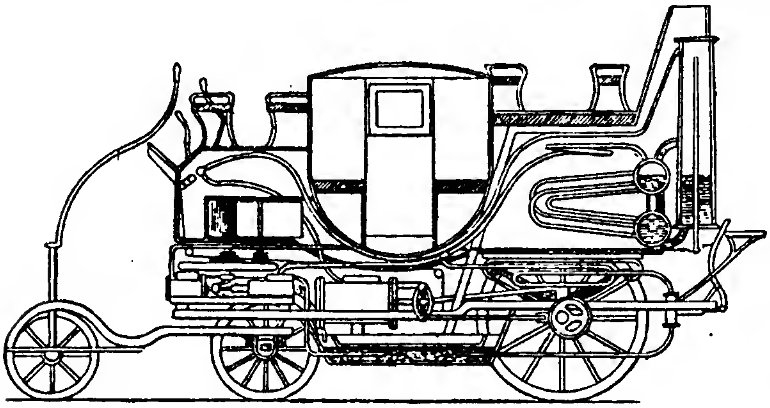


Fig. 3.—Gurney's Steam Carriage (1825–8).

chamber sides, and gunmetal rings acting as distant pieces were placed within the chambers at the bottom, and narrower rings within and between the chambers at the top. Through all these rings and through strong side plates, and small end chambers carrying the safety-valves and for the attachment of fittings, were passed strong bolts, by which the whole structure was firmly held together, the collars forming chambers, the lower one for the receipt of the feed-water, and the upper one acting as a steam chamber; the boiler so constituted was kept from half to two-thirds full of water, and only on one occasion did the boiler ever show any weakness, and even then, although one of the plates split, nothing more happened than the mere stoppage of the engines. Besides the two bolts mentioned for holding the

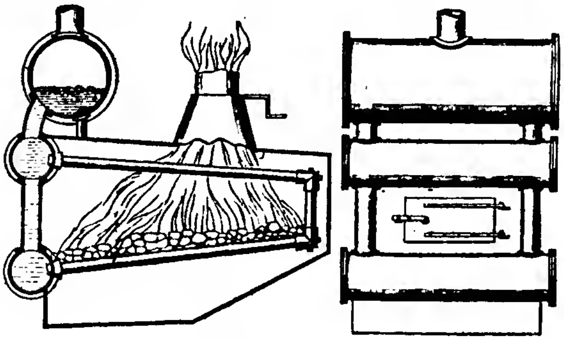


Fig. 4.—Gurney's Boiler.

boiler together, two others passing through the ends of strong bars at the centre of the end plates were used. One of the coaches in which this boiler was used, used to run an 8-mile stage, and from 7 cwt. to 8 cwt. of water, or, say 115 lbs. per mile, were used; at the same time about 2 bushels, or 80 lbs. of coke, were used, hence making an allowance for the full fire at starting the boiler evaporated at least 10 lbs. of water per pound of coke burning, say, a total of 11½ lbs. per mile. I think, therefore, I am justified in again referring to Hancock's boiler as one which is not without suggestive value.*

* For further particulars as to Hancock's boiler, wheels, and coaches, see the Author's Cantor Lectures, *Society of Arts Journal*, 1896.

Gurney's coaches and tractors have been referred to on many occasions, but I would draw particular attention to Gurney's boiler and to some figures concerning it, to which attention has not been drawn. The coach (Fig. 3), unlike Hancock's, was driven by a pair of horizontal engines, and the road wheels were 5 feet in diameter; the driving axle was the crank shaft of the engines; the crank shafts in the different coaches were the cause of considerable trouble, trouble which was avoided by Hancock by using a straight axle and a driving chain. So many of Gurney's coaches were made and used by himself, Sir Charles Dance, and others on different roads, that a short description of the arrangement of the machinery may be given.

The engines were of what was then known as 12 nominal steam horse-power, with cylinders 9 inches diameter, 18-inch stroke, and about ¾ inch in thickness; they were at first made of gunmetal, but cast iron was found to be best; cut-off took place at about half stroke; being direct coupled the engines were, of course, slow-speed engines; forced blast was used as it was by Hancock, Hill, and others, but Gurney's fan was on a vertical spindle driven by the little vertical crank shaft of a little engine on the fore carriage, which also worked two feed-pumps; the exhaust steam from the engines passed into and from a tray-formed tank under the coach by means of which the water was heated on its way to the boiler, the feed-pipe being taken into the uptake space and heated on its way to the delivery into one of the steam receivers of the boiler. The exhaust steam finally passed into the uptake and escaped highly superheated into the atmosphere through one of four chimneys. The boiler shown in Fig. 3 is of the kind which Gurney made when he fitted them with vertical separators, two of which were used as steam chests in which the water from the steam was deposited and found its way back to the lower water trunk of the boiler; steam was taken from the top of these receivers by a pipe which passed along under the coach body to a point below the driver's seat, whereat was situated a regulating cock and lever. Subsequently Gurney gave up the use of these vertical receivers and used an upper horizontal receiver (Fig. 4*). This boiler was

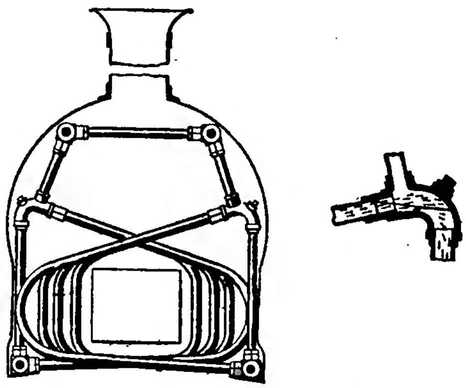


Fig. 5.—Dance's Boiler (1831).

remarkably successful, but I have not been able to find the amount of heating surface it contained; at first a great deal of trouble was experienced by the splitting of the tubes, but afterwards tubes with lap welds were obtained and little further trouble was met with. The boilers were tested to 800 lbs., and worked at from 70 lbs. to 120 lbs. With 70 lbs. Gurney estimated that he got 20 lbs. per square inch in the cylinders, presumably meaning an average pressure with cut-off at half-stroke. Various sizes of tubes were tried, and tubes 1 inch internal diameter were preferred. With a coach weighing

* Cantor Lectures.

about 3½ tons ready for the road, about 10 gallons of water were used per mile and about 20 lbs. of coke, a consumption which, though only approximate, seems very high, for it gives an evaporation of only about 5 lbs. per lb. of fuel; and the water consumption, as far as can be gathered from Gurney's statements before the Select Committee in 1831, would seem to have reached as much as from five to seven gallons per horse-power hour, or from 50 to 70 lbs. This is assuming the horse-power to be 20, but if we take only the average pressure of 20 lbs. in the cylinders, and the speed of slightly over 11 miles per hour, giving 60 revolutions of the crank per minute, the estimated indicated horse-power would be only 14.

Fig. 6.—Summers and Ogle's Boiler.

Fig. 7.—Maceroni and Squire's Boiler.

Gurney's estimate of 20 lbs. is, however, probably far below the mark, for even assuming that the 70 lbs. steam fell 20 lbs., on the square inch on its way to the steam chest, the average pressure throughout the stroke was probably much nearer 40 lbs. than 20 lbs. In any case, however, it would appear that Gurney's tubular boiler was not as efficient as Hancock's thin, flat chamber boiler, and this is borne out by the fact that Sir Charles Dance, who had several of Gurney's coaches, found it desirable to improve the boiler, and he invented and patented certain modifications which he embodied in the boiler known under his name (Fig. 5). Gurney had about five years' experience of the running of his coaches and tractor vehicles, and

Fig. 8.—Maceroni and Squire's Coach.

he concluded by experience that a piston-speed of 220 feet per minute was as high as it was desirable to use, and this affords a further check on what was the maximum horse-power of his engines. With regard to the weight of his coaches and tractors, he used to reckon each 10 cwt. of vehicle and its machinery as equivalent to one horse of the four horses usually used on an 18-passenger coach. It is noteworthy that in his experience, as well as in that of Hancock, one driving wheel was found sufficient for all ordinary running. One of Gurney's tractor vehicles was sent down to Cyfarthfa, where Mr. W. Crawshay fitted it with cast-iron flanged wheels early in 1830, and ran it on a piece of railroad three miles in length, when it hauled 16½ times its own weight. Dance's boiler (Fig. 5) was an interesting form of tubular boiler in which the fire was completely surrounded except at part of the ends by tubes which formed grate bars, water-heating tubes, and steam tubes, but we do not find much evidence as to the performance of this boiler, for it was only finished a few months or a year before the coaches ceased running.

Another boiler of considerable interest is that of Maceroni and Squire, which was a tubular boiler and a modification of Summers and Ogle's combined water and smoke-tube boiler. These are shown by Figs. 6 and 7. Maceroni and Squire ran their coach about 1,700 miles almost without repair, and the cost of coke was only from 3*d.* to 4*d.* per mile, which, as was the case with Gurney and Hancock, was only a fraction of the cost of the food of the four horses otherwise used, including the spare horses

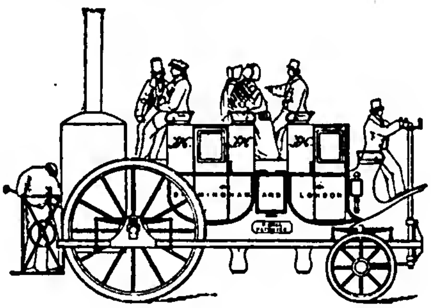


Fig. 9.—Hill's Coach.

which were necessary. The engine used was a double-cylinder horizontal, mounted on the perch pole, and with cylinders 7½ inches diameter and 15¾ inches stroke. Fig. 8 shows Maceroni and Squire's coach. Summers and Ogle's coach weighed three tons in running order. The boiler shown by Fig. 7 had 250 square feet of heating surface, and about 6 feet of grate surface; it weighed about 8 cwt., and consisted of vertical water-tubes, through which the smoke-tubes passed, these tubes being fitted and fixed in horizontal top and bottom cross-tubes of rectangular external section and circular internal section, and apparently made of cast iron.

The boiler was 3 feet 8 inches in height by 3 feet by 2 feet 4 inches, and was worked at a pressure of 250 lbs. It supplied

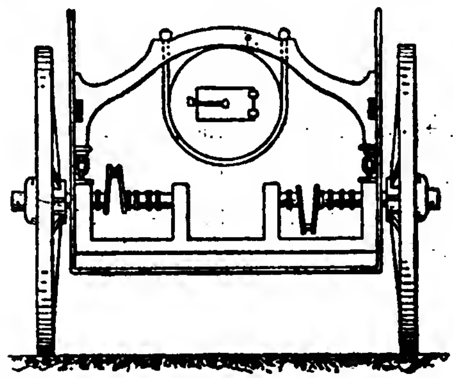


Fig. 10.—James's Carriage.

a double-cylinder engine, the cylinders being 7½ inches diameter and 18 inches stroke, coupled direct to a crank driving axle, the driving wheels being 5 feet in diameter. The engine was stated before the Select Committee to be of 20 horse-power, and this, with the statement as to fuel and water used, gives an evaporation of 7 lbs. of water per lb. of coke, and about 56 lbs. of steam per horse-power per hour, running the coach at an average speed of ten miles, with from a ton to a ton and a half of passengers.

Hill's coach (Fig. 9) differed considerably in general design from those previously mentioned, the under frame being more

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like that adopted in railway work, including the springs and horn-plates used for the main bearings of the crank-shaft, which was worked by a double-cylinder vertical engine; both wheels were drivers, and the crank-shaft was apparently in two parts, connected by what is now known as a compensating motion, this being the first instance of its use. The boiler, as

FIGS. 11 and 12.—Church's Boilers.

seen, was a vertical boiler, which was adopted by Hill after previous experience with his partner, Burstall, who in 1824 designed and patented an arrangement of steam coach in which an instantaneous steam generation boiler was employed, and in which all four of the wheels were driven.

An arrangement of coach with two double-cylinder engines actuating independent crank shafts, one to each driver, and

FIG. 13.—Church's Steam Carriage.

a well thought out arrangement of spring suspension was patented by W. H. James (Fig. 10) in 1824, this being the first suggestion of the use of independent engines for each driving wheel, making compensating gear unnecessary.

I will only refer to one more illustration of the ingenuity and practical character of the designs of many of the inventors of 60 years ago, namely, the water and smoke tube boilers of Church (Figs. 11 and 12). One of these (Fig. 11) is, it will be seen, a combination of vertical boiler with smoke tubes and horizontal shell boiler with completely water-cased firebox, and with a water bridge or a row of vertical stop-ended tubes forming a bridge. The air for combustion was supplied by a fan below the large grate. Fig. 12 shows the arrangement of the same boiler converted into a water-tube boiler. Dr. Church's coach, or one of his designs, is shown by Fig. 13. These are only a few examples of the designs of coaches, boilers, and motors made, and many of them used at a time when the country was not ready for them, and it will have been seen that in many points the boilers and other details were forerunners, very closely followed by things of very recent date. Reference may be made to the high steam pressures used by some of these men, and it is much to be regretted that the courage and ability with which these high pressures were provided for and used were discredited by the adverse opinions of some of those who were supposed to be more scientifically informed than those who used them.

On many questions connected with steam engineering matters, no circumstance has done more to prevent the attainment of highly desirable achievements and knowledge than the possession of knowledge by contemporary educated men. With regard to high pressures, and the immense value thermodynamically, this has been particularly the case down to within very recent times.

The records of the doings of the men of 65 years ago are in many respects imperfect, but enough remains in the chronicle of their times to constitute monuments to their ingenuity, and to make the Patent Office publications extremely interesting with respect to mechanical invention and development. The periodical literature may also be consulted with much profit as to the bearings of invention and design of many things of recent date.

The great movement which these men had originated having, for many reasons beyond their power, proved commercially unsuccessful steam traction on common roads ceased to occupy anyone seriously. From time to time after about 1835, attempts were made to produce a steam vehicle of one kind or another, but a very few years was sufficient to cause men to forget or to ignore the teaching of the work of Hancock, Gurney, and others. With a few exceptions, from 1840 to 1895 the steam road-vehicles which occasionally appeared were of the heavier kinds, more of the nature of a self-moving engine or of traction-engines; steam cart-horses in fact, when compared with the steam carriages of 1832. Latterly, the English laws, passed chiefly in the interests, contradictory as it may seem, of slow speed traction-engine makers, and of the public opposed to anything mechanical on the roads, were absolutely prohibitive of development in any direction, and they have enabled our foreign competitors to enter upon and make considerable strides towards the occupation of an industrial field which, by virtue of British ingenuity, should have been an important one in the United Kingdom.

The interregnum was relieved from complete stagnation by road steamers, such as those made by Ricketts, of Stafford (Fig. 14) for the Earl of Caithness and for the Marquis of Stafford, road steamers which weighed about 30 cwt., and only carried three or four persons, in very considerable discomfort, and a stoker. The steamer made for the Marquis of Stafford in 1858 had a locomotive form of boiler supplying steam to a horizontal engine, on one end of the crank-shaft of which was a pitch chain pinion, by means of which, at a ratio of 1 to $2\frac{1}{2}$ the 3 feet driving-wheels were driven. The road steamer made by Ricketts for the Earl of Caithness was very similar to that of the Marquis of Stafford, but the engine drove the main axle by gearing instead of by chain, and it weighed 50 cwt. A road steamer was made in 1861 by Messrs. Carrett and Marshall, and like those of Rickett ran on three wheels; it carried seven or eight passengers and a stoker, but as it weighed over six tons it is not of very great interest now, although it, known as the "Fly-by-Night," acquired a very high degree of notoriety.

In 1845 R. W. Thompson invented and patented (No. 10,990) the pneumatic tyre for wheels, and he called them his aerial wheels. His pneumatic tyre consisted of an outer cover which he made of leather, and of an inner tube which he made of indiarubber and canvas. His outer cover was held on by bolts passing through the leather and the felloes and tyres of the wheels, but of course he was not confined to that method of holding, and I believe he attached the leather cover by other modes than those shown in his patent specification. Thompson experimented with these tyres, but being born long before the days of cycles his experiments were made with tyres of very large size, and on very heavy wheels. A trial on a brougham showed that they might be run 1,200 miles without much or very serious wear. Experiments were also made to ascertain the difference of the draught of a vehicle with aerial wheels and those with ordinary tyres. The result was a saving of over 60 per cent., it was stated, on ordinary roads, and a gain of 300 per cent. on newly-metalled roads. Experience, however, did not encourage Thompson, and many years later he departed from his promising aerial tyre, and was the cause of the infusion of new life into road steamer construction through the introduction, in 1871, of solid indiarubber tyres. The road steamers were,

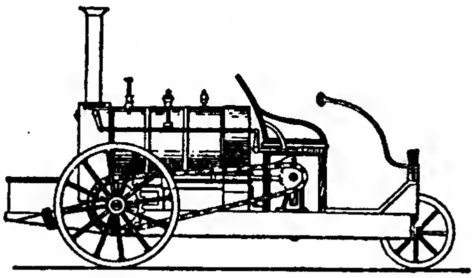

FIG. 14.—The Marquis of Stafford's Steam Carriage (1858, Rickett).

however, of the heavy kind, that is to say they were vehicles carrying a heavy vertical shell boiler of the Field type, with small heating surface, and, therefore, small horse-power per unit of weight. One of these road steamers is shown by Fig. 15. Others were made with the horizontal or ordinary locomotive type of boiler, but the cost of the tyres, which were put loose upon the wheels, was so great, and the wear and tear so heavy, even when shod with a form of linked iron tyre, that the system was ultimately abandoned; a set of three tyres for the Ravée costing £241, the tyres being 5 inches in thickness and 10 inches in width. Mr. R. E. Crompton attached these encircling linked tyres in various ways by wires, one of them resembling that of the wire used for holding pneumatic tyre covers. Somewhat similar tyres are, however, now used, but the interior part is made of harder rubber, and this is vulcanised on to the rim of the wheel. In this way Messrs. Burrell have overcome the difficulty which attended the rolling out and breakage of these massive solid rubber rings. About the same time, and a little later, numerous forms of spring wheels with steel and with rubber springs and buffers were invented and tried, but none of them have withstood the test of prolonged experience.

As we now know, the pneumatic tyre provides, above all others yet known, the most perfect form of spring wheel; for there is in it the minimum quantity of imperfectly elastic material, namely, indiarubber, with a maximum quantity of a perfectly elastic material, *i.e.*, air; while the rubber is so used that the amount of working it receives, tending, as in a rubber-kneading machine, to convert it into a soft, gluey material, is comparatively small. There is, however, a point beyond which it is not at present advisable to load pneumatic tyres, and a problem of some interest on this subject remains to be solved: Up to a given and somewhat limited load, the necessary thickness and weight of the rubber-canvas envelope of the circular air spring column does not injuriously interfere with the elastic action of the air spring, or with the functions of the rubber envelope as an equalising pad neutralising or equalising the inequalities of a stony, pebbly road. Beyond that limit, however, the strength and thickness of the envelope begins to approach the dimensions of a mere rubber cushion and canvas tyre, and although increase in the diameter of the tyre increases, in the ratio of the square of the diameter, the quantity of the perfectly elastic material, the strength of the envelope must be increased in direct proportion to the increase in diameter. Thus, with large diameters for large weights, the pneumatic tyre, as at present made, becomes a heavy and costly tyre as compared with that for light loads.

Numerous road steamers about this time, and down to 1876, were made by Mr. A. F. Yarrow, the well-known torpedo-boat builder, Mr. H. P. Holt, Messrs. Tangye Bros., Mr. A. Paterson, Mr. H. A. Mackenzie, Loftus Perkins, J. G. Inshaw,

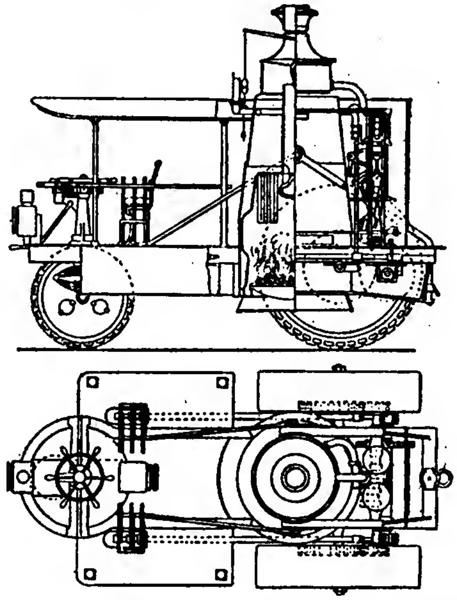

FIG. 15.—Thomson's Road Steamer "Ravee" (1871).

J. W. Bolton, Leonard Todd, and others, for particulars of which I must refer to my Cantor Lectures, already mentioned. In all these, with the exception of Perkins, who used a Perkins' tubular boiler and a pressure of 450 lbs., the boiler was of the heavy, large water space kind. One of the most original of these was that of Mr. Holt made in 1866–7, in which the two driving wheels were independently driven by two little double-cylinder engines, the crank-shafts of which were connected by pitch chain to the driving wheels, the engines running independently, as was partly suggested 42 years previously by James. Mr. Holt used a higher type of boiler than the other designers I have mentioned. It was a fire-engine boiler with Field tubes, and there were several points of mechanical interest in his carriage; the exhaust from the engines passed into a cast-iron box, which formed a baffle-plate at the bottom of the uptake. From this, highly superheated, it issued almost noiselessly, and generally invisibly, from five jets. A similar device for this purpose was used by Mr. Mackenzie in his steam brougham. The Perkins road steamer was a one-wheel steam-horse or tractor, the one wheel being fitted with a Thompson rubber tyre and steel chain-link tyre outside it. The boiler was carried immediately over the driving wheel, which was 25 inches in diameter, and 12 inches wide, and it only occupied a space of 26 inches in height, 15⅝ inches wide, and 20⅜ inches long; on one side of the boiler was carried a water tank, and on the other, a little high-speed engine connected by bevelled gearing to the road wheel. The average steam pressure used in the engine was 250 lbs. during experiments which Perkins made with a light van, which with load weighed 57 cwt. The steam from the engine was passed by a pipe to a condenser with a water tank under the vehicle it hauled, the speed was only three miles an hour, but the system was, of course, applicable to larger powers and higher speeds; the weight of the steam-horse was 32 cwt., so that it only hauled about double its own weight, but if arranged to receive more of the weight of the vehicle hauled, and if carried on two wheels instead of one, this proportion might be considerably improved.

During the period which I have just been dealing with, the traction-engine and the self-moving and agricultural-engine and road locomotive made great strides in the hands of Messrs. Garrett, Aveling, Burrell and Sons, Fowlers, G. and H. McLaren, Ransomes, and others, and there can be no doubt that with the traction-engine and road-locomotive builders rests a good deal of the future of the steam road vehicle for the heavier work. They have, during many years, acquired immensely valuable stores of practical information concerning the design, form, and behaviour of materials as used in road-engines for all kinds of heavy work, and, however much we may in future change the character and reduce the weight of the boilers used, and however much we may increase pressures and engine speeds and decrease engine dimensions, this information, with ability to apply it, will be required. Whatever the other changes made in future may be, the actual net power required to move a ton of vehicle and load will remain the same. There is no doubt, however, that the difference between the work done by the engine and that given off at the periphery of the road wheels will be tremendously lessened, in other words, the efficiency of the transmission between crank shaft and road wheel will have to be enormously increased. The masses of heavy cog-wheels and heavy shafts and large bearings, the one high qualification of which is that they cannot be broken, will have to give place to gearing of much higher efficiency. In some cases chain gear will be in many respects preferable to any other, and in a few cases engines directly coupled to the main shaft will be used. On the other hand, for that road traffic which requires the employment of trains of loaded vehicles only comparatively small modifications or departures from existing road locomotive practice, or from the double chain traction-engine made by Burrell's nearly 30 years ago, will be required. Considering the requirements of high-class traffic on the roads in days to come, and the facilities which the Light Railways Act should afford for that class of heavy traffic which requires trains to carry it, it is questionable whether it will be policy to allow the ordinary roads to be permanently used for it. It is unnecessary here to describe the main features of these traction-engines or their bearing on future motor vehicles, but the value of the experience acquired by their use must not on the one hand be neglected, and on the other must not be allowed to misguide us with regard to what is really necessary as to weight and strength for things which are not heavy traction-engines, with heavy boilers and heavy gear, and the roughest of usage.

Turning now from this digression to the new-born interest of the past three years in motor vehicles, an interest which has been the means of freeing British engineers from legal restrictions which made any development impossible in this country, we come to the era of the light high-speed motors and of vehicles propelled by a motor, which is one of very recent times, *i.e.*, the oil and mineral-spirit motor. Untrammelled by oppressive enactments, our neighbours across the channel have been free to take advantage not only of the development of this motor, but also to experiment with the steam engine for passenger carriage purposes. It remains yet to be seen to what extent this new era motor can be successfully applied to the heavier classes of vehicles, but there can be no doubt of its practical sufficiency for vehicles of the lighter kinds.

Each year since and including 1894 our French neighbours have organised races of mechanical road vehicles propelled by steam, mineral spirit, and electricity, and encouragement was given to makers by the proprietors of the *Petit Journal*, who offered prizes of considerable value for the best and fastest motor vehicles of numerous kinds, including motor-cycles. Races were run in 1894, 1895, and 1896, the race of September last being from Paris to Marseilles and back, a total distance of 1,070 miles. The main features of this race, and the extremely adverse conditions under which a greater part of it was run, are generally very well known, and the fact that 13 vehicles accomplished this race of 1,070 miles, the best of them at an average speed for the whole distance of 16 miles per hour, shows that, notwithstanding the slight repairs which were necessary in some cases, these vehicles have reached a considerable state of efficiency. In this race none of the steam carriages were amongst those which were successful, although in 1894 and 1895 the De Dion and Bouton and the Serpollet carriages were amongst the winners.

Again, in a race last January between Marseilles and Monte Carlo, a distance of 144 miles, the race was won by two of De Dion and Bouton's tractor vehicles, hauling landaus or wagonettes. The road is very hilly, but an average speed of 18·7 miles an hour was maintained during the whole run, which was performed in three sections. There were 37 starters, including nine motor-cycles. Most of the motor-carriages were constructed by MM. Panhard and Levassor, and by MM. Peugeot Frères, and were propelled by mineral-spirit motors. Only half the starters went through the race, the circumstances of which were not favourable to the comparatively small power of the petroleum-spirit motors, although several of these were fitted with more powerful motors—namely, 6 to 7 horse-power —than the makers usually employ. The steam tractors were heavy vehicles, and succeeded because they did not meet with any of the mishaps which had troubled them in 1895 and 1896. Their victory, however, does not necessarily point to the general applicability of the system for carriages, for which minimum weight with maximum seating capacity is the most essential quality. The winning of the race was, moreover, only a question of a quarter of an hour and upwards as against several of the lighter and far more convenient spirit motor-carriages.

Doubt may be expressed with regard to the utility of these races as means of ascertaining the working qualities and durability of any motor-carriages. The use of unusually powerful motors on vehicles of given seat capacity detracts from the value of these races as indications of the sufficiency, in ordinary hands, of carriages with lesser powers; on the other hand, they prove that with the power used high speeds can be maintained under conditions much more severe than those of ordinary running, and that, in fact, machinery and gear which, according to English notions is deficient in strength, has been sufficient to pass through a very heavy ordeal.

It may, therefore, be fairly concluded that for those users who would be satisfied with a lower power than that necessary to maintain a speed of 18·7 miles an hour on a hilly road, smaller motors might very well be employed, especially if a slow or reasonable hill speed were deemed sufficient. It cannot be too often repeated that well-constructed motor-carriages can be driven on good ordinary roads with very small power, and in a general way it is not until the carriages have to be lifted up hill that the demand for considerable power arises. A little consideration will show how much greater this power is than is usually supposed, and how much more advisable it is for many reasons that a moderate hill-climbing speed should be adopted.

A few figures, by way of example, may be given. Taking a vehicle which, when fully loaded, weighs, say, 2½ tons, the power required on a good level road would be about 2·5 horse-power for a speed of eight miles an hour, or of about 3·75 horse-power for a speed of 12 miles an hour. To mount a hill, some parts of which may be on a gradient of 1 in 20, the 2·5 horse-power rises to 10·5 horse-power, but if a speed of three miles per hour were deemed sufficient for climbing the gradient of 1 in 20, only about four horse-power would be required. Now, for dealing with bad roads these quantities ought to be doubled, so that to take 2½ tons of vehicle and load up a gradient of 1 in 20, at the rate of eight miles, would require about 20 horse-power, whereas if a reasonable speed for the hill climbing were adopted only about eight horse-power would be wanted. This, of course, means that some form of speed reducing gear for hills must be employed, but this may be of a simple kind, and it would secure lessened first cost of motor, lessened cost of working, smaller weight, better arrangement, and more room for the machinery, and if a steam motor be employed a lessened weight of boiler and of condenser, and practical possibility of producing a vehicle of moderate weight instead of the prohibitive weight which high speed hill climbing means.

Among the vehicles which first attracted attention in Paris were the steam vehicles of Le Blant, Serpollet, Scotte, Bollée, and De Dion and Bouton. The Serpollet and the Dion and Bouton with, on one occasion, the Scotte, have been most prominently before the public during the recent racing periods. The carriage of M. Serpollet (Fig. 16) is distinguished from all others by the form of instantaneous generator boiler which is known by his name. There is nothing new in the instantaneous generation of steam, but M. Serpollet, as is now very generally known, adopted a peculiar form of tube and numerous devices connected with it, so that the manipulation by the driver of the vehicle becomes very simple. As at first made the tubes were flat and with only a capillary passage in them, but at the present time the tube instead of being flat is crescent form in section, seen at G (Fig. 16), and the passage is from $\frac{1}{16}$ inch to $\frac{3}{16}$ inch in thickness or width, and about 2 inches in length. There is no water space in the boiler, and steam is only generated when the engine is running and driving a pump which sends water into the heated tubes stroke for stroke of the engine. Formerly the tubes, which were placed within a casing over a coke fire of considerable size, were cast into a cast-iron covering, but now the tubes are made of thicker section and the cast-iron covering dispensed with. A hand-pump is employed for injecting by two or three strokes enough water into the boiler tubes for starting the engine, and a by-pass is provided by means of which some of the water pumped by the engine returns from the bottom row or rows of tubes to

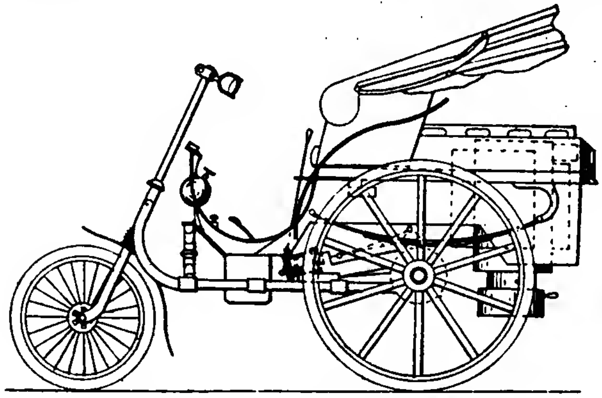

Fig. 17.—Serpollet Steam Carriage (Latest Type).

the feed tank, when the engine has only light work to perform. An advantage of the system is that the user has no concern respecting the water level in the boiler, and experience seems to show that with clean water no trouble arises from incrustation in these very narrow tubes, and this is the experience not only of French users, but of Mr. J. Brown, of Belfast, who has been running one for a considerable time. The occasional high temperature of the tubes with no water or steam in them, and the scouring rush of the steam when formed by the introduction of the small spirts of water, appear to keep these tiny passages open. In a more recent carriage (Fig. 17), which originally appeared in this Journal in January, M. Serpollet has modified his generator to some extent, and is using a petroleum burner (Fig. 18), known as the Longuemar burner. In it ordinary lamp oil is supplied under pressure at *A* to the coil *B*, and after circulating through it passes away as oil gas at *C*, down the pipe *D* into the central chamber of the burner, which is closed by means of a valve on the end of a rod, *E*, actuated by some form of lever *F*. From the central chamber the gas can, when the valve *E* is opened, pass to the burners *G G G*. It also passes to two burners

Fig. 17.—Serpollet Steam Carriage (Latest Type).

Fig. 18.—Longuemar Burner.

at the ends of arms at right angles to the arms carrying the burners *G*, and shown by dotted lines, but as it enters these from the lower chamber below the valve, these burners are not extinguished when the three first mentioned are: thus, when it becomes necessary to stop the engine three-fifths of the power of this powerful burner is shut off, and two-fifths remain to keep the boiler warm and to act as pilot lights for the other burners when full steam is again required, and the lever *F* moves the valve *E*. The position of this burner under the carriage is shown in Fig. 17. In the first-mentioned Serpollet carriage,* shown in section, a coke fire is used, fed automatically by the descent of the coke which is in the bunker between the boiler G and the water tank E, and it will be observed that with large or small fire the tubes were subject to its heat almost as much when the carriage was standing as when it was running. The petroleum burned is thus a great improvement. In the same carriage it will be seen that a small double cylinder horizontal engine was used, the pistons of which were 2½-inch diameter with 2¼-inch stroke, and which were connected to two cranks in the usual way on a crank shaft, which by means of one pinion actuates a second motion shaft by a spur wheel on a hollow shaft, one end of which carries the outer ring of a neat form of spur wheel compensating motion. On the ends of this second motion shaft are pinions having 10 teeth gearing into pitch chains, by which the road wheels are driven. In the newer vehicles (three-wheeled) the engines have inclined cylinders and give motion to the driving wheels by means of spur gearing of about five to one. The pinions on the ends of the crank-shafts gearing direct with wheels on the drivers. In both carriages the steam passes into the space above the top tubes of the boiler, and from it into a downward chimney or escape pipe in a superheated condition, so that it is generally imperceptible. I have said that much concerning the Serpollet system, because whether precisely in accordance with the designs of M. Serpollet or not, there appears to be good reason for belief that the instantaneous steam generator, or an analogous generator, may for the smaller vehicles, at least, be an important element in the future success of steam carriages. Of the engine used by M. Serpollet, it is not necessary to say more.

The Count de Dion and M. Bouton have been very energetic and persevering in their attempts to make a successful steam carriage. At present they have achieved most success with the steam tractor already mentioned in connection with the Monte Carlo and Marseilles race. The boiler used in these tractors is of the water-chamber and tubular class (Fig. 19), with what might be called a central pot. This form was adopted after trials with the form which was illustrated in the author's Cantor Lectures. It consists of a circular water casing, made up of the outer shell and cylindrical fire-box; in the centre of the fire-box space, about a foot from the bars, and extending about 9 inches above the top of the boiler shell, is a central chamber or pot, the upper part of which forms a steam dome. This central chamber and the outer water shell are connected by short, straight, radial, upwardly-inclined tubes in considerable number, the upper rows being superheating tubes. Very good results appear to be obtained by this boiler, but of course its water-level has to be watched as with an ordinary boiler, and when the carriage is stopped the production of steam for a considerable time continues, and much care would have to be exercised in this country to prevent the noisy escape of steam. It is, however, a type of boiler which is of considerable interest, although in all probability the future will lie with more completely tubulous or water-tube boilers. The Dion engine is horizontal, and, with the second motion shaft driven by it, is carried in one frame, the engine being compound with overhanging crank-pins, a main pinion in the centre of the shaft driving the exterior of the differential motion. The slide-valves are worked by eccentrics on a separate shaft driven by pinions, one on each side of the main pinion.

Exceptional lightness for most vehicles will be aimed at, and the steam-engine will have to compete with the oil motor, for in spite of its undisputed advantages, the steam-engine and boiler together are of more weight, and in some cases more trouble, than its mineral-spirit competitor. The very small coil boiler made some years ago by Mr. Blackburn, patented by him in 1877, is said to have had great evaporative power; it was heated by a Bunsen methylated spirit burner, and was, it seems, merely a close coil of tubes about ½ inch diameter or less. It provided steam for a small Brotherhood engine fitted to a three-wheeled dogcart, the subject of his patent, but it does not appear that anything like a severe test to prove its capacity for ordinary road travelling was ever made.

In this country, of recent date, the Thornycroft Steam Van and Wagon Company have made steam vans, in which a Thornycroft water-tube boiler has been employed with a small vertical compound engine. This van (Fig. 20) and its parts I have fully described before,* and it is only necessary to say that for a van capable of carrying a maximum load of one ton, and weighing itself, ready for the road, 30 cwt., the boiler and its casings weigh, I believe, about 9 cwt., and contains 50 square feet of heating surface and 2½ square feet of grate.

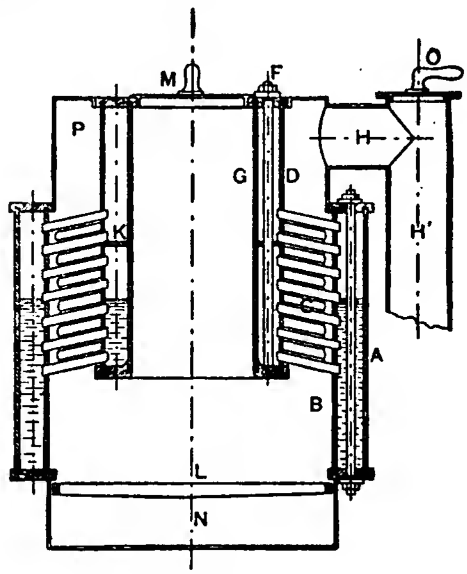

Fig. 19.—Dion Boiler.

Now, the weight of this boiler is at least as much as the weight would be of an oil motor of equal engine power, and this leads me to consider the relative merits of the steam and oil or spirit motors.

With the steam-engine we have greater range and ease of manipulation, within the limits of no power and full power, than with any other motor; for short periods it may be made to give more than its proper maximum, it may be stopped and started with more freedom, certainty, and smoothness than any other motor, with the exception of the electrical; it may be employed for travelling any distances with fuel available everywhere, is easily fitted with reversing gear, and is easily understood.

Now, for long-distance work the only competitor at present with this is the oil or the spirit motor, the disadvantages of which are small range of power within the maximum, no excess of power for short periods, difficulty of starting, and consequent necessity for keeping the engine running when the carriage is stopped for short periods; vibration due to explosive impulse on the piston, and necessity for running the motor at nearly full speed before starting the vehicle, most of the change of speed having to be made by frictional or other gearing. The motor and vehicle cannot be started together, and hence whenever the vehicle is started the motor is called upon to attempt to impart

* *Engineering*, October 18th and 25th, 1895

* For illustration see the December number of The Automotor and Horseless Vehicle Journal, page 90.

to it a speed equal to that proper to the lowest ratio of the speed gear. A frictional gear means loss of power and loss of time in overcoming the inertia of the vehicle, and unless the frictional clutch is connected to the motor through very low speed positive gear, the starting is almost certain to be effected more or less jerkily. To avoid the difficulties attending the use of all variable speed gears in which the gear not in use is running, whether at work or not, the author devised the "antinertia" power gear and clutch, by means of which any driven thing may be put into motion by positive gear at a low speed, and in which the gear for the time being doing the work is the only part in motion.

Having described the disadvantages of the oil or spirit motor, it is necessary to describe their merits as compared with the steam-engine. The first is that the oil-engine requires no steam generator and no condenser. It uses fuel of a high calorific value, easily carried, and no trouble to apply, and it uses it more economically than the same fuel, oil, can be used for the generation of steam. As it needs no apparatus for the generation of the working fluid there is no such apparatus to attend to and no space required by it. Hence the motor and gear can be much more conveniently arranged than the steam-engine. This it is that gives it all its advantages over the steam-engine, even assuming all the little troubles connected with boilers and condensers to be entirely overcome. The motor will, however, weigh a little more than the steam-motor of equal power, running at equal speed, and this may, perhaps, be put at 25 per cent. The weight, moreover, of a boiler and condenser is not all in excess of the oil-motor, for jacket water arrangements and exhaust silencer have to be included. The oil-motor cannot, however, use the cheapest fuel, such as coal or coke, or even crude or the partly-refined petroleums, and this is an objection to it for the larger powers and for vans and vehicles, which must in any case have a paid driver and attendant to whom the work of stoking would be part of his duty. It is, moreover, an objection to oil-engines for such purposes that they in some respects depend upon more delicate adjustment as to air, vapour, and oil supply, admission and ignition, and it is not always that even those well acquainted with oil-engines can say precisely and at once why an oil-motor will not start, or being started will not continue to work. The cause may be one of a dozen things which are not obvious, and which may take a good many minutes to find out. In a corresponding sense, the steam-engine is not at all delicate, and this is an advantage it will probably offer for a considerable time, but with decreasing force as the motors become more definite or fixed in points which are now subject to adjustment and are more generally understood. In the oil-motor, either the main or the supplementary air supplies may be too much or too little, the oil supply may be too much or too little or may stop, the exhaust or the air valve may either of them leak or be made temporarily to leak, by dirt under the seat or part of it, or by corrosion or erosion, and in any of these cases it is difficult to say what is happening. The ignition tube may not be hot enough; this may be seen, or it may be stopped or partly so, which cannot be seen, and this must be guessed, or, like any of the other numerous things, must be diagnosed. To sum the matter up, it may be said that the steam-engine would be in every way the best were it not for its boiler and condenser or escaping steam; and that the oil-motor is best where the boiler and condensor are both inadmissible, and where the vibration it causes and its occasional freaks (which are diminishing in frequency) are not sufficient reasons for rejecting the advantages of motor-carriages.

We are thus led to the conclusion that steam propulsion is mainly a question of steam generator, for, although a condenser is very desirable, the passage of the exhaust steam into the uptake, as was done by Gurney, Hancock, Holt, and Mackenzie, might be considered sufficient means of disposal for many kinds of vehicles. A condenser is not, however, an impossibility, and a combination of the air and evaporative condenser systems will probably lead to the solution of the problem. The construction of a suitable very light generator is not, however, very easy, and it would seem that, in spite of the high efficiency of a boiler made up on Hancock's system, with numerous flat thin chambers with thin passages between them for the heated gases, the weight of the enclosing plates and buck-stays cannot be brought below a minimum which is too great. Other methods of supporting the pressure of the sides of the envelopes might be devised, but increase in the number of joints is undesirable. A generator of the instantaneous kind, although those of Serpollet are heavy, seems to offer itself as the best means at present available. The objection as to want of heat storage is one which would have to be overcome by means of a furnace or other heat supply which can be made to respond rapidly to a call for a maximum quantity of steam for some little time. Heat accumulation in the form of heated water cannot be obtained with this class of generator, and the specific heat of iron being very low, storage by thick or cast-iron coated tubes is a very inefficient addition to weight. The generator question, therefore, resolves itself into one of the construction of a suitable rapidly responsive furnace for ordinary fuel, or of burners for liquid fuel, acting in concert with the steam demand from an instantaneous generator, or one in which the weight of the water-containing space is not materially greater than that of a mere tank for carrying the same quantity of water. With a good condenser even this qualification need not be conceded; but, ignoring the value of pure water, the economic question is one of selection as between (1) the boiler containing a quantity of water, accompanied by a water-tank; (2) the lighter, instantaneous generator with no water contents, and demanding no care as to water level but by a larger water-tank; or (3) an instantaneous generator and a condenser and a water-tank of merely nominal capacity. The weight of the condenser seems to be the determining quantity for this. Such generators as that used by H. S. Maxim for his flying machine suggest another line of development. This boiler* contained a very large number of thin $\frac{3}{8}$ copper tubes connected to larger trunk tubes, none of them containing much water, and a steam receiver of small diameter. Most of the tubes were only $\frac{1}{50}$-inch thick, and with four of these in a white-hot furnace Maxim found he could evaporate $26\frac{1}{2}$ lbs. of water per hour per square foot of surface. His boiler was heated by gasified naphtha, and contained 800 feet of heating surface, and weighed 1,000 lbs. with feed heater. Inventions and patents for light steam generators are numerous enough, but none are yet, or not more than one or two are being used, even experimentally.

I have said nothing as to the smell of the oil or spirit motor—firstly, because it is not or need not be really serious, it is only a different stink from that or those to which we are accustomed, either with horses or steam-engines, and will be lessened by experience.

With regard to the vibration caused by them I think there is little doubt that this will soon be overcome. The piston and connecting rod of an oil-motor and cylinder are like a shot in a gun, action and reaction being only equalised by different amounts of imparted motion or of inertia of different masses overcome at different velocities. A vertical motor operated by explosions at irregular intervals, and mounted on a springy base is not likely to stand very steady, and as few motors are properly balanced the occasional explosion merely aggravates a vibratory movement of smaller range set up by the continuous rotation of unbalanced parts. The difficulty is one which should be surmountable, but there is no doubt it is less a difficulty with the horizontal engine and for obvious reasons.

It is unnecessary that I should again describe either the French spirit motor-carriages of the leading makers, or those of Benz, of Mannheim, or of Lutzmann. They are represented in this country by the Great Horseless Carriage Company, London and Coventry; by the Anglo-French Motor-Carriage Company, Birmingham; by Arnold's Motor-Carriage Company, East Peckham; by Julius Harvey and Company, 11, Queen Victoria Street; by Mr. J. A. Koosens, Southsea; and many of them were illustrated in the Cantor Lectures previously referred to, and in the paper by me read before the Society of Arts in November last.

I may, however, by means of a few views on the screen,

* *Journal of the Society of Arts*, November 30th, 1894.

recall some of them to your memory, including those above mentioned and some of those of English make. All these Continental vehicles, with the exception of the Serpollet and the Dion, are propelled by mineral-spirit motors, several of them by the Daimler motor, which is the only one with which no carburetter is employed. It is a vertical of simple design and works exceedingly well. Ignition is effected by heated ignition tubes. Several of the foreign makers, including the Lutzmann, the Benz, the Delahaye, and others, are propelled by horizontal motors, and ignition is effected by electric sparks. No noteworthy improvements have been made in recent months. The gearing used by the best-known makers, such as MM. Panhard and Levassor (Fig. 21), remains much the same as when described at the end of 1895. It usually consists of

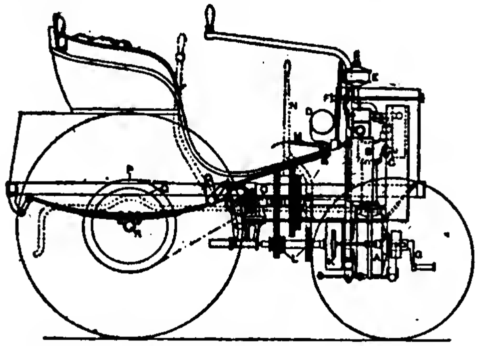

Fig. 21.—Panhard and Levassor's Daimler Motor-Carriage (1894).

three or four pairs of spur-wheels of different sizes on the engine shaft, driving by one or other of three or four corresponding wheels, a second motion shaft which gives mo ion to the driving wheels by chains or by belts. It has two cylinders, set at an angle of about 15°, and coupled to a crank partly formed by a pair of fly-wheel discs. This motor is entirely enclosed in a box, which also contains the carburetter, B, and an exhaust box, C. The reservoir for carrying the benzoline is seen at D. At E is the regulator for controlling the supply of benzoline to burners for heating the ignition tubes. At H is a small centrifugal pump driven by a belt on the pulley, J, for circulating the water round the cylinder jackets. Gearing

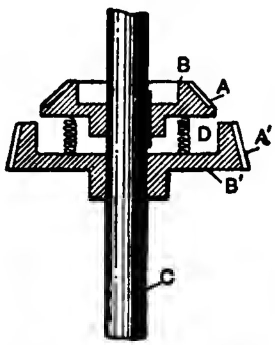

Fig. 22.—Panhard and Levassor's Friction Clutch.

is arranged for three different speeds, the cog-wheels, L, being made of gun-metal, and movable, so that they may either of them be made to engage with the three wheels above them, they are made tight or loose upon the crank-shaft by means of friction clutches at K. The intermediate shaft driven by this gear conveys motion by another intermediate shaft, placed transversely across the carriage, and carrying a pair of pitch chain pinions which drive the road wheels by a pitch chain on sprocket wheels attached to their spokes. A differential or compensating motion is fitted to the transverse intermediate shaft. To alter the speed while the engine is running, the pedal, M, is depressed, and the gearing then brought to rest by means of the lever, N. The change in the position of the gear wheels is then made, the cogs all being rounded at their corners to enable them to find their way into the corresponding teeth of the upper wheels.

A pulley, Q, is placed upon the driving wheels, and used for carrying a brake instead of putting a brake on the tyres of the road wheels.

The clutch already referred to is shown by Fig. 22. The shaft, C, is the crank-shaft, upon which is fixed the coned disc, B. In front of this and sliding upon a feather is another friction cone, the face of which has a greater angle. When the containing or interior cone disc which encircles these is pushed against these inner cones, the smaller one retires into the larger one against the resistance of the springs, D, and when the frictional contact due to the resistance is reached, the further frictional contact and more powerful grip of the disc, B', is obtained, the object being, as far as frictional cone clutches makes it possible, to put the carriage gradually into motion; the faces of the cones B and B' are coated with leather at A and A'.

Most of the makers who use gear transmission between the engine and second motion shaft employ the three or four speeds, but those who use belts avail themselves of the slip of the belts more or less controlled to vary speed between the two which are mostly used. Belts are not, however, to be commended for vehicles, because the belts must be short, some must be crossed, and all of them may often have to run in bad, wet weather. For light work the shortness of the belts when on pulleys of no great difference in size may not make great tightness necessary, but for variable work the objections to tightness can only be escaped by using jockey pulleys. In some cases where these are used the belt which for the time being is doing no work is nevertheless running idle on one of the pulleys, or loose on both, and this is objectionable. The use of belts as friction brakes, or in place of better variable speed arrangements, is also objectionable, even if for no other reason than that it polishes the pulleys and makes greater tightness, necessary for a given amount of frictional adhesion. We can only say of it that it is not a bad makeshift.

In Great Britain there are now numerous manufacturers who are making or preparing to make oil or spirit motor vehicles, but for the next two or three months it does not seem that we shall see their vehicles on the road. Some of these makers use the Daimler motor, the construction of the main features of which is so well known as to need no description here.* Mineral spirit is used for its operation.

Several makers will use what is known as the Pennington motor, which is a small light high-speed mineral-spirit motor, the cylinders of which are made of thin steel tubes, as used by Mr. Hiram S. Maxim in his steam-engines for his aerial machine, and from which Maxim got over 360 horse-power† from engines which he could support on his lap, weighing 640 lbs., or less than 1·8 lbs. per horse-power actual. The pressure used was 325 lbs. Mr. Maxim is now at work, not only on a gas-engine which will run fast or slow like a steam-engine, and reverse, but on a light steam-engine and boiler or generator of high capacity, a 12 horse-power generator being only 9 inches thick, and in the shape of a book.

American inventors are at work on the subject, and the Duryea carriage, fitted with the Duryea mineral-spirit motor,‡ is running in this country, and is in the hands of Messrs. Maberley and Thrupp, of Oxford Street, London. Compressed air is much favoured in America, but less progress seems to be made in the United States than in this country.

Messrs. Petter, Hill, and Boll, Yeovil, are also making motor-carriages run with Petter's mineral-spirit motors.§

Messrs. Atkinson, Phillipson, and Toward have made a steam carriage, a photograph of which appeared in the last issue of

* *See* Cantor Lectures.

† *Society of Arts Journal*, November 30th, 1894, and Automotor and Horseless Vehicle Journal, December, 1896.

‡ Pat. Specification No 7,036, 1896.

§ *Society of Arts Journal*, November 27th, 1896, and Automotor and Horseless Vehicle Journal, December, 1896. Paper by the author.

THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL, which has reached the stage of experimenting on the road, and with promising results.

As far as I am aware, the only motor-carriage which is at present being propelled with a motor using ordinary lamp oil, is that made by Messrs. Roots and Venables, of the Westminster Bridge Road, the motor being a horizontal one on the Roots system. I have fully described this motor-carriage recently,* but I may here mention that the motor is constructed on the vaporised system without any spray-making apparatus,† and is fitted with a governor which controls by acting both on the oil feed and on the exhaust, so that the objectionable smell resulting from the exhaust of imperfect combustion is avoided.

There appears to be a general opinion in England that the use of mineral spirit is likely to be attended with more risk of accidental ignition and explosion than ordinary lamp petroleum. There is no doubt that more care is necessary, but very little more. Very few accidents have happened with motor-carriages as a result of the use of the mineral spirit, while lamp accidents with ordinary lamp oils happen every day and often with fatal results. The extra care required in handling mineral spirit is, however, attended with much greater simplicity in the construction of a motor worked by it, and some minutes less time are required in starting than when the heavier oil is used. Hence the fact that all the Continental and American so-called oil-motors use mineral spirit. In contrast with the well-made economical English oil-engine, with good governing arrangements, any tin toy maker could make a spirit motor which would work, though a great deal of ability and ingenuity has been expended in producing a really useful spirit motor for carriage work. There is still much remaining to be done, not only with reference to complete combustion under the varying loads, and more or less frequent stoppages of motor-car work, but particularly in the construction of an oil or spirit-motor, which in daily ordinary use will work well throughout a considerable range of power, from light load to its maximum. There is also a great field for the inventor of a satisfactory self-starting oil or spirit motor. We seem to be some distance from it at present, but it is not impossible that the combination of a self-starter and existing engine might produce a motor which would start by turning on the oil or vapour supply and igniter, and thus avoid the necessity for keeping the motor running while the carriage stands during short stops.

Concerning electrically-propelled vehicles, there is still not much that can be said with respect to those intended for more than the short runs in towns. The electrical motor possesses all the attributes of a perfect motor for any power within its maximum when used with suitable speed-gear to get over the difficulty of starting the vehicle and climbing steep hills. The one practical difficulty is the great weight of the accumulators required for a few horse-power for a few hours. At present there is no good battery which weighs less than about 500 lbs. per horse-power hour, and this weight far exceeds that of the whole motor machinery required for an oil or spirit motor-car.

Compressed air for motor purposes is again occupying attention. In this connection it would do little good to base any calculations on the foot lbs. of work represented by the expansion of a given quantity of air at a given pressure down to atmospheric pressure, the losses being numerous, variable, and considerable. We can best arrive at an estimate of the comparative cost of compressed air for the purpose by two different methods from practical experiments with engines worked by compressed air. At the well-known air compressing establishments of M. Victor Popp, of Paris, engines have been run on the brake with compressed air. At a pressure of 80 lbs., and with the air raised to a temperature of 300° F., as it might be on motor-cars, a 70 horse-power engine consumed an average of 34 lbs., and a smaller engine giving two horse-power on the brake consumed 55 lbs of air per brake horse-power. Now, if we take 50 lbs. of air and allow one-fifth for the air which must be left in the receivers, and make the usual estimate of ten times the weight of the air as the weight of receivers, we get a weight of 600 lbs. per horse-power hour actual. One horse-power is, however, of very little use for a vehicle to carry, say, four persons, and we must reckon upon two horse-power actual at least as the mean power required on most roads, and giving the compressed air the benefit of any advantage that may arise from a lessened draught on particularly good roads it will be seen that at least 1,000 lbs. weight of air and receivers will be required, and this 1,000 lbs. weight will itself require another horse-power to move it; so that for a stage of, say, 10 miles between charging stations the total weight of air and receivers at pressures which it would be advisable to use would be considerably more than half the weight of vehicle and load.

As another method of arriving at some estimate of the value of compressed air for the purpose, we may take the cost of air compression on a large scale in Paris, but allow 20*s.* per ton as the cost of steam coal instead of 25*s.* per ton, the cost in Paris. As the result of a year's working it was found that the coal consumption to compress air to 120 lbs. per square inch reached 1 lb. for every 13·8 lbs. of air. At 20*s.* per ton this costs 0·017*d.*, so that, taking 60 lbs. of air as being required for small motors per horse-power hour, it will be seen that we get, as the actual cost of coal alone for compressing, 0·465*d.* per horse-power hour. The numerous other charges in a compressing establishment will easily run this up to considerably over 1*d.* without any charge for distribution. It is thus pretty clear that compressed air is out of the running except for very short town service, but it is quite possible that it may be cheaper and less troublesome to deal with than the secondary batteries of electrical motor-cars.

Comparing this with compressed gas for motor-car use, we see how great is the advantage attending its use. Instead of requiring receivers for 60 lbs. of air per horse-power hour, and a capacity of say 50 to 70 cubic feet according to pressure adopted, we should only require receivers for about 1 lb. of gas per horse-power hour, but with receivers weighing rather more than those for air. Instead of being limited as in the case of air to short stages of say eight miles, long stages of say 50 to 70 miles could be run, and the two horse-power previously referred to could be used throughout the whole of this distance. If the good roads mentioned with respect to the air-motor were met with the distance would, of course, have been correspondingly increased. Thus by using compressed gas instead of air we may have from 50 to 100 per cent. more power, and from six to seven times the number of hours stored in the same space. The one disadvantage of the gas-motor as compared with the air is the difficulty of starting it, and as at present made, the necessity of keeping it running light while the vehicle makes short stops. There is, however, little objection to this in the case of tradesmen's vans and many other vehicles, and it does not cause any trouble with the gas-driven tramcars as used so successfully and economically on the Blackpool, Lytham, and St. Anne's Tramway on the Gas Traction Company's system, and as equally successfully at work on the Dessau and other Dresden Tramways. The system has the advantage that the motor can get its working fluid in almost every town and every village of any size, and the motor vehicle could be provided with a pump by which it could fill its own receivers while the users go to lunch or dinner.

During this year there are to be numerous public exhibitions and trials of motor vehicles of various kinds, commencing with the exhibition at the Royal Aquarium in May, and including the trials of the Royal Agricultural Society at Manchester, those which presumably will be made for the competitive prizes offered by the proprietors of *The Engineer* and by the British Motor Syndicate. The conditions of competition for the Royal and for *The Engineer* prizes have been widely published, and the latter include runs of not less than 200 miles, as well as the preliminary trials, but routes and arrangements for the long runs have not yet been made known.

Disappointment is often expressed at the non-appearance of British-made motor vehicles at present, and in this connection it must be remembered that it was not until November last that British makers were permitted to run their vehicles,

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* *Society of Arts Journal*, November 27th, 1896, and AUTOMOTOR AND HORSELESS VEHICLE JOURNAL, December, 1896. Paper by the author.

† *See* the author's articles on "Oil-Engines," in *The Engineer*, June and July, 1894.

even for trial purposes, on our roads. Until the Act was actually passed last August, engineers and manufacturers would not turn their serious attention to the construction of vehicles and motors, the use of which Parliament might, after all, not sanction. Now that they are free to make and try their vehicles, they have to start in quite a new industry, and even those who propose to manufacture vehicles very much on Continental lines have to get their factories and plant built in order to manufacture on a paying scale. Many makers have been misled by unqualified irresponsible condemnation of Continental vehicles to attempt to start on radically different lines, instead of devoting their attention to such modifications as would remove substantial defects, and this will cause much waste of time, for the French vehicle makers have accomplished a great deal which should not be ignored. In England many are prone to reject a thing as a failure which is not a success, and to deny themselves the advantages of a partial success or a good makeshift. In America this is much less the case. There the tendency is to use whatever at the time is best, if it secures any advance, until something which is better is achieved, and this policy often leads to rapid development.

As compared with the men of 60 years ago, we have advantages which in many respects are of the greatest importance, and which ought to enable us to accomplish with ease and certainty that which they left unfinished. In particular, we have the advantage of the materials and tools which make it possible to run engines continuously at three times the number of revolutions they could use, and at double the piston-speed. We have, moreover, materials at our disposal which enable us to reduce the weight of our motor machinery by probably 70 per cent. as compared with theirs. We have steel sheet tubes of all sizes and splendid quality, steel castings, drop forgings, and many other such things; we have ball bearings and rubber tyres, and we have aluminium alloys, which place in our hands materials for motor parts and frames, water and oil tubes, connecting pieces, and many other things of half the weight of anything then or at present made of either cast iron, bronze, or gun-metal. Aluminium alloys for castings are now made of specific gravity very slightly over 3·0 and therefore of considerably less than half that of cast iron, and of much higher strength. Tests made at the Durham College of Science, Newcastle, of aluminium alloy castings from Mills's Atlas Works, Sunderland, of 3·05 specific gravity, have given a tensile strength of as much as 20 tons per square inch with an elongation of 1·25 per cent., and another alloy used for castings of bed-plates and standards for engines and dynamos, brackets, gear-wheels, and other parts, has a tensile strength of 15 tons per square inch, and with a specific gravity of only 2·98. The immense advantages such a material offers in the construction of motor-carriages and motor-cycles will be readily seen, and should help to remove considerable difficulties.

"THE ENGINEER" HORSELESS CARRIAGE COMPETITION.

The entries for this competition finally closed on the 31st ultimo, and we trust that no intending competitor neglected the chance of being able to secure one of the prizes by being a day too late. For many reasons the decision of the proprietors of *The Engineer* not to publish the list of entries until the date fixed for delivery of the vehicles at the Crystal Palace is an excellent one. In the meantime, it is interesting to note that the number of entries received is 71, distributed as follows:—In Class A 25 entries, in Class B 21, in Class C 15, in Class D 2, and in the "Supplemental" Class 8.

NOTES OF THE MONTH.

Birmingham just now is so full of orders for cycles, &c., that it is difficult to place any new business at all. Several firms, however, are finding time to push on in the motor-car line, and we think those who are getting well forward in this branch of engineering will find themselves shortly in a position to double and treble their connection, as any good work in this line turned out quickly will ensure repeat orders from a large number of dealers all over the country who are anxious to be supplied with motor-carriages. Amongst others we may mention Accles (Limited), who are putting forth every effort to get out the first delivery of a thousand De Dion tricycles. These are being built on an entirely new pattern, and are at the order of the British Motor Syndicate. We believe that the first complete machine will be shortly ready, probably about the same time as the publication of this month's issue of the Automotor Journal, and we hope in the next number to give a photograph of some of this firm's excellent work. We noticed upon a recent visit to their premises that very extensive enlargement is going on, which to a very great extent will be utilised for building motor-cars. Mr. G. Accles is personally much interested in the new industry, and he already has on the way from America a special motor-vehicle of his own, in the advantages of which we understand he has the very greatest confidence.

The Wolseley Sheep-Shearing and Machine Company, of Alma Street, Birmingham, are also determined to be in the front rank for motor-car building, and so as to be able to meet the likely demand upon their establishment, are erecting a new building especially for this purpose. We also hear of a new motor which is likely to be exploited shortly by Messrs. Wilkinson and Son, of Birmingham.

We give herewith a brief description of a horseless fire engine. It is the invention of Mr. Reuben Plass, of 508, Lafayette Avenue, Brooklyn. On either side of the machine is a footboard, while on the body are arranged the ladders and hooks, at the back of which sits the person in charge of the steering gear. Above the front axle and directly beneath the driver's seat is placed the gas-engine, from which the power is transmitted by a series of cog wheels. These are directly in front of the engine and just below the footboard of the driver's seat. Through the footboard extend two levers a little higher than the driver's seat. By one of these the speed of the engine is controlled, and the other is used in steering the machine and as a brake. By drawing the left-hand lever toward himself the driver puts the machine in motion. On the lever is a set of cogs which, when the former is pulled, act upon another set of cogs directly connected with the engine. In order to stop the machine it is not necessary to stop the engine. Pressure on one of the levers throws the cogs out of gear, and the other lever controls the compressed-air brakes, by which the machine is stopped. The engine can also be reversed by another set of cogs. As the motive power is always under control, it can be used successfully in elevating an extension ladder, which is a great advantage in that much time can be saved over the ordinary method.

Evidently Mr. William Georgeson, ex-technical teacher in coachbuilding in Gordon's College, Aberdeen, is a strong advocate of coachbuilders working in harmony with engineers to produce perfect motor-vehicles. This gentleman recently lectured before the members of the Aberdeen Coachmakers' Mutual Improvement Association in Silver Street Hall, on "The Rise and Progress of Carriage Building," Mr. James Clark presiding. In the course of his remarks, he said that motor-cars were not such a recent invention as many people imagined, motors being used in London in 1781. A steam omnibus capable of going from 10 to 15 miles an hour was in use in the metropolis in 1833, and plied between the Bank and Paddington, the fare being 6*d*. With the introduction of the electric motors of the present day, coachmakers, he maintained, would have to prepare themselves for the new innovation in locomotion. It was possible that motor-carriages would to a certain extent solve the problem of agricultural depression, as they could go long distances and collect cottage and farm produce very expeditiously, and bring it to centres of distribution.

To a physician in Youngstown, Ohio, is due the distinction of being the first medical man in the United States to make use of a motor-carriage for the purpose of working his practice. Dr. Carlos Booth terms his vehicle a motor-cab, has used it for several months, finds it an excellent substitute for one drawn by a horse, and prefers it in most respects to that animal as a motive power. In this carriage Dr. Booth has attained a speed on the level of 10 miles per hour, and climbed an incline of from 10 to 15 per cent. grade at the rate of 5 miles per hour.

Motor-carriages should prove especially useful to the general practitioner in Great Britain, and particularly to the country one, on whose shoulders the burden of maintaining the two or three horses, with their attendant expenses, necessary for a large and scattered practice falls very heavily. The initial cost is the worst part, but, on the other hand, the cost of working horseless carriages is small, and the country roads of England, unlike those of America, are peculiarly well adapted to their use. Cripples, paralytics, and those who retain the use of their arms but have no control over their lower limbs should also find these vehicles of the greatest service; they would not only be able to travel by means of them without assistance, but also be able to amuse themselves with corresponding benefit to their health.

As a result of the recent report of the Aberdeen Parks and Links Committee Mr. John T. Clark, the well-known carriage builder of Aberdeen, is working two experimental vehicles propelled by electric motors. He is also engaged in constructing, for private owners, a vehicle to seat six persons, in which Mitchell's Electric Motors will be employed.

Application has been made to the Watch Committee of the Brighton Town Council for permission to run an electric char-a-banc from Brighton to places of interest in the surrounding districts. The committee have resolved that they will be willing to grant licenses for electric motor char-a-bancs after each vehicle has been inspected and approved by the committee.

The lock-out in the engineering trade has necessarily been a further check to the development of the Johnston-Arrol oil motor. Since the blow it received from Glasgow's municipal dignitaries little has been heard of its progress, but we understand that the working drawings of the motor have been completed, and the patterns are on the point of being put in hand. But as Messrs. Arrol, the engineers, and Messrs. Fullarton, Hodgart, and Barclay, the founders, are members of the Engineering Employers' Federation, it is feared the motor needs must wait until things in the engineering industry have resumed their normal condition.

It is to be hoped that by the time the Paris Exhibition of 1900 is open, a goodly show will be made in the British section of English-made motor-cars. At present the majority to be seen in England are of Continental manufacture, but we think there is little doubt that long before the Exhibition the tables will have been turned and the leading makes will be from the works of British engineers.

In Belgium the manufacture of motor-vehicles is increasing rapidly. A number of well-known firms are already putting down special plant for this purpose, the movement for the moment being centred at Brussels and Malines.

In Ireland they are not slow to press any new idea into service for coercive purposes; and the motor-car has not had to wait long before finding its place. At a meeting held a few days back in Belfast regarding a direct tramcar service from York Street to Antrim Road, the conveners, who included several of the leading Belfast citizens, were determined that the Corporation should provide them with what they demanded, or they would start an opposition service of motor-cars to the tramcars. Mr. James Hogg, in reading the circular convening the meeting, said: "It is not our intention to promote a rival carrying company to the tramway, provided our requirements are granted, but in view of the unsatisfactory replies referred to, we have put ourselves in communication with the Motor-Car Company, and have obtained prices for suitable cars, and are promised a trial on most favourable conditions. But before going further in this direction we think it only right that the representatives for our ward should have an expression of opinion from the ratepayers, so that they may do what in them lies to endeavour to secure for us what is admittedly a long-felt grievance." There was, he (Mr. Hogg) urged, great necessity for the tram service, and he said the principal ratepayers in the ward were prepared to adopt the motor-car system if they did not get the tram service. For the running of the motor-cars a company would be formed, and it was intended to run those cars from Chichester Park to Messrs. Robinson and Cleaver's and to the Northern Counties Railway terminus. Mr. John M'Cormick thought the only practical suggestion was the formation of a Company for running the motor-cars. That Company would be a great benefit not only to that district but to the city, and it would let Mr. Nance see that they were not dependent on the Tramway Company, which had abused the power given to it. Ultimately, before starting motor-cars, it was resolved to send a deputation to the Corporation giving them the alternative of motor-cars or a direct service as desired.

The following personal experience of a motor-car by the special correspondent of the *Weekly Sun* is interesting. Writing from Paris, the correspondent, who is presumably one of the fair sex, says:—"I have had my heart's desire—a drive on a motor-car. Mrs. Crawford, of the *Daily News*, said, 'If the weather is good we will come for you at half-past two o'clock.' It has been a long time since my anxiety was so keen for a fine day. And great was my relief when Marie opened the blinds the next morning, and the sunlight streamed in. The air was absolutely intoxicating in its freshness, the sun as warm as in May. Promptly at the hour my hostess appeared, and after a few minutes of a rather trying, trembling condition, we started bravely off. So far, the motor-car has the right of way—mothers and nurses gathered up their children and rushed for the pavement; tramcars and omnibuses stood still to allow our trundling by; carriages and cabs fairly fled from our rumbling approach.

"The horses in Paris are now somewhat accustomed to the car, but a few were made unhappy by it. But we soon left them in the rear, as our car was almost twice as quick as horse locomotion. After we started, the odour of oil was not perceptible, and the motion was easy and smooth. Being able to go, however, at a very smart pace, and knowing there were no fagged animals to consider, was a comfort. It seemed but a moment after leaving Paris that we passed Buzenval, the place where the French made their last sortie during the Franco-Prussian War. It looked peaceful and happy with its fields of short new grass. La Manche, the racecourse, is beautifully kept. A few horses were being exercised there. We were so quick that I scarcely caught a glimpse of Vaucresson, where a number of pretty new villas are going up.

"When we reached Versailles, which I thought never looked more picturesque nor full of colour than with the brilliant spring sunshine striking down upon it, we had not the inconvenience of waiting for the horses to rest, and, as one of our party was hurried, we at once turned our fore-shortened carriage, and whistled along at great speed back to Paris. And, what with the perfection of the day, the rapid motion, and Mrs. Crawford's brilliant descriptions of the East, where she has been lately travelling, it was but a moment from Versailles to the Avenue de l'Opéra. Everything went well, from the start to the finish, and I can only speak of the motor-car as one hears one woman apologetically speak of another who has the reputation of being disagreeable, 'She was very nice to me.' And so with the motor-car—he was very nice to me."

An amusing but realistic sketch of a journey by diligence in Spain appeared in the *Daily Mail* a short time back. The writer in describing it as the laziest travelling in Europe, says that "even in these progressive days of electric railways and motor-cars there are to be found people conservative enough to affect a yearning for the return of what they are pleased to call 'the good old coaching days.' In the most acute cases a radical cure might be effected by a night journey in one of the old-fashioned diligences which to this day form the chief means of communication between the lesser towns and villages of Spain. The diligence is a lumbering vehicle that bears a far-away resemblance to a London 'bus, to which has been added a railway coupé and the platform of a tram, whilst its speed may be compared to that of a hearse." The rest of the article describes graphically the many discomforts experienced through a night journey, and may well bring home to sceptics the advantages in store for mankind from the advent of the motor-car.

The Nuneaton Urban Council intends to get as much value as possible for the ratepayors' money. At a recent meeting the question of purchasing horses, and the Council carrying on its own haulage instead of contracting for it, was considered, and in the course of the discussion Mr. J. F. Johnson thought the Council should consider whether they might not effect a great saving by having motor-traction carts, which were being made, and which would do away with the keeping of horses. The question was referred back to the committee, the clerk being instructed to write to the Local Government Board asking if it would allow the Council to obtain a loan for the purchase of either horses or motor-cars.

The Automobile Club of France has now nearly 1,000 members, which number embraces 139 owners of motor-vehicles. The list of members is of a very cosmopolitan order, and we notice that amongst some of the more recent elections are Mr. Radcliffe Ward, Sir Edward Blount, Mr. Thomas Myring, and Mr. William Ingersoll. The present premises of the club now being too small for its increasing membership, additional buildings have been secured in the Bois de Boulogne.

Mr. Ernest M. Bowden, writing in a contemporary, in suggesting that in the course of another month or two the Local Government Board authorities will have to consider the question whether any change shall be made in regard to the speed that is legally permitted, for the limit (or rather limits, since they vary with different classes of vehicle) were imposed, to commence with, for a period of six months from November 14th, hopes the authorities will see fit to raise the limits of speed above what they are at present, for although it is all very well for irresponsible drivers to disregard the law on unfrequented roads, it is much better that the law should not attempt to restrict freedom any more than is necessary. We hardly agree with his statement that the limits for the heavier vehicles are a serious difficulty in the way of successfully introducing motor-omnibus traffic. Of course, nothing short of an Act of Parliament can legalise a higher speed than 14 miles an hour, but the limit for the lighter vehicles might very well be brought up to this speed.

Mr. Bowden, speaking as a leading authority upon cycling matters, truly says that it seems to be forgotten by many people that no attempt is made to impose a hard and fast limit on such machines as triplets and quads and quints, which are capable of developing tremendous speed, and are by no means as manageable as a well-designed motor-car. Yet we do not find that these machines are a formidable danger to the public, for the simple reason that riders are not usually such idiots as to get up a high speed unless the road is seen to be clear.

Messrs. G. Kynoch and Co. have during the last month incorporated themselves under the Limited Liability Act with a capital of half a million sterling, a significant feature of the articles of the new Company being the power which they take to build motor-cars. Their extensive premises at Witton, Birmingham, are particularly adaptable for this business, and the recognition of motor-cars as an accomplished fact by this eminent firm should turn the scale with any firms who are wavering as to the wiseness of embarking in the new industry.

A remarkable article appears in the *English Illustrated Magazine*, in which Mr. G. P. Lathrop has thrown into the form of a story the notes which he made of suggestions and hints received from Mr. Edison as to inventions and changed conditions which may possibly be accomplished in the future. For narrative purposes Mr. Lathrop gives particulars of a Society of Futurity whose members have discovered the secret of preserving life in a state of suspended animation. The hero is chloroformed and is subjected to an elaborate process, whereby he becomes inanimate, and at the end of 300 years is restored to existence at the exact point he had quitted it when chloroformed. Amongst the many wonderful things he finds (which are supposed to represent Mr. Edison's views of the future) the great features are electric motors and air ships. Mars can be reached in eight hours, trams travel at 150 miles an hour, and special paths are available for electric bicycles, tricycles, and carriages, with power supplied from stations at regular intervals, and at all hotels. Horses are but little used for travel, and exist mainly as a form of preserved life, like deer in parks, or for racing purposes, although, even in racing, their speed is so greatly surpassed by that of flotation, sails, and rubber-oared boats, and various mechanical four-legged machines for running, that they are not much more than domestic pets, like cats and dogs. A motor "walking balloon" is described and a marvellously ingenious motor-driven "air ship" is minutely worked out. The article is an extremely interesting feature of Messrs. Macmillan's magazine, and conveys the impression that Edison is distinctly in favour of motor-vehicles as the coming form of locomotion.

With a view to meeting certain defects in the existing Patent Laws of America, the United States Congress has recently passed a Patent Law Amendment Act, which is not without importance to English inventors. This new Act will come into force after January 1st, 1898. In the present state of the law, if an invention is patented in America, subsequently to its being patented in other countries, the American patent becomes void on the first date that a corresponding foreign patent expires, no matter for how short a time it may up to then have run. As not infrequently a very long period elapses in America between the application for, and granting of, a patent, it is evident that a patent might actually be rendered void before it was granted, by the expiration of a corresponding foreign patent. At the same time it will be observed that a patentee might insist upon payment of royalties in respect of the use of an invention patented in some other country, although, perhaps, for many years well known in the United States, or might even restrain its use immediately after the grant of an American patent for it.

To remove these defects, from the beginning of next year it will be a law that a valid patent cannot be granted in the United States for an invention which has been published in any way in that country two years prior to the American application. And also that no patent can be granted for an invention that has originally been patented in a foreign country after seven months from the date of application for the earliest foreign patent, but that if application be made within the prescribed time, the patent shall be granted for the full term of 17 years.

These enactments will, of course, not apply to patents granted before January, 1898, nor to applications filed prior to that date or to patents granted on such applications. It follows from these amendments that to obtain a United States patent it will be necessary to file the application within the present year for foreign patents applied for before the 1st of June of this year, or for inventions which have been made public in the United States prior to January 1st, 1896. The new measure also provides for a six years' period of limitation in actions for infringement of patents.

The accompanying sketch is the latest idea for a horseless carriage emanating from America. It has been built on the lines of patents secured by Gotthold Langer, of St. Louis, Mo., and is an odd-looking contrivance, but it is claimed for it that it is the only practicable automobile vehicle that has yet been invented, inasmuch as it is superior to irregular road conditions, and is not limited in its usefulness to boulevards or perfected pavements, and is the only motor-carriage designed for pneumatic tyres. These are to be of special construction, and will be made self-inflating by means of an automatic pump connection with the motor—a principle, it is stated, that has recently been utilised in the construction of an English bicycle. The entrances to the carriage are on either side, through the centre of the main wheels, which are of a maximum diameter of 8 feet. The inner wheel or rim, which is a wheel within a wheel, furnishes the bearings for the body of the vehicle. The motor, which may be of steam, gasoline, or electric power, is stored beneath the driver's box and is geared to two drive wheels, which revolve in the inner rim of the large wheels in front of the centre. The motor is double geared, so that the power can be applied by the driver or motorman to both wheels simultaneously, or to either wheel alternately, or in steering the carriage, the front supporting wheel being pivoted to the under forepart of the wagon in front of the centre. The front wheels are the rudder and the large driving wheels are operated like the paddle-wheels of a side-wheel steamer. There is at present a big outcry for a new design for horseless carriages. This "latest" may fairly claim to "fill the bill" just to go on with.

No wonder the untravelled Yankee thinks the Britisher a "krank" when he reads the trash served up to him by papers which have the reputation of being at the head of American journalism. We have before us an article in a leading Pittsburg paper seriously dealing with the English Motor-Car Club and its doings, in a way to bring ridicule upon all concerned. The article is headed with a sketch showing a bevy of frivolous-looking girls taking an airing upon what appears to be a Pennington motor-carriage, the legend under the picture being:—

"Feminine Members of the London Motor-Car Club ont for a Spin. (Drawn from a Photograph.)"

The article deals freely with the doings of the Motor-Car Club, bnt we hardly think the statements of fact (!) therein put forth are likely to be either corroborated or relished by Mr. Harrington Moore, the Honorary Secretary of the Clnb. Such articles are not calculated to add to the dignity of anybody concerned.

Councillor West, of the Coventry Electric Light Committee, is urging the Council to supply the current for charging the storage batteries of motor-cars. The transformer plant for this purpose wonld be fixed in the switch room which it is proposed to have in the centre of the city, so as to be easily accessible.

The motor-car seems likely to enter very largely into the service of the Continental restanratenrs and hotel proprietors. Some mechanical vehicles are already running between the Riviera Palace Hotel at Nice and Cimiez, while other services are to be run by the Compagnie Internationale des Grands Hotels to Cannes and Monte Carlo.

The prejudice is still so great amongst the ignorant and bigoted inhabitants of these Isles, that it behoves all those interested in the fntnre of motor vehicles to exercise the greatest care to avoid any transgression of the rules and regulations laid down for the time being by the authorities that be. This more especially relates to an excess of speed beyond the maximnm of 12 miles an honr prescribed by the Board of Trade. Any violation of this vital rule gives only too readily a peg npon which to hang a complaint by the enemy, and in view of probable revision of the present rules it cannot be too strongly impressed npon users of motor vehicles rather to travel nnder the 12 miles than over. Like other innovations, the diffienlties and prejudices now existing will be broken down in time, but it will take all the longer if, at the outset, those who are now the most interested financially, and shonld, therefore, be all the more in a position to grasp this fact, are themselves the greatest offenders.

Referring to this very point the *Coventry Standard*, which is published at what is termed by a certain set the "home of the motor-car industry," last week thonght fit to sonnd a note of warning in the following leaderette:—

"It may do no harm to draw attention, through the medium of a local print, to the fact that the pace at which motor-cars are in some cases being propelled is, ontside Coventry, becoming a matter of criticism and complaint. Coventry being the home of the motor-car, mention of the matter in these columns may help to bring it under the notice of those principally concerned. Our sympathies, together with those of every well-wisher of the industries of Coventry, are with the motor-car as a promising source of industrial activity, and when the question of restrictive legislation as to speed, &c., has been under the consideration of governing bodies, we have supported the landable disinclination which has been shown to hamper and hinder the development of the new industry by surronnding it with too stringent conditions. Bnt the fact that this possibility exists makes it all the more imperative on the part of those who have the control of the motor-cars already in use to be extremely carefnl, for their own sake, how they risk creating a hostile spirit by running their cars at a higher speed than wonld seem to be consistent with the safe use of the roads by the ordinary public. A word to the wise is sufficient."

As an illnstration of how far the above-mentioned prejudices can go, the following paragraphs, which we reproduce from the current issue of our excellent contemporary, *The Road*, is worthy to rank with the records in which we read of some of the effects of the first introduction of steam locomotives:—

"A correspondent at Leamington sends me an amnsing description of a visit paid to that town a few days ago by a conple of motor-cars, which had rather a bad time of it. Leamington is a town whose associations and surroundings are eminently sporting, not to say horsey, and anything that does not in some form or other appertain to the friend of man can rely upon but a cool reception. How much more so, then, in the case of a stinking, snorting machine, which is so entirely opposed to the very existence of the horse? The advent of a motor-car in the streets of Leamington acts in pretty much the same way as a red rag does to a bnll. Hence the fnn which ensued when two particularly nasty specimens of the new road terror made their appearance there nnexpectedly.

"Snuffling, snorting, and quivering, the motor-cars pulled up—or rather waddled np—to the hospitable door of Mr. McGregor's well-known Bath Hotel—hospitable, that is to say, to all genuine users of the road. It is not necessary to dilate npon the ready welcome and pleasant reception awaiting travellers as a rule at the Bath hostelry; bnt a line mnst be drawn somewhere, and Mr. McGregor apparently draws it at motor-cars. The fact remains that he refused to accommodate these fearsome things anywhere near his premises, and, in view of the presence of people with sensitive nostrils, to say nothing of several horses not used to such things as motor-cars, the landlord cannot be held to blame.

"The motor-car passengers were furious, of course; but that fact weighed but little with Mr. McGregor, who keeps his livery stables *as* livery stables, and does not let them out as goods and locomotive sheds. So persistent were his unwelcome visitors, however, that the good services of the law in the person of a local policeman had, I am told, to be called in. By the time that the custodian of the peace arrived upon the scene the two motor-cars had moved on, much to the relief of the Bath Hotel proprietor, and to the intense amusement of a number of interested spectators, who had, by sound and smell—especially the latter—been attracted to the scene. If this sort of thing becomes common, special hotel and stable accommodation will have to be provided for motor-cars and motor-car passengers."

This all reads very prettily, but somehow we think should the story be true and the conduct of Mr. publican McGregor be brought before the licensing magistrates at the next Sessions this licensed victualler might find it difficult to explain the correctness of his views as to his obligations under the public-house license which he holds. Possibly the travellers, whoever they may be, will make themselves heard under the circumstances when the renewal of Mr. McGregor's license comes on. Licenses *have* been recently refused renewal for less offences than this, and it should be fully worth the aggrieved individuals' while bringing it home to persons of this sort that to continue to participate in the big profits obtained from being one in a monopoly is subject to the due performance of certain decent obligations to the public set forth under the license when granted to the publican. This type of person is growing so rich now by reason of this participation in a monopoly that some of them are apt to forget that they are still amenable to the law which imposes certain obligations and regulates the supply of refreshments, liquid and otherwise, to Her Majesty's subjects whilst travelling in her realm.

MR. KNIGHT ON MOTOR-CARS.

Mr. John Henry Knight, of Barfield, Farnham, recently gave a most interesting lecture on Motor-Cars, at Tongham (Surrey). Mr. Knight, while admitting that France had taken the lead in the matter of motor-cars, clearly showed that this was due to the silly prejudices of English landowners, &c., who stifled the invention of such motor carriages by making prohibitive road tolls for such. Just as railways were fiercely opposed, so were motor-cars, but with this difference in result—whereas the railway companies had large capital to back them up, and often had to bribe, the inventors of motor-cars had no such means of pushing their schemes. He had twice been fined for running his machine on the road. By means of a lantern, fitted with the new acetylene gas, Mr. Knight showed photographs of the various steam and petroleum gas motor-cars lately invented. He had himself been to France, and tested the various machines. The Serpollet steam carriage, which he described, was, he said, a most ingenious and safe invention. Petroleum gas, however, had proved superior to steam as a motive power, and many of the most satisfactory motor-cars were those worked by this gas. Several inventions were described and illustrated, and loud cheering was evoked when a photograph of Mr. Knight on his own petroleum gas tricycle, which he invented, was thrown on the screen. To conclude, Mr. Knight referred to the value which such motor-cars would prove to tradesmen, professional men, and others, when the expense of their construction became smaller.

A 300-MILE RUN ON A PEUGEOT PHAETON.

The illustration on this page is the Peugeot phaeton referred to by Mr. Wellington in his letter on page 284, taken immediately after the run of 300 miles.

Writing of this performance, a correspondent says that "some sensation was caused in Colchester by its sudden appearance, when Mr. Wellington took several gentlemen short trips, who pronounced the sensation agreeable as well as novel, and in giving general information stated that orders had already been placed for 500 cars, and that no fresh cars, therefore, could be undertaken for several months to come. One gentleman was driven to his home on the car, covering the distance—13 miles—including 20 minutes for stoppages, in five minutes under the hour, which, considering the state of the roads, was good. During this run two or three brewers' carts and coal wagons, that usually can never by any threat or persuasion be made to get out of the way of other vehicles, gave the occupants their blessing (?), and made a more rapid departure from the centre of the road towards the ditch or fence, as the case might be, than they had ever done before in their lives. The effect on the cottagers as the car passed along was curious. Some flew in precipitous haste to the interior of their dwellings and, clutching hold of the door-posts, looked on in wonder and fear. Others advanced with a broad grin, and looked as though they wanted to run behind. Boys invariably broke into loud laughter, and hurried after. So, altogether, the ride was pleasant, and made one ponder over the thought that perhaps by-and-by motor-cars will be as common as carriages are now, when roads would be like pavement, and everybody racing—no horses, no oats, no stables—and nothing to cloud the agricultural horizon but perhaps a few balloons in the sky!"

The Glew Tyre.—The necessity of having a special tyre for motor vehicles is already being realised by inventors, and Mr. Glew, of 40, Chancery Lane, is, we understand, about to place upon the market one of an improved cushion or noiseless type, especially applicable to road vehicles. On the score of economy, the rubber being covered by a steel shield, it is claimed that the durability far exceeds that of the ordinary plain rubber tyre, the saving in repairs being estimated at quite £6 per annum for each pair of wheels. The rubber being protected by the steel covering, a more virgin material can be used, thus securing a smoother movement, and to an extent reducing the vibration. These tyres are easily removed and replaced without having to call in a skilled wheelwright; they are free from suction in damp weather (which is a great consideration when an increase of draught power is difficult to obtain), are smart in appearance, and by Mr. Glew's arrangement the tyre is practically as noiseless as an ordinary plain rubber tyre.

NOTICES.

Contributions and articles likely to prove of interest to our readers will receive due attention, but in all cases the name and address of the writer must be given, not necessarily for publication.

All matter intended for publication should reach us not later than the 10th of each month. Stamped envelope must be sent if the manuscript is required to be returned. The Journal is published the middle of each month.

All Advertisements should be sent to the Advertising Department, F. King and Co., Limited, 62, *St. Martin's Lane, London, W.C., where Advertising Rates may be had on application.*

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SPECIAL NOTICE.

The Automotor and Horseless Vehicle Journal *can be obtained from all* Messrs. W. H. Smith and Son's *bookstalls, and the following Agents:—*

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When any difficulty is experienced in procuring the Journal from local newsvendors, intending subscribers can obtain each issue direct from the Publishing Office, by forwarding remittance of 7s. for 12 months' subscription, post free (or at the rate of 7d. per copy).

The Automotor and Horseless Vehicle Journal.

A RECORD AND REVIEW OF APPLIED AUTOMATIC LOCOMOTION.

APRIL 14th, 1897.

ANSWERS TO CORRESPONDENTS.

H. M. Bramall (Eastbourne).—(1) There are several books already published dealing with the subject you mention: "Autocars," published by Messrs. Whitaker and Co.; "Horseless Road Locomotion," by the same publishers; "Carriages Without Horses Shall Go," and "Power Locomotion on the Highway," publisher Wm. Gate (Limited). There are also several other publishers getting works ready upon the subject, including "Motor-Cars," to be shortly published by Crosby Lockwood and Son. (2) We are afraid there will not be many new types of motor-vehicles where you mention.

E. A. Walton (Derby).—Many thanks for your good wishes. Our endeavours are to maintain our success by absolute independence.

E. Hozier (Co. Wicklow).—We are not personally interested as owners of any motor-car patents. You will find plenty of names in the current and previous issues of our Journal, both in the text and advertising columns, to enable you to arrange agencies for New Zealand, &c.

D. F. D. (Liverpool).—It is perfectly correct that the British Motor Syndicate will very shortly have a good stock of motor-vehicles on hand. We refer you to the current issue of our JOURNAL for further information upon this point.

SHEADU (Tunbridge Wells).—(1) The address of the Wolseley Company is Alma Street, Birmingham. (2) We note your remarks, and our columns are always open to fair criticism. (3) Shall be glad to hear from you as suggested. (4) The address of the Roots' Petrocar is 100, Westminster Bridge Road, London.

R. F. HALL AND Co. (Manchester).—We are always glad to notice any real novelty, but make it a rule to examine personally first. Evidently your novelty is hardly as important as your letter implies, or you should have spared time to allow our special representative to inspect the article at your works when he called. You do not even supply section as asked. Under the circumstances your communication savours somewhat of endeavouring to obtain, with scant justification, a free advertisement.

POSTING (Norwich).—(1) Solicitors dealing with the matter can only tell you what the arrangement is. As you have shares and cannot obtain the return of your money, possibly it is best to hold in hopes of a better price; but the concern is hopelessly over-capitalised at the premium price. (2) This Company appears to be a *bonâ fide* concern, and is preparing to do considerable business, we believe. They have a really good motor, and we would recommend waiting before selling.

WM. SCHEU (Leeds).—(1) Our JOURNAL is published about the 15th of each month, and should be procurable not later than the next day by you. If ordered at W. H. Smith and Son's railway bookstall, you will always get it immediately. (2) Your query is too vague *re* French axles, as there are so many in use. In the present issue we illustrate Ackermann's very old steering system, which is probably what you refer to.

W. HUGGINS (Dundee).—The address of Mons. Serpollet is 13, Boulevard Malesherbes, Paris.

W. E. (Dewsbury).—Medhurst's gunpowder engine is described and illustrated in his Patent Specification, No. 2,431, A.D. 1800, which we are afraid is out of print, but may be inspected at the Patent Office Library, as well as at a good many other libraries throughout the country. The idea of using gunpowder for motive power engines is a very old one. The suggestions or schemes of Sir Samuel Morland, Jean de Hautfeuille, and others, all made in the seventeenth century, are described in some of the steam-engine text-books. The Patent Records contain a great number of inventions in this direction, but we do not know of any books dealing with the subject.

M. G. McCONNELL (Manorcunningham). — Mons. Serpollet's address is given above. For England you had better apply to Mr. G. Hopkins, 30, Parliament Street, London, S.W.

ALAN FARIE (Lanark, N.B.).—The address of the Wolseley Company is Alma Street, Aston, Birmingham.

RACROTOM (Tunbridge Wells).—We appreciate the points in your letter, but we prefer letters for publication couched in milder terms. We are not desirous of unnecessarily bringing ourselves within the Libel Act.

"STEAM-FOR-EVER" (Chipping Norton).—(1) The consumption is not actually known, but would be about 50 per cent. to 100 per cent. more than the oil used in the internal combustion engine of the ordinary oil motor. (2) Compound engines are not used.

EBOR (Liverpool).—(1) We do not know anyone making the Serpollet Section in this country, but you can obtain solid-drawn boiler-tube, other than Serpollet Section, from the Credenda Company, Spencer's, or Lloyd's, &c. (2) We would suggest your applying to Mr. Shrapnell Smith, 35, Botanic Road, Wavertree Park, Liverpool, who will be able to put you in the way of what you want.

W. H. WYBORN (Walmer).—The address of Messrs. New and Mayne is Palace Chambers, Bridge Street, Westminster, S.W.

ACETYLENE.

THE proverbial idiot who searches for a leak in a gas pipe with a naked light and generally succeeds in locating the leak and eternity at about one and the same moment of time would be well advised if he left acetylene severely alone.

Handled with ordinary intelligence and care acetylene is as safe as coal gas, but being an endothermic compound, that is one in the formation of which heat has been absorbed instead of, as is usually the case in the formation of chemical compounds, liberated, it is evident that its stored heat must be again set free when the gas undergoes decomposition, thereby adding considerably to the violence of its action, and as it only requires 2·7 per cent. of acetylene as against 8 per cent. of coal gas to render its admixture with air explosive, it follows that the "p. i." should rather depend upon his nasal organs than upon a lucifer when searching for a leak of acetylene.

Notwithstanding its being an endothermic compound the gas at any pressure up to two atmospheres, roughly 30 lbs. per square inch, is perfectly safe from any explosive action *per se*, as at these low pressures a high temperature, even up to that caused by the detonation of a charge of mercuric fulminate in the gas, simply causes a purely local decomposition, and any explosion so caused would not travel more than a few inches from the point of origin; but given the gas under higher pressures, such as obtains when compressed in the liquid state in cylinders, and the application of a red heat will cause an explosion of the whole volume of the gas, the moral of which is that experimenters should not store cylinders of the gas in close proximity to a stove or try to forcibly unscrew the cap of a supposed empty cylinder with a 4-foot lever, as the assistant to a well-known professor did, or they may find in their flight through space that v^2 by m, where m equals a 9-inch brick wall, is a quantity the value of which will interest them no more.

On the other hand, and with rational treatment, cylinders of liquid acetylene are, for all practical purposes, perfectly safe, as spontaneous decomposition and its attendant explosion will not occur until a temperature of close on 1,400° Fahr. has been reached, a temperature surely sufficiently high in itself, but which the timid layman can still further augment by 100° Fahr. for every 10 per cent. of coal gas with which he dilutes his acetylene.

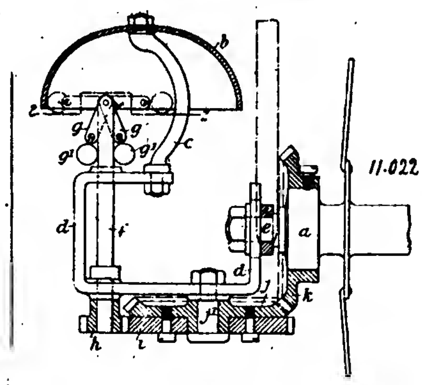
It having recently been proved that the gas will not form those explosive combinations with copper and the copper alloys with which it was at first credited, and that its noxious properties are not any more dangerous than are those of ordinary coal gas, it only remains to warn those of our readers who may contemplate going in for acetylene that the calcic carbide made in England is much purer than that which is imported, and though the British product is a trifle dearer to buy the yield of gas per unit of weight is higher.

Regarding the use of acetylene for motor purposes we have, unfortunately, very little available data, but the following comparative figures may be of service to those interested in the subject. It attains its maximum explosive force when the volume per cent. of acetylene in the air is 7·8. The ignition temperature of the gas is 896° Fahr., or just 20 per cent. lower than that of coal gas, while its heat value in calorics is about two and a half times that of the latter gas. Tested in a two horse-power gas engine, with double-acting cylinder, it was found that 28·4 cubic feet of acetylene per hour gave 2·48 indicated horse-power, the same engine requiring 85·3 cubic feet, or almost exactly three times the quantity, of coal gas to produce the same amount of power. Used as an illuminant it is about 20 times more powerful than coal gas; one cubic foot of the liquid gas sufficing to supply a 16 candle-power burner for no less than 800 hours.

Messrs. Cohendet and Co., 166, Quai Jemmapes, Paris, are building an acetylene motor to the design of M. Raoul Pictet. The motor will have three cylinders, and will be 10 horse-power.

SPEED INDICATOR.

A novel arrangement for giving an audible indication that the speed limit has been attained is shown herewith. The action of the apparatus is of course due to the fact that the arms, g, g, are caused to fly out centrifugally when the speed of the spindle, f, reaches the predetermined point. This causes the hammer, g', g', to strike the gong, b, so warning all concerned of



the speed at which the vehicle is moving. The other details are sufficiently clear, a being the hub of the wheel to which the apparatus is attached, the gong, b, being mounted on an arm, c, rigidly bolted to a bracket, d, secured to the axle, e, on which the hub rotates. Mr. John Clements, of 360, Coldharbour Lane, Brixton, is the inventor of this signalling apparatus.

LAW REPORTS.

The Dublin Pneumatic Tyre Deal—Dunlop v. Maccabe—Judgment for the Plaintiff.

Judgment was given on the 18th ultimo in Dublin, by the Vice-Chancellor, in the case of Dunlop *v.* Maccabe, which involved a sum of £10,500, and which was at hearing for nearly a week. The plaintiff, who is the inventor of the Dunlop tyre, sought a re-transfer by the defendant, Dr. Maccabe, to himself, of any of 2,000 shares in the Pneumatic Tyre Company undisposed of, which the plaintiff charges that the defendant obtained to make sale of and re-transfer as his agent. The plaintiff further charges that the defendant obtained the execution of the transfer and legal ownership of the shares by fraudulent representations and fraudulent concealment. An account of defendant's dealings with the shares was sought, and also damages. In giving judgment in favour of the plaintiff, the Vice-Chancellor went carefully over all the facts deposed to in the evidence. Regarding the interview between plaintiff and defendant, his Lordship said there was, of course, a direct conflict of testimony as to what passed between them then; but, in weighing their evidence, he could not give the same credit to the men who formed the deliberate purpose of what he must designate as defrauding the plaintiff out of his shares, as he did to the plaintiff, who appeared to have acted honestly in this transaction. The defendant had difficulties to contend with in proposing to the plaintiff the purchase of 2,000 shares. He dared not tell the plaintiff that it was by the advice of Du Cros that he was offering to purchase, or that Du Cros was to lend him the money for the purchase; for the plaintiff would have at once seen that there was more in the matter than an ordinary purchase. He now came to a very grave portion of the case, namely, the transaction about the letter of Du Cros to the defendant, written on the morning of 29th March. That a letter was written by Du Cros to the defendant, which was produced by the defendant to the plaintiff on the Sunday morning, was undisputed; but there was a very great controversy as to its contents. The letter was not forthcoming, and it was the only document that was not forthcoming. The defendant said he kept this letter in his pocket for about a week and destroyed it, as he considered it of no value. He could not credit this statement. He knew well he had produced it to the plaintiff for the purpose of inducing him to sell his shares. He gave it to him to take upstairs to show his wife, in order to overcome her advice to her husband not to sell. This was not a letter which a person like the defendant would be likely to keep for a week in his pocket, and then destroy as of no value. But that was not all. The defendant must have known it would have been of great importance to his case to have something more than a mere verbal statement from memory of the contents of such a letter, and accordingly a document was prepared by Du Cros, at the instance of defendant, and described as a memorandum of the letter. It appeared that it was prepared in the month of September, which was after this action was brought. There was a very serious contradiction between the parties as to the true contents of the letter, and it was important for the decision as to which version was the true one to bear in mind the relative positions of the parties when it was written. He could not account for the great haste of Du Cros in writing a letter merely for that purpose on Sunday morning, and sending it by his servant on horseback to the defendant. But that letter was not so compiled, no matter which version was the true one. There was evidently something more to be communicated, and so the letter showed. It seemed an extraordinary coincidence that a letter should be despatched in haste by Du Cros to the defendant unsolicited, which should come to the defendant's hands exactly at the time he wanted it in order to work on the plaintiff. It was difficult to believe that some communication did not pass between the defendant and Du Cros which led to the writing of that letter. As soon as the defendant got the letter he took it with him to the plaintiff's house and showed it to him. The plaintiff took it up to his wife, who was unwell and in her room, and the result was that the bargain between the plaintiff and defendant was closed. He had no doubt that it was the production of this letter that induced plaintiff to sell. He was satisfied the letter produced to the plaintiff, and shown by him to his wife, was understood by both of them as showing the opinion of Du Cros that as a matter of prudence it would be well to sell the shares at £7, and that it produced the intended effect, and induced the plaintiff to agree to sell them to the defendant. This established the second case of fraud relied on by the plaintiff. After going fully into the other matters in the case, his Lordship, in conclusion, held that the defendant had been guilty of fraud and misrepresentation, and declared that the sale by the plaintiff to the defendant of 2,000 shares in the Pneumatic Tyre Company was procured by the fraud of the defendant, and adjudged him to pay to the plaintiff all profits realised by him by resale or other dealings in the shares, and directed an account of such profits, with interest at 4 per cent. He should adjudge the defendant to pay all costs. A stay was put on the order, pending an appeal, the defendant to lodge £5,000 within a fortnight, and a further sum of £2,500 within an additional week, the defendant to speed the appeal.

Cycle Components as a Monopoly.

In the Court of Appeal, on the 31st ultimo, before Lords Justices Lindley, A. L. Smith, and Rigby, Mr. Fletcher Moulton, Q.C., with whom was Mr. Walter, appeared on behalf of the Cycle Components Manufacturing Company (Limited) in support of an appeal from a decision of Mr. Justice Kekewich, refusing to grant an injunction restraining the Standard Weldless Tube and Cycle Components (Limited) from trading under their present title, or from in any way using the term cycle components as a part of their title, or in a way calculated to deceive the public into believing that the defendants were connected with the plaintiff company. The defendants relied upon affidavits, showing that the words objected to were used by many firms; and Mr. Justice Kekewich, without calling upon the other side, gave judgment in their favour, remarking that the case illustrated the anxious desire of many people to appropiate a bit of the English language. There seemed to be no reason why the defendant company or any other company should not manufacture cycle components, and why, if they did so, they should not state so. Their Lordships now upheld the decision in the Court below, and dismissed the appeal, with costs.

Company Promotion.

On the 1st inst., before Mr. Justice Bruce and a special jury, the case of Evans *v.* Hart was an action brought by Mr. Edward Jones Evans, a member of the Bristol Stock Exchange, against Mr. William Hart, to recover £787 10*s.* alleged to be due to plaintiff on a letter signed by defendant on June 9th last. Defendant admitted the letter, but said it did not contain the true contract.

Lord Coleridge, Q.C., and Mr. Ernest Pollock appeared for the plaintiff; while Mr. Dickens, Q.C., and Mr. A. J. David represented the defendant.

Lord Coleridge said in June last a Company was to be floated called the New Beeston Cycle Company, with a capital of £1,000,000, and the chief promoter was Mr. H. J. Lawson, who, being anxious to introduce the matter in as large and wide a manner as possible, selected the plaintiff to act for him in the West of England. Mr. Lawson consulted with the plaintiff as to engaging a broker to act for him in London, and the plaintiff selected the defendant, whom he had known as a broker on the London Stock Exchange for many years. Mr. Lawson engaged the defendant, and agreed that in consideration of the defendant permitting his name to be used in connection with the prospectus of the Company as the London broker, and pushing the business amongst his clients, to pay him, within one month of the Company going to allotment, a fee of 2,000 guineas, together with the usual commission of 5*s.* per share in all shares allotted to his clients. On the same day the defendant handed the plaintiff a letter agreeing to pay him 750 guineas out of his fee as soon as he received it. The defendant, being unable to get the amount of his claim, issued a writ against Mr. Lawson, and the case was settled, the defendant receiving 1,500 guineas and £500 in shares. The defendant, in a letter to his solicitor, asked if he should pay the plaintiff 25 per cent. on the first half of the 1,500 guineas, 50 per cent. on the second half, and his proportion of the shares, and these sums, when totalled up, came within a shilling of the sum now claimed. The plaintiff would be quite content to take this sum, and would make the defendant a present of the shilling. (Laughter.)

Mr. David: Such generosity overpowers me. (Renewed laughter.)

The plaintiff was then called, and bore out the opening statement of counsel.

Mr. David, on behalf of the defendant, submitted that under the agreement the plaintiff was only entitled to recover a proportion of the compromised sum, seeing that it was a reasonable and proper thing to compromise the action, and that he had been offered £525 as his proportion.

The jury found for plaintiff for the amount claimed. Judgment accordingly.

Underwriting Motor Shares.

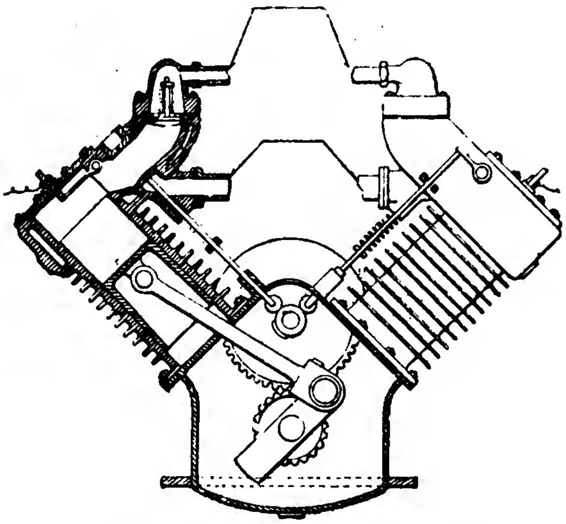
On the 1st inst., in the London Lord Mayor's Court, before the Common Serjeant (Sir Forrest Fulton, Q.C.) and a jury, the case of Gamage *v.* Marshall was disposed of. The plaintiff, Mr. A. M. Gamage, athletic outfitter, sued the defendant, Mr. Marshall, to recover the sum of £20, and damages, for breach of an underwriting contract in the London Electric Omnibus Company. According to counsel's statement, early in last year the defendant was bringing out the London Electric Omnibus Company (Limited), and an arrangement was made with the plaintiff by which, in consideration of his underwriting 400 of the shares, he was to receive 5 per cent. in cash and 10 per cent. in fully paid up shares. Under this contract the plaintiff had had to take up 160 shares. There was at the time a boom in this class of shares, and if the plaintiff had had delivery he could have sold those due to him for commission at a premium, as he had done those taken up by him. At the present time the shares were practically unsaleable. After hearing counsel for the defendant, the learned Common Serjeant said the case was practically undefended, and the only question was that of damages. Eventually the jury returned a verdict for the plaintiff for £66 5*s.*, including a sum of £20 paid into Court by the defendant.

A lecturer at Dover College, who appears to be a humorist, has amused his audience considerably by the conjugation of a new verb. It is worth recording, especially as the spirit of the joke is equally applicable to the acquisition by a novice of a fresh young horse and cart, or a timid learner of the bicycle. Life was too short, he said, for such sentences as "I am going to ride my motor-car this morning." There had long been the verb to "bike"; there must now be the verb to "mote." The active voice, present tense, ran somewhat thus: "I mote, thou stokest, he looks out for the police, we're getting on, you run us into a lamp post, they pay the damages." The imperative ran: "Mote me by moonlight alone," and "Mote ye, or perish in the attempt." The present subjunctive was: "I may mote, thou mayest buy me a motor, he may think better of it."

THE MORS MOTOR-CAR.

One of the most conscientious French engineers endeavouring to produce a perfect motor-vehicle is M. Emile Mors, of 48, Rue du Théatre, Paris. In a recent interview with the representative of *The Engineer* he gave some interesting particulars of his latest type, which we illustrate, as being of value to workers for an ideal car in this country. M. Mors's present carriage is fitted with a water reservoir under the fore part of the carriage, the water circulating through a coil of ribbed cooling pipes.

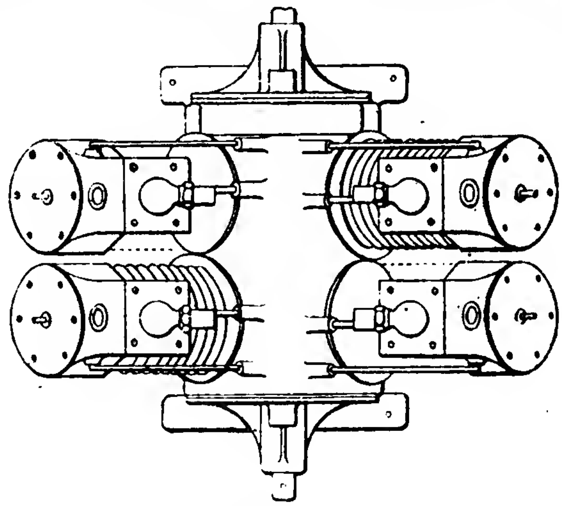
The motor is composed of four cylinders inclined in pairs at an angle of 45 degrees, the pistons working on a single crank. While one pair of pistons is compressing the gas mixture the other pair is performing its active stroke, so that the crank receives two thrusts at each revolution. By this arrangement the motor is able to run very steadily, and there is said to be an almost entire absence of vibration when the transmission mechanism is thrown out of gear. Above the crank is a distributing shaft geared down to half the speed by pinions, and this shaft carries cams for actuating the valves, which are enclosed in the upper part of the ribbed cylinders, and the electrical igniters. Each cylinder has an inlet valve opened by simple pressure; the exhaust valve is operated by a rod, one end of which presses on a cam on the distributing shaft. As the piston makes its downward stroke a volume of air, which has been carburated in a special apparatus, is drawn through the



valve, and is compressed by the piston making its upward stroke, and then exploded by electricity. The piston is thus driven forward again, and at the moment of returning the cam on the distributor opens the exhaust valve and allows the piston to expel the burnt gases. The electricity is provided by a small dynamo driven by friction by the fly-wheel and generating enough current to explode the mixture and keep the accumulator permanently charged. The accumulator is only employed for starting the vehicle. The current from the dynamo passes through an extra-current bobbin, and is conveyed inside each cylinder where a "breaking spark" is produced by means of a couple of pallets and an insulated rod, the pallets being operated by cams on the distributing shaft. This spark is certain and instantaneous in its action, and all danger of erratic explosions is said to be avoided.

The carburator is of a special type invented by M. Mors, and is intended to provide a perfectly regular supply of gas mixture for the engine, so as to prevent the dangers incidental to such appliances where the supply of mixture is liable to be in excess of the needs. The spirit flows by a pipe into a receptacle in which there is a float. When the spirit reaches a certain level, the float rises and shuts a valve, thus cutting off further supplies until the level of the spirit in the receptacle again drops, when the valve is of course opened. From this receptacle the spirit flows up through a pipe into an atomiser in the shape of an inverted cone, and a quantity of air equal to that represented by the downward stroke of the piston enters through a pipe and mixes with the spirit. The quantity of air admitted and the density of the mixture may be regulated with the greatest nicety by means of screws.

The crank of the motor is geared on to the countershaft by bevel pinions, one of which serves for the forward movement and the other for reversing. Leather belting transmits the power from the countershaft to the driving axle, and the speed



is varied by moving the belting on to one or other of the pulleys. The mechanism is thrown out of gear by a pedal, and another acts on the brake with such force as to stop it almost instantly. The carriage complete weighs only 570 kilos., and, running at from 300 to 1,600 revolutions a minute according to needs, the motor will, it is stated, give nearly 6 horse-power on the brake.

The vehicle will attain speeds of 19 miles an hour on the level, and will climb gradients of 12 per cent. at 6·5 miles an hour. It is claimed that once the carriage is started it will run for 10 hours without its being necessary to renew supplies of water or petroleum, or to pay any attention to the machinery. The oiling is done automatically; in fact, the whole carriage has been designed to avoid the necessity of any attention being given to it once the engine is started. M. Mors is about to carry out extensions to his works so as to be able to build his new vehicles on a large scale, and he hopes in a month's time to be able to start delivering them, having already taken orders for 240 carriages.

BUSINESS NOTES.

The British Motor Syndicate have taken the ground floor premises at 40, Holborn Viaduct, which have hitherto been occupied by the Daimler Motor Company, and purpose using them as a show room for their carriages. The Daimler Company have removed their head offices to Nos. 219 to 229, Shaftesbury Avenue, W.C.

Messrs. Conze and Simon have taken into partnership Mr. Herbert Berry, who lately represented Messrs. Siemens Bros. and Co. (Limited). The name of the Company has been altered to Simon, Berry, and Co., and all debts due to Conze and Simon will be taken over by the firm under the new style, and likewise all liabilities will be paid by the new partners. It is their intention to conduct the business upon the same lines as heretofore.

We regret to hear that, a few days after going to press with our last number, a serious fire occurred at the works of Messrs. Peugeot of Lille (France). We understand this will not interfere with the business of the firm, and that fortunately practically no serious injury was done so far as the Motor-Car Department is concerned.

The Secretary of the I.E S. Accumulator Company (Limited), notifies that the head offices of the Company have been removed to 78 and 79, Palace Chambers, Bridge Street, Westminster, London.

The London Electric Omnibus Company (Limited) intimates that Mr. F. S. Tomkins has been appointed the Secretary of the Company, and that the registered office of the company is now No. 6, Northumberland Avenue, Charing Cross, London, W.C.

The Tubeless Pneumatic Tyre and Capon Heaton (Limited) has, we understand, served the Trench Tubeless Tyre Company (Limited) with writs for infringements of its patents.

Messrs. J. and C. Stirling, of the Hamilton Carriage Works, Hamilton, N.B., are now prepared to accept orders for their motor dogcarts, stanhopes, victorias, wagonettes, and vans, for delivery in April, May, and June, and will shortly issue a catalogue. They use the Daimler motor.

A new motor-car wheel and special puncture-proof tyre for light and heavy weights under any pressure of inflation is about to be placed on the market by the Aquinas Cycle and Motor Company, Aquinas Street, London, S.E. The actual patentee is Mr. J. D. Stidder, and from the special designs which we have had the pleasure of inspecting we gather that the invention consists of new ball hubs with self-containing oil chambers, which can easily be taken off and on the axles, it being rendered practically impossible for any dirt or grit to pass on the inside. There is also a provision for oiling and for regulating the oil to a given height in the chamber, with a waste draw-off when it has done its duty. The driving wheel hub and ball box are of a rather novel construction, and are easily taken apart or refitted, and in order to avoid vibration are worked in slides. The wheels can be made of iron or wood, and the fellies are secured by being pressed to the tongue of the spokes and by having a spring socket with a screw dowel, the end of the tongue expanding so that it cannot disconnect itself from the felly; for repairs you simply unscrew the expanding block and the fellies can be taken off without damage. The tyres, Mr. Stidder claims, are inflated with a new mode of action, and are specially adapted for carrying heavy weights, being unpuncturable. Mr. Stidder also has another solid form of tyre, which is attached on short lengths of steel bands of a particular section, and in case of any damage to one part it can be set right by removing one connection and replacing it by a new section of tyre of any length required.

REVIEWS OF BOOKS.

"Horseless Carriages." By J. E. Tuke, Burleigh Villa, Harrogate. Price 6*d.*

This is a carefully put together little pamphlet, written by the author with the idea that it might prove useful in giving some information about horseless vehicles to those whose curiosity is large and whose practical knowledge is small. In about 24 pages Mr. Tuke has given well condensed particulars of the ancient history of Self-propelled Vehicles, the present position of steam, oil, and electricity, whilst the text of the new Act, and hints on the management and use of oil motors, brings the booklet to a close.

The British Motor Syndicate have issued what they call their "Monthly Trade Circular," which appears to be made up of a review of the present position of the Company. From a trade point of view the title of this latest production of the "B.M.S." is a misnomer, as for all practical purposes there is nothing of interest to the trade. The document chiefly deals with the financial position, prospective dividends, and price of shares, &c., and we think it would be more to the point, if the intention of publishing this document regularly is adhered to, if there were a little less detail emanating from the finance department, and a little more information likely to be useful to members of the trade, who are desirous of assisting in securing part of the coming motor-car business.

We are in receipt of the current number of the "Coachbuilders' Art Journal," from Messrs. J. and C. Cooper, of 64 Long Acre. We are glad to notice that this excellently got up journal is taking the motor-car building seriously in hand from the coachbuilder's point of view. There is no doubt a big scope for the practical coachbuilder to join hands with the engineer in turning out a perfect vehicle, and we trust that the leaders in the trade will in every way assist to that end, setting aside all prejudice. It certainly will not be the fault of our contemporary if this does not come about, and amongst several well-produced plates given with the issue is a charming design for an elegant park motor-car.

A motor-omnibus, constructed to carry about six persons, was placed on the streets of Birmingham last week by the Birmingham Motor-Omnibus Company. Several journeys between Colmore Row and Five Ways, and between New Street and Five Ways, were made; but as the vehicle had not received its formal license from the Watch Committee, the driver was unable to pick up the crowd of would-be fares who crowded up to take their places.

THE NEW-MAYNE ELECTRIC RUDDER-MOTOR.

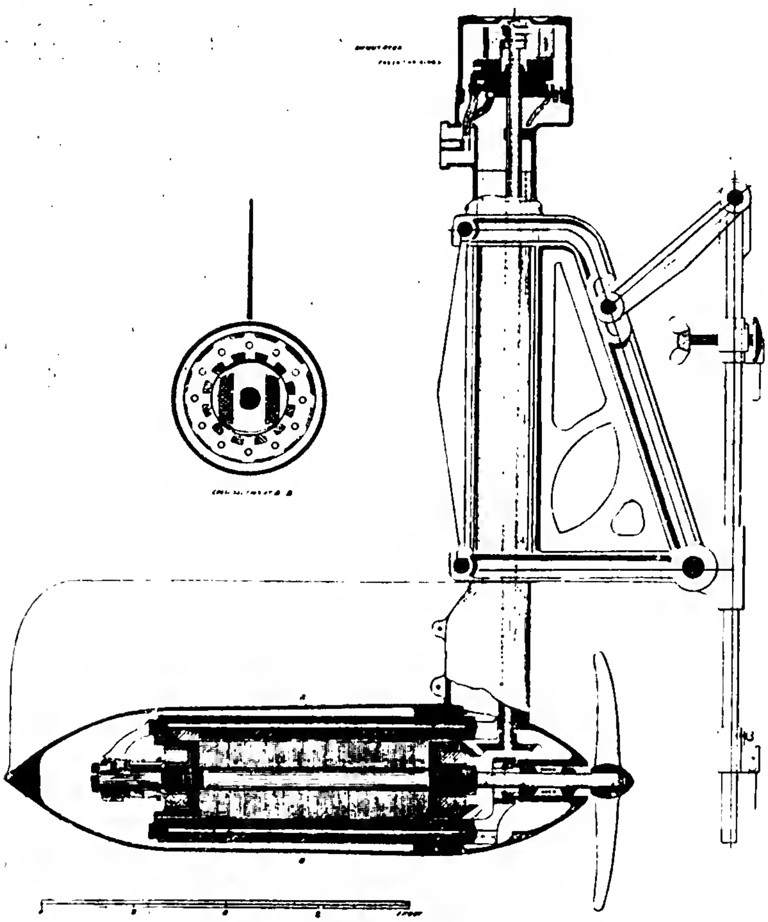
An ingenious method of adapting an electric motor to the propulsion of a boat, without in any way interfering with the structural arrangements of the same, is shown in the accompanying illustrations.

The New-Mayne rudder-motor is not by any means an innovation, but the 1897 model contains so many improvements as to render it now practically perfect. In the new type the efficiency of the machine has not only been greatly increased, but the weight of each size has been considerably reduced, while at the same time the insulating properties have been enhanced by a special patented process, so much so that no breakdown takes place, even though water should leak into the motor case as the result of any collision or careless handling. Further additional improvements allow of the commutator and brushes being inspected while the motor is running, which, as now arranged, it will do for long periods without lubrication.

As will be seen from the part sectional elevation the motor rudder is fitted to an adjustable frame, and this is attached to the stern of the boat in the ordinary manner, and all the bearing surfaces being ample there is no vibration, the frame being held perfectly rigid by two small pads pressed against the stern of the boat by thumbscrews. The propeller moving as it does away from the keel line of the boat, adds greatly to the steering qualities, but as the rudder area is made sufficient by means of the fin above the motor case, the rudder answers in the ordinary way when sailing or rowing. Electrically the motor is peculiar, in that the field magnet revolves within the armature, and drives, by means of bevel gearing, a vertical shaft, by which commutation is effected in the manner shown, the connections from the sections of the armature being taken up the interior of the supporting tube to the segments of the commutator, which is fixed near the top of the vertical shaft. The commutator is stationary and the brushes revolve. This arrangement does not prevent a fairly high electrical efficiency being attained. The necessary current is supplied from secondary cells, the motor being controlled by a regulating and reversing switch. Electrical connection between the switch and motor is made by means of the rudder lines, which terminate with metal plugs, and these fit into sockets provided on the switch.

The motors are listed from half horse-power to two horse-power, but can be made to four horse-power, the weight of a one horse-power motor rudder, exclusive of batteries and switching gear, being 110 lbs.

Ordinary Boat Fitted with New-Mayne Rudder-Motor.



Sectional Elevation of Rudder and Motor.

A New Lubricant.—A serious difficulty which arises in the use of motor-cars is the necessity of having a first-class lubricant, it being essential that the body should be just sufficient to keep the rubbing surfaces apart and prevent abrasion of the metal, whilst the flashing point should be very high in consequence of the heat, and in the case of acid being present, corrosion of the metal must necessarily follow. We understand there are several firms at the present moment who are endeavouring to meet these special requirements, and we have just received from the Britannia Supply Company, of 49, Lime Street, E.C., a sample of a special oil which they are about to place on the market, for which they claim that the flashing point is from about 350° to 400°, and that, in regard to the body and its freedom from acid, they are prepared to guarantee their commodity as fully meeting the requirements in both cases. They also appear to have got over the difficulty of the residue which remains in the cylinder, thereby clogging the engines, as the Britannia Motor Oil is a pure petroleum product instead of the usual made-up oil.

A PRESTON MOTOR-CAR FACTORY.

Striking evidence of the commencement of the new era in locomotion is afforded by a visit to the works of Messrs. T. Coulthard and Co., Preston.

This well-known firm of engineers has taken up in earnest the construction of automotors, having erected large works, well supplied with special tools for this purpose.

Messrs. Coulthard have in hand several vehicles fitted with "Pennington" motors. One of these, shown in the adjoining illustration, is a motor-car built, we understand, to carry eight or nine passengers and a ton of luggage. The car is fitted with a 16 horse-power Pennington motor and carries two tanks of 50 gallons capacity for supplying the motor with oil and water. Messrs. Coulthard are building several of these cars for the West Australian Freight and Express Company, of Southport, for use on the goldfields of Western Australia. An interesting feature in this vehicle is the dispensing entirely with carriage springs by the use of wheels built upon cycle lines with ball bearings, and fitted with 9-inch pneumatic non-puncturable tyres. These tyres, attached to one of the above-named cars, have been very thoroughly tested by Messrs. Coulthard over very rough ground, and have been found to give entire satisfaction.

Another type of carriage, and one which has apparently an important future before it, is the "*Lancashire*" autocar, shown by the annexed illustration, the design of which has been registered by Messrs. Coulthard.

This car has been specially designed to meet the requirements of those who desire a light, compact, yet strong and durable vehicle for ordinary use. The "Lancashire" is fitted with a powerful Pennington motor, having two different speeds, as well as a reversing motion.

The body is hung on springs, rendering it quite independent of the frame which carries the motor and gearing. In consequence of this, the vibration of the motor is taken up by the special arrangement of springs, instead of being communicated to the carriage body and its occupants.

A very different kind of vehicle, also built by the firm, in striking contrast to the last-named, is a large freight wagon, to carry a load of 10 tons, and fitted with a motor of 25 horse-power.

We gather from Messrs. Coulthard that they have some difficulty in satisfying the demands of customers for quick delivery, as the latter do not sufficiently recognise what a variety of points in this new industry have to be carefully considered, tested, and approved before being carried out in the construction of the vehicles to ensure their giving entire satisfaction.

The majority of the public, which does not understand the practical side of motor-car building, expected to see thousands of these vehicles overrunning the country within a week of the passing of the new Act, imagining that they could be turned out at a moment's notice. Hence the mistaken idea amongst the ignorant that the motor-car boom is a thing of the past. It will not be long now, we think, before they have a sharp awakening, and it is as well for the future of the industry that the new vehicles have not been "rushed" in manufacture, but have been delayed by the various makers like Messrs. Coulthard and Co., who, having a reputation to lose, are determined that what they do deliver shall not impair it.

The Motor Mills, Coventry.—The confusion as to the ownership of the Motor Mills, Coventry, is, to a certain extent, explained by a letter addressed by Mr. E. T. Pennington to the Dublin Press. In it he states that these mills are the property of the Great Horseless Carriage Company, and they at present occupy the first story, recently used by the Humber Company, and the third story; while they rent the second story to him at £400 per annum, for the manufacture of the Pennington motors, and the fourth story to the Beeston Tyre Company. Then, on the ground floor, brick extensions have been erected which are used for the works of the Daimler Company. The Motor Mills have a 300 horse-power steam engine, which is arranged to drive the shafting on the different floors, by means of rope transmission. While this power can be utilised, Mr. Pennington at present does not use it, as he prefers to drive his works by means of his own engines. We understand the prospectus of the new Irish Company to carry on Mr. Pennington's works in Dublin will be issued in a few days.

Self-Propelled Traffic Association.

(Incorporated by Special Licence of the Board of Trade, under the Companies Acts, 1862 to 1890.)

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ANDW. W. BARR, 30, Moorgate Street, London, E.C.

Some of the objects for which the Association is established are:—

To originate and promote improvement in the Law from time to time directly or indirectly affecting self-propelled locomotive road traffic, and to support or oppose such Law, and for the purposes aforesaid to take proceedings as the Association may deem expedient.

To popularise and assist the development of self-propelled vehicular and locomotive road traffic, and for this purpose to take such steps and proceedings as the Association may deem expedient.

To take or defend any proceedings on behalf or against the Association or its members, which in the interests of the Association or the members thereof may seem to the Association expedient to take or defend. Provided that no such proceedings shall be taken or defended on the part of the members of the Association except in the *bona fide* furtherance of some object of the Association of a public or *quasi* public nature.

To promote the scientific knowledge of the construction and propelling of all kinds of self-propelled vehicles or locomotives, by means of competitions, exhibitions, by giving of prizes, or in such manner and on such conditions as may be found desirable.

Subscription ... ... £1 1s. per annum.

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Hon. Local Secretary	E. SHRAPNELL SMITH, Esq.
Semi-Official Journal of the Association	THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

THE Honorary Secretary of the Self-Propelled Traffic Association (Liverpool and district centre), Mr. E. Shrapnell Smith, has been elected a member of the special light railway committee of the Liverpool Incorporated Chamber of Commerce. This body is making an exhaustive inquiry into the question of improved means of transit for goods between Liverpool and the manufacturing towns, and it is satisfactory to know that so energetic a gentleman as Mr. Shrapnell Smith is a member of the Committee, as the claims of motor-wagons, &c., on the road can be safely left in his hands.

AN EARLY MOTOR-CAR.

By J. H. KNIGHT.

THE steam-carriage shown in the illustration was made in the years 1868-1870. Originally it was fitted with a single cylinder, 5 inches by 7 inches, driving the road wheel, or rather one wheel only, by a pitch chain geared as 1 to 6. With the single cylinder it was found very difficult to start on rising ground, and after running some months was altered; two cylinders, 5 inches by 7 inches, were put in, but the gearing reduced to 1 to 4. This was a great improvement, but after some time the boiler, a vertical multi-tubular, gave trouble; there was great difficulty in keeping the tubes tight, and it also gave trouble through priming, therefore it was altered to a Field boiler.

The steering wheels, 2 feet 8 inches diameter, were only about 2 feet gauge. Steering was done by a tiller, but the arc through which the tiller moved was twice that of the steering wheels; this gave the steersman good control over the steering.

The weight empty was about 32 cwt., three passengers sat on the seat side by side, a fourth (making a fifth with the stoker) was sometimes carried on the firing platform. On fair roads about eight miles an hour was maintained. The engines were far from economical, and used more fuel and water than they should have done. Water for about six or seven miles was carried in a tank under the engines. Coal for about 18 miles was carried in a bunker at the back.

Looking back after 25 years, it is easy to see what mistakes were made in construction. The slide valves and pistons were not easily accessible, and, after a short time, became leaky and wasted steam. The boiler was unnecessarily heavy; it would have been improved by a fire-brick baffle in the fire-box; a feed-water heater would have been a considerable help. If the boiler had been stoked carefully and with a thin fire, doubtless better results would have been obtained. A very sharp blast was required, and it was impossible to burn coke so a soft coal was used and, consequently, there was a great quantity of smoke at times. If the boiler primed (and the original boiler would sometimes suddenly prime for a few minutes), the passengers were covered with a black rain. Many of these difficulties were overcome, and in 1870 and 1871 some very good runs were made. A hill about three quarters of a mile in length, with one sharp rise of 1 in 11, was ascended on three or four occasions. After using the steamer for three or four years it was sold and converted by the purchaser into a small traction-engine.

In the early seventies, although the red flag Act was in force, the writer was only once stopped by the police, and then only name and address demanded. This caused a rather amusing rumour. Some passer-by who had seen the police inspector stop the carriage reported that the passengers had all been arrested, handcuffed, and walked off to prison; a few miles further on a breakdown occurred which delayed the return of the steamer till late at night, and this report was in some instances really credited.

On one occasion what might have been a very serious accident was avoided; a pin came out of one of the levers in the steering gear, the carriage turned sharp round and ran through the hedge; if it had turned to the right instead of the left it would have gone down a steep bank some 5 or 6 feet high into a pond, and most probably would have turned over on the slope.

An Early Motor-Car.

Another time the chain broke and the carriage ran away down a long hill, and was only stopped by running it into the bank, with no further damage than smashing the steering handle and carrying off a few yards of fencing.

The pressure at first carried was 110 lbs. and to get up any fair incline at least 100 lbs. was required; if a stop were made on the slope to allow a restive horse to pass the safety valve would immediately commence blowing. Once, on meeting a regiment of cavalry, after a few of the horses had passed by the valves began to roar, so the stoker was compelled to hold them down till all had gone by. But when the two cylinders were put in the pressure on the road was kept at 80 lbs., so there was a large margin left before the valves lifted.

Justice Romer last week sanctioned a petition by the Burnley and District Tramway Company (Limited) for the confirmation of special resolutions enabling the Company to add to its memorandum of association power to run motor-cars and omnibuses as well as tramcars.

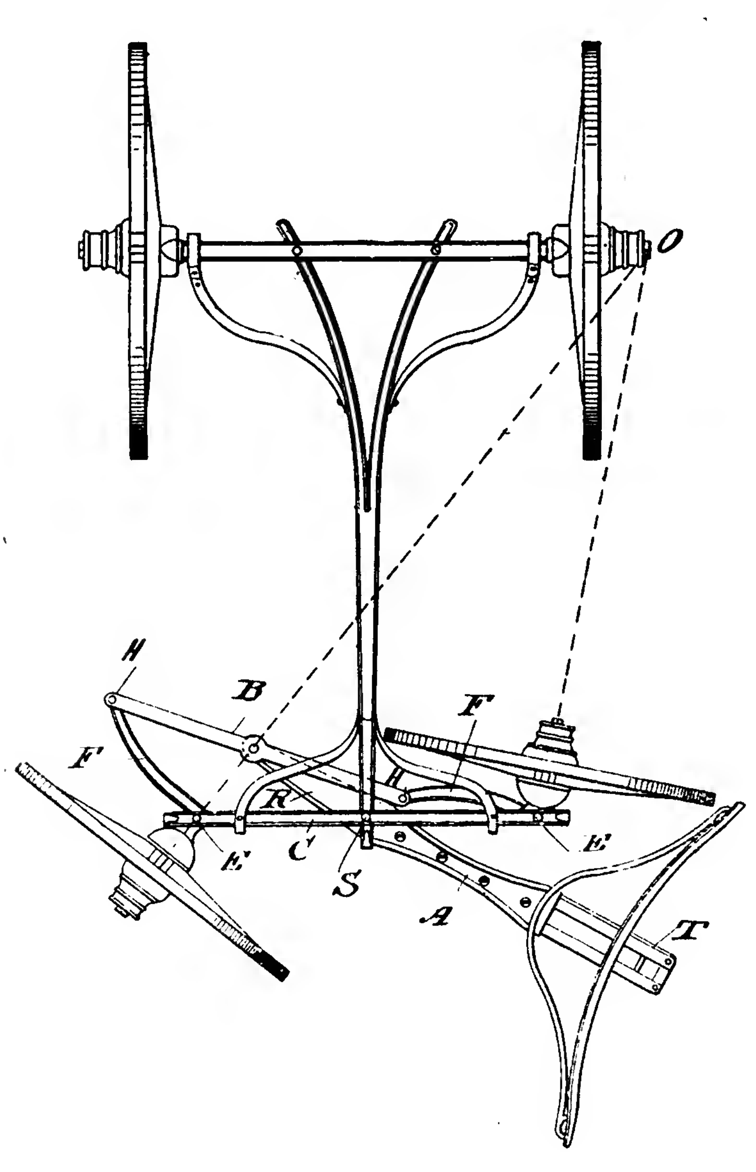
MR. BRUFORD ON AUTOMOTORS.

At Hinckley, on March 27th, the subject of Horseless Carriages was dealt with by Mr. G. J. Bruford in an illustrated lecture. The Rev. D. Stephens, before introducing the lecturer, called attention to the enormous strides and changes during the Victorian age that had come over our methods of locomotion. Sixty years ago, people who could not afford to maintain a large establishment and keep horses and carriages had to walk, as nature originally intended they should, but such an important development had since taken place with regard to locomotion that nowadays nearly everybody rode cycles, and probably in the near future motor-cars would come into general use. The commencement of the Victorian era was marked by a period of carriageless horses; to-day we had horseless carriages. Mr. Bruford said he claimed that in time the autocar would prove the greatest benefactor to the overworked quadruped, which was more often treated as the poor slave of man. He pointed out that one of the most prominent and practical horseless carriages now produced was made in Coventry, where large factories had been acquired for the manufacture of this latest form of conveyance. Electricity was what they had to look to as the ideal power for propelling these vehicles, but the chief difficulty at present was the storing of the electricity. The lecturer also pointed out that nearly every autocar which had been running in this country up to the present time was made abroad, with the result that English money had gone elsewhere. Now, however, large factories in Coventry and other places were as busy as they could be in bringing out these vehicles, so that they would see more and more of them every week.

Before the Sheffield Society of Engineers and Metallurgists, at the Technical School, on Monday evening, the President, Mr. T. W. Sorby, in the chair, Mr. Wm. Cleland, M.I. Mech. E., gave a lecture on "Motor-Cars, or Horseless Carriages." The lecturer gave a short historical account of the motor-car, described in detail the different kinds of motive power and motor employed, the different methods of transmission of the power to the driving wheels, &c., concluding with an account of the present position of the motor-car industry, and stated that the industry was being seriously injured by the company promoter. The Chairman, in moving a vote of thanks to the lecturer, proposed that a separate evening be set apart for the discussion of this most interesting subject, and this was agreed to.

ACKERMANN'S STEERING GEAR.

We have had so many applications from our readers in reference to Ackermann's Steering Gear, of which we now give an illustration, and to which a short reference was made in one of our early numbers, that we now have pleasure in giving fuller details of this interesting invention. The original patent was taken out on June 13th, 1818, and was numbered 4,212, it being



the patent of Mr. Rudolph Ackermann, Strand, London, the communication of same to our Patent Office being made through George Lenkensperger, of Munich, Germany. At the time of the sealing of the patent a good deal of interest was created by its novelty, and in the Patent Library, in a work entitled "Observations on Ackermann's Patent Movable Axles, &c.," published by J. Diggens, St. Ann's Lane, in 1819, a number of comments are passed upon it and the principles involved, the book embracing a large amount of well-merited praise from well-known coachbuilders of the day, although at the same time there is full evidence of determined opposition being made against the system by those most interested in its adoption. In this respect Ackermann's invention shared the same fate as nearly all other innovations which have subsequently been great successes. Its practical utility was afterwards demonstrated by means of an extended tour through Germany of a carriage furnished on its system.

From a very careful search made since Ackermann's patent was granted, we find practically the same principle has subsequently been the subject of at least 50 patents, one and all of which there is little doubt are clearly based upon this original. We hardly think we can improve upon the original wording of Mr. Ackermann's claim, which is as follows:—

Improvements on Axletrees Applicable to Four-wheeled Carriages.

At or near the ends of the fore transome, *C*, are holes which form the sockets wherein the vertical axles, *E*, *E*, are inserted, and they are secured by nuts, &c., in the manner of linch pins in order that the vertical axles, *E*, *E*, may turn in their sockets and form the centres round which the axle-arms have their horizontal rotary motion for the purpose of placing the fore wheels in an oblique position when the carriage is to be turned. *F*, *F*, are levers or stays projecting backward from the elbow or bend where the vertical axles and the axle-arms unite; these stays are connected together by the controlling bar, *B*, which is united to the extremities of both stays by knuckle-joints, *H*, *H*, and therefore if any motion is given to one vertical axle and axle-arm the other must partake of it. The futchel, *A*, passes through a bow or crook underneath the fore transome with which it is united by the perch-bolt, *S*, making the centre of motion for the pole, and the futchel projecting behind the fore transome forms a lever, *R*, whose centre of motion is at *S*. The controlling bar is connected with the end, *R*, of the futchel by a pin. The splinter bar, *T*, is bolted to the futchel as usual and braised by iron stays; it must be fixed at such a distance from the perch-bolt as to allow full play for the fore wheels at their greatest obliquity. In turning, the futchel moves on the perch-bolt and moves the controlling, bar, *H*, *B*, *H*, end-ways; this communicates motion to both stays, *F*, *F*, and consequently to both the axle arms and fore wheels so as to put them into an oblique direction in respect of the hind wheels and then the carriage is prepared for turning. If the distance between the two vertical axles, *E*, *E*, be made more than the distance between the joints, *H*, *H*, at the ends of the controlling bar, *B*, it will occasion that fore wheel which is on the side to which the carriage is intended to turn to have a greater degree of obliquity than the opposite wheel. This is conducive to quick turning because the axles of all the four wheels of the carriage become directed to one point, *O*, as shown by dotted lines, but if the length of the controlling bar, *B*, be made equal to the distance between the two vertical axles, then the fore wheels will always stand parallel to each other.

A limit of speed is to be imposed on motor-cars in France, but it will be less restrictive than in this country. It is proposed to restrict the speed of the lighter vehicles to 20 kilometres an hour in towns and 30 kilometres in the country; while other regulations are also to be enforced in relation to reckless driving.

A Horseless Vehicle.—A ship's gig.

DOINGS OF PUBLIC COMPANIES.

The British Motor Syndicate.—Progress of the Action by Subscribers.

MR. HAYDEN COFFIN A VICTIM.—HOW HE GOT HIS MONEY BACK.—HIS SOLICITOR STILL A USEFUL SHAREHOLDER.

THE action by the subscribers to the British Motor Syndicate, to which we have already referred in previous issues, is progressing as rapidly as legal procedure will permit. The actual plaintiff is Mr. Malcolm Wagner, the defendants being the British Motor Syndicate, Messrs. Harry J. Lawson, Thomas Humber, H. H. Mulliner, Prince Ranjitsinghi, Lord Norreys, and Thomas Robinson, all these gentlemen being directors of the first-named Syndicate. The writ, which was issued on February 17th, will be supported by Sir Edward Clarke as leader. The plaintiff claims to have his name struck off the register of shareholders, and also asks for damages and the return of moneys which he was induced to subscribe through alleged misstatements in the prospectus. Mr. Wagner is nominally the only plaintiff, but in fact, we understand, his expenses will be divided amongst a number of subscribers who are in the same unfortunate position as himself, this being practically a test action which will govern the rest of the sub scribers' rights.

ON previous occasions, says the *Financial Times*, when recording the progress made by the agitation amongst the shareholders of the British Motor Syndicate (Limited) for the return of their subscriptions, we have hinted that a similar movement was likely to develop in regard to the Great Horseless Carriage Company (Limited), which is a baby of the former concern. We now learn that this movement is drawing to a head, and that the shareholders are combining, under the same leadership as the British Motor Syndicate shareholders, the counsel who is settling the pleadings in the former case having advised that the shareholders of the Great Horseless Carriage Company would have good grounds for bringing a similar action. Mr. Harry J. Lawson appears to be having a very lively spring.

IN reference to the rumoured resignation of the Earl of Winchilsea as a director of the Great Horseless Carriage Company, the noble lord has, through Messrs. Ashurst, Morris, Crisp, and Co., his solicitors, addressed the following letter to a contemporary :—

"My attention has been drawn to a statement that I have resigned the chair of the Great Horseless Carriage Company, and to the fact that this statement has been reiterated, in spite of an official letter from the Board stating that it was incorrect.

"As such an impression appears to me likely to prejudice the interests of the shareholders, I think it my duty to remove it by stating that I have taken no such step. The fact is that I have for the past two months been so unwell that I have not been allowed to see, much less to answer, my correspondence; but I am better, and hope soon to be in a position to do business again.—Your obedient servant, WINCHILSEA."

As a supplement to the articles published by the *Pall Mall Gazette* regarding the British Motor Syndicate, the following thrice interesting communication received from Mr. Munton, of Munton and Morris, the solicitors of 95A, Queen Victoria Street, is worth reading :—

"Early in January last you allowed me to take part in a correspondence in your columns as to this Syndicate. Numerous persons had written to you on the subject, and you became acquainted with the fact that my firm were solicitors for a certain shareholder whose name and my own I withheld from the public, as I neither had the consent of my client to mention his, nor did it then seem expedient that I should mention mine. It was sufficient that my client held 40 shares in the Company, and that having paid the allotment he was hesitating as to complying with the demand for calls, looking to the allegations which were appearing in your columns and elsewhere.

"I limited my personal statement to the fact that I had commenced legal proceedings to recover back the amount paid on allotment, and these being actually pending there was greater reason why I should be reticent. Circumstances have, however, since altered, and as my client sees no reason why the steps he and I have taken should not appear in chronological order in your columns, I will shortly summarise what has happened, it being no part of my province to do more than record facts.

"A GENEROUS ALLOTMENT.

"You went a very long way in one of your leaderettes to identify my client, when you were good enough to dub him as a famous light-opera singer, and I now complete the identity by saying that he is Mr. C. Hayden Coffin. It is not necessary for me to state that he is closely occupied in his profession. He has, however, a taste for investigating mechanical coutrivances, and seeing it extensively advertised that the original £1 shares in this Syndicate were so much sought after that they had been freely sold at £3 (a preliminary to issuing to the public a fresh lot of £1 shares at £2 premium), and being desirous of obtaining 20 shares by way of a toy holding, he thought he would apply for 40, seriously believing that he might not get more than half. He, however, at once received a notificatiou that the whole 40 shares for which he had applied had been allotted to him.

"He soon saw reason to think that he had better not have applied for premium shares, so much so that he wrote a letter to the secretary suggesting that his application should be vacated. His request, of course, was not acceded to, and he paid the allotment of £20, in due time receiving a demand for the first call of £50 followed by an application for the second call of like amount; and these documents tumbling in one after the other brought him to me.

"Having carefully perused the statements contained in your journal I advised Mr. Hayden Coffin not to pay the calls, and on January 6th I wrote a formal letter to the Company stating that I should be glad to know when and where the £1 shares had been dealt with at £3 and upwards as alleged. I gave a reasonable time for a reply, and no answer having arrived I resolved, looking to the smallness of the amount, to take a short cut by bringing a simple action in the Mayor's Court, London, for the return of the £20 allotment money.

"This process was served upon the Company on January 9th. On the 11th of that month I received a communication from the secretary to the effect that the Company would hand the process to their solicitors. They eventually did hand same to a well-known firm—not, however, the firm whose name appeared in all the papers as the Company's solicitors—and I was told that my measures would be resisted in every possible way. This was followed by a formal notice of appearance with an intimation that an application would be made to remove the case from the Mayor's Court to the High Court.

"AN IMPORTANT POSTSCRIPT.

"The secretary's letter emphasising the intended resistance contained, however, a footnote, which (like the lady's postscript) formed the more important part of the communication, intimating that the Company frequently had applications for £1 shares at prices varying from £2 15*s*. to £2 17*s*. 6*d*., and that if my client really desired to sell, business could be done on such terms.

"I had noticed in your columns that these identical shares were nominally quoted at less than half the price which the Company were offering me, and being anxious to test the market I walked across to the Stock Exchange and asked my broker in a casual way whether he could buy 20 shares at anything like the then public quotation. He ascertained that he could buy 20 shares at the rate of 22*s*. 6*d*. per share. I accordingly instructed him to purchase them at that price, at the same moment telegraphing the Company that I should recommend my client to sell his 40 shares at the middle price of their quotation—namely, £2 16*s.* 3*d.*

"This seemed to be a very easy way of getting what Mr. Hayden Coffin wanted, practically achieving the object of the Mayor's Court action, and my wire being followed by a firm offer from the secretary I notified to my professional adversaries that as by the course taken by their own clients the action had been reduced to vanishing point, it might remain where it was. My client accepted the offer, and in due course the case was settled on these lines.

"But now comes a point. My client can sing to the thousands, but he has not practised the art of making himself heard at company meetings, and he asked me to be trustee of his Stock Exchange purchase of 20 shares at 22*s.* 6*d.* per share. I heard that the articles of association were astoundingly rigid as to selecting shareholders—indeed, quite hampering sales—but my brokers applied that my name should be placed upon the register in respect of such newly acquired 20 shares, and after seven weeks' interval the usual certificate has come to hand.

"I have promised the numerous gentlemen who applied to my client for information and assistance that if and when occasion arises I shall be found in my place among the rank and file of the shareholders whether the meetings be held in Coventry or elsewhere, and here I take leave of the matter for the present. Indeed, I personally am just leaving for the south of Europe on business."

Hastings and St. Leonard's Cycle and Motor-Car Co.

A statutory meeting in connection with the Hastings and St. Leonard's Cycle and Motor-Car Company was held at the offices and works, Marina recently, when Councillor L. O. Glenister (chairman of directors) occupied the chair, others present being Councillors Coxeter and Slade, Messrs. H. F. Cheshire, Wingfield (manager), Gaby, J. C. Miller, Newman Chennells (managing director), G. Jenkins (secretary), and Salter.

The Secretary having read the notice convening the meeting, the directors' report was read as follows :—

"In presenting their first report, your directors congratulate the shareholders upon the bright prospects of the Company. We have a plant which will compare with any on the South Coast, and are now in fair working order, and can turn out a bicycle within fourteen days from booking order. After pointing out several excellent pieces of business which the directors had in hand, the report referred to the motor-car part of the business which so far the directors had not been able to touch, as the wholesale houses at present would not accept orders on account of the great demand for motor vehicles, but we have the promise of three orders as soon as these can be taken. In conclusion, the directors solicit the recommendation of shareholders, and no trouble will be spared to give all customers the best article at a reasonable price with prompt delivery."

Midland Cycle and Motor-Car Exhibition Co.

The first ordinary general meeting of the Midland Cycle and Motor-Car Exhibition Company (Limited) was held in Birmingham on the 31st ultimo, Mr. J. B. Burman presiding. The report stated that the first exhibition held by the Company, in Bingley Hall, in January last, was a complete success. The profits, after payment of all expenses in connection with the formation of the Company, &c., amounted to £1,052, out of which the directors recommended the payment of a dividend of 80 per cent., and to carry forward the balance to reserve.

The Chairman, in moving the adoption of the report, remarked upon the satisfactory character of the balance-sheet and the success of the first show. With the exception of 20 per cent. carried to reserve, the whole of the capital had been returned to the shareholders during the first year, and it was complimentary to know that similar companies had been formed in Manchester, Sheffield, and Leeds, and also in Melbourne. The Company had cleared off the formation expenses, and might have paid 100 per cent. and still have carried 5 per cent. to reserve, but the directors thought it wiser to pay only 80 per cent. The exhibition had been so successful that the directors' fees had come to a good deal more than was expected. The report was then adopted.

Wednesday, March 31st, was the day appointed by the Stock Exchange Committee for a special settling day in the shares of the London Electrical Cab Company, Nos. 1 to 62,768.

We notice that our enterprising contemporary, *The Scottish Wheel and Motor News*, has formed itself into a limited liability company with a capital of £2,000 in 2,000 shares of £1 each. The first subscribers are :—David R. Stavert, accountant, 10, St. Andrew Street, Edinburgh, 100 shares ; Richard W. Hawk, insurance secretary, 32, Gayfield Square, Edinburgh, 50 shares ; Henry Brown, insurance manager, 24, York Place, Edinburgh, 100 shares ; A. F. Bainbridge, printer, Tanfield, Edinburgh, 100 shares ; George Inglis, S.S.C., 19a, Hill Street, Edinburgh, 100 shares ; and R. L. Orr, advocate, 38, Great King Street, Edinburgh, 50 shares.

The Esson Motor (Limited) statutory return has been filed, showing 14 shares taken up out of a capital of £20,000 in £200 shares ; £120 per share has been called, and £1,440 has been paid, leaving £240 unpaid.

Applications have been made to the Stock Exchange Committee to appoint a special settling day in :—

Clement Gladiator and Humber (France) (Limited)—20,000 ordinary shares and 10,000 six per cent. cumulative preference shares. (Special application.)

Great Horseless Carriage Company (Limited)—36,507 shares, Nos. 1 to 36,472, and 61,473 to 61,507.

Starley Brothers and Westwood Manufacturing Company (Limited)—78,000 shares, Nos. 32,001 to 110,000.

New Issues.

For the Month ending April 12th.

Hanman's Cycle and Needle Company.

Share capital £100,000, the present issue being 85,000 £1 ordinary shares, there being offered in addition £25,000 in 6 per cent. mortgage debentures of £100 each, repayable on January 1st, 1918, and redeemable at any time at £105 per cent. on six months' notice. The prospectus states that the Company has been formed to acquire the businesses of the Hanman Cycle Company (Limited), of Sparkbrook ; Messrs. S. Thomas and Sons, of the British Needle and Fish-hook Mills, Redditch ; and the Radiant Cycle Company (Limited), also known as the A B C Cycle Company, Redditch. It is proposed to make cycle component parts and motor-cars. The purchase price is £105,000, leaving £5,000 available from the present issue for working capital.

Hearl and Tonks (1897).

Share capital £160,000, in £1 shares, divided into 50,000 7 per cent. cumulative preference and 110,000 ordinary. The Company has been formed to acquire the whole undertaking and assets of the cycle manufacturing business of Hearl and Tonks (Limited), carried on at their leasehold premises, Imperial Works, Bordesley, the Victoria and Albert Works, and the Britannia Works, all at Birmingham. The works are complete in themselves, and may be worked either jointly or independently, and are equipped with the latest machinery. The purchase price is £160,000, the vendor taking in part payment £25,000 in shares, and provides £20,000 in cash as working capital.

THE TRENCH TUBELESS TYRE COMPANY (LIMITED).

SHARE capital £200,000, in £1 shares, the present issue being 170,000 shares. The Company has been formed to acquire the patent rights of John Townsend Trench and others in an improved form of tubeless pneumatic tyre, and to manufacture and sell the same. The purchase price is £150,000. Thirty thousand shares are reserved for future issue as required to develop the business of the Company.

BRITISH "ZENITH" ADJUSTABLE CYCLE COMPANY.

SHARE capital £80,000, in £1 shares. Present issue 53,500 shares. The Company is formed to acquire, work, and exploit the British patent rights in the inventions for improvements in cycle handle bars, cranks, and pedals, the right to apply for Colonial patents, and to acquire the Tabard Works, London, S.E. Among the improvements claimed for the patents are that the handle bar can be turned so as to line with the machine, and that the cranks allow the pedals to be folded inwards. These adjustable parts can be fitted to any modern machine at a small cost. The purchase consideration is £65,000, payable as to £26,500 in shares, £10,000 in cash, and the balance in cash and shares, or either, leaving £15,000 available for working capital.

THE DIAMOND CYCLE COMPONENTS AND ENGINEERING COMPANY (LIMITED).

SHARE capital £65,000, divided into 15,000 7 per cent. cumulative preference shares and 50,000 ordinary shares of £1 each. Present issue 5,000 preference and 40,000 ordinary shares. Formed for the purpose of acquiring the New Hudson Cycle Company (Limited). The purchase money is £50,000.

BRETT'S (LIMITED).

SHARE capital £100,000, in £1 shares. Formed to acquire the business of general stampers and manufacturers of stampings in steel, iron, aluminium, and other metals for all kinds of cycle, motor-car, and general engineering work, now carried on by Brett's Stamping Company (Limited), at Coventry, and also certain patents taken out and in course of being taken out by Mr. Edward Samuel Brett. The present issue includes £20,000 of 5 per cent. mortgage debentures. The prospectus does not state what is the purchase price of the business.

MORGAN'S CHAINS AND PEDALS (LIMITED).

CAPITAL of £50,000, in ordinary shares of £1 each. The present issue is 30,000 shares. Formed to acquire the business of manufacturers of cycle and motor chains and pedals, now carried on by Morgan Brothers, at Floodgate Street, Birmingham. Messrs. Henry and J. W. Morgan (who are largely interested in the vendor company) guarantee that the minimum profit for the next two years shall not be less than £4,500 per annum. The purchase price is £20,000. This will leave £10,000 available for working capital.

WELDLESS TUBES (LIMITED).

CAPITAL £1,000,000, in preference and ordinary shares. Formed to manufacture weldless steel tubes, which are used in the construction of marine and other boilers, shafting, heating apparatus, condensers, super-heaters, boring and mining apparatus, axles, gun-carriages, cycles, &c., and to acquire, with their liabilities, the following undertakings:—Climax Weldless Tubes (Limited); the New Credenda Tube Company (Limited); the Star Tube Company (Limited); and the St. Helens Tube and Metal Company (Limited). The total purchase moneys of the four undertakings as going concerns amount to £981,000, and the capital to be provided by the present issue of shares and debentures will leave a sum of upwards of £100,000 for extensions. Present issue 475,000 6 per cent. preference shares, and 475,000 ordinary shares of £1 each, and also £150,000 of mortgage debentures.

NEW FOWLER-LANCASTER (LIMITED).

SHARE capital £100,000, in £1 shares. Formed to acquire, as a going concern, the business, property, and assets generally of Fowler, Lancaster, and Co. (Limited), electrical and mechanical engineers, autocar builders, &c., of Birmingham. The purchase price is £51,500, leaving £23,500 available for the purchase of additional plant and machinery and working capital.

PNEUMATIC TUBE MACHINE COMPANY (LIMITED) (BRAINARD'S PATENT).

CAPITAL £300,000, in £1 shares. Formed to purchase and work the British letters patent granted to Austin Brainard, of Hartford, Connecticut, U.S.A., for machines to manufacture pneumatic tubes, hose-pipe, and other similar articles. The machine can also be used for making pneumatic tube tyres for carriages and autocars, vacuum brake connecting tubes for railway carriages, &c. The purchase price is £230,000, payable as to £100,000 in fully-paid shares, and as to the balance in cash. The present issue is of 200,000 shares, of which 70,000 will be set apart for working capital.

CHAMPION WELDLESS TUBES (LIMITED).

Capital £35,000, in £1 shares. Formed to carry on business as manufacturers of weldless steel tubes used in the construction of cycles, locomotive, marine, and other boilers, motor-cars, &c. Purchase-money, £25,000.

New Companies Registered.

[Under this heading we give a full list of new Companies registered which take power to make, deal, or become interested in any manner in automotor vehicles. We shall be pleased to reply with detailed particulars to inquiries through the "Answers to Correspondents" column. All communications should be addressed to the Editor. The only stipulation which we make is that where the inquiry involves a search of the records at Somerset House—as in the case of information on the subject of the holdings of shareholders—a postal order must be enclosed to cover the Government stamp of one shilling which is charged before a search is allowed to be made.]

	Capital. £
Adjustable Handle Co. (Limited)	10,000
A. King and Co. (Limited), Peterborough	4,000
Alpe Manufacturing Syndicate (Limited)	15,000
Auster (Limited), Birmingham	25,000
Barton and Devoil (Limited)	15,000
Bath Cycle Co. (Limited)	2,000
Blumfield Manufacturing Co. (Limited), Birmingham	5,000
Brazeless and General Cycle Fittings Co. (Limited), Birmingham	60,000
Brett's (Limited), Coventry	100,000
Brierley Hill Cycle and Manufacturing Co. (Limited)	5,000
British Electrical Cycle and Motor Engineering Co. (Limited)	40,000
British Steel Ball Syndicate (Limited), Birmingham	10,000
Briton Cycle Co. (Limited), Chelmsford	2,000
Cambria Cycles (Limited), Swansea	15,000
Cameo Cycle Co. (Limited)	10,000
Challiner Carriage Tyre Syndicate (Limited)	10,000
Circular Chain Syndicate (Limited)	12,000
Clipper Pneumatic Tyre Co. (Limited)	150,000
Coventry Gear-Case and Belting Co. (Limited)	25,000
Coventry Indiarubber Co. (Limited)	250,000

	Capital. £
Coventry Stamping Co. (Limited)	35,000
Diamond Cycle Components and Engineering Co. (Limited), Birmingham	65,000
Dunlop Cycle Co. (Limited)	100
Edge Brothers Cycle Components (Limited), Birmingham	5,000
Fleuss Cycles (Limited)	25,000
Hearl and Tonks (1897) (Limited), Birmingham	160,000
Hudson Brothers (Limited), Birmingham	45,000
J. A. Robertson and Co. (Limited), Peterborough	10,000
Kynoch (Limited), Birmingham	500,000
London and Provincial Motor Syndicate (Limited)	5,000
Martin Noiseless Safety Motor Syndicate (Limited)	24,000
Midland Acetylene (Parent) Syndicate (Limited), Cradley Heath	50,000
Midland Steel Ball Co. (Limited), Birmingham	60,000
Midwinter's Engineering and Cycle Stamping Co. (Limited), Birmingham	55,000
Morgan's Chains and Pedals (Limited), Birmingham	50,000
Nalder and Hilton (Limited)	20,000
Neal Cycle Co. (Limited), Birmingham	20,000
New Fowler-Lancaster (Limited)	100,000
New Gear Syndicate (Limited)	5,000
New Rapid Cycle Co. (Limited), Birmingham	130,000
Pneumatic Cycle and Engineering Co. (Limited)	2,000
Pneumatic Tube Machine Co. (Limited)	300,000
Rimington Brothers and Co. (Limited), Newcastle	3,500
Road Traction (Limited)	4,000
Rocket Cycle Co. (Limited)	2,000
Scottish Wheel and Motor News Co. (Limited)	2,000
Smart and Parker (Limited), Birmingham	75,000
Smart and Son (Limited), Hastings	5,500
Stampings Alliance (Limited), Birmingham	60,000
Twentieth Century Development Syndicate (Limited)	25,000
Tyre Development Syndicate (Limited)	100
Weldless Tubes (Limited)	1,000,000
William T. Smith and Co. (Limited), Bolton	20,000
Winchurch Bros. (Limited), Birmingham	2,000
Yarrow and Co. (Limited)	160,000

"PEERLESS" METAL.

This new metallic alloy, in consequence of its strength and brilliancy of colour, is particularly suitable for the framework and other parts of motor-cars, &c. "Peerless" is a white metal, closely resembling old silver in colour, and does not tarnish or oxidise by exposure to atmospheric influence, nor is it affected by salt water, while, being a solid metal of uniform quality throughout, its appearance and polished surface are improved by ordinary wear.

As the result of some extensive tests carried out by Messrs. David Kirkaldy and Son we notice that this metal, in the form of 12 B.W.G. wire, stood an ultimate stress of 87,757 lbs. per square inch with an extension in a 10-inch length of 26·3 per cent., while a 5-inch length took 19·04 twists. These figures are the means of 10 tests. Tests were also made with castings, and the mean of these showed that when cast "Peerless" had an ultimate strength of 32,567 lbs., and an elastic limit of 20,350 lbs., giving the very favourable ratio of 62·6 per cent. The ultimate extension in a 10-inch length was 7·4 per cent., while the contraction of area at the fracture amounted to 17·5 per cent. Good as these results are they were equalled, if not surpassed, by the behaviour, in Messrs. Kirkaldy's hands, of rolled strips of "Peerless," the means of which show an ultimate breaking stress of 71,402 lbs. per square inch, with an extension of 7·2 per cent. in 10 inches. The specific gravity of the alloy when cast ranges at about 8·5.

The Peerless Metal Company (Limited), of 38, Parliament Street, S.W., will furnish any further information.

CONTINENTAL NOTES.

The Automobile Club of France.

This Club, which is maintaining its premier position on the Continent in promoting the best interests of "Automobilism," has announced a contest for automobile hackney carriages, to be held in April, 1898. The Committee have forwarded us the rules and conditions to be observed at the contest, and for the information of British "motorers" we now have pleasure in giving these in full:—

COMPETITION FOR AUTOMOBILE HACKNEY CARRIAGES, APRIL, 1898.

PROGRAMME.

Art. 1.—Under the patronage and direction of the Automobile Club of France an International Competition has been arranged for mechanical motor vehicles with regard to their use in the streets of towns.

Art. 2.—The meeting will be held in Paris on April 4th, 1898, and the following days.

Art. 3.—The meeting will have reference to—

(*a.*) The net cost for the day of an automobile hackney coach in general use in Paris, which shall accomplish a course of at least 60 kilometres in the space of 16 hours. To facilitate the trial, the 60 kilometres will be accomplished in a single journey, according to the route of the road.

(*b.*) The ease and management of the carriage.

(*c.*) The frequency of recharging; the extent of repairs needed, and the ease with which these were effected.

Art. 4.—Being accepted for the competition, all vehicles furnished with a mechanical motor, whatever the system, shall be classed in one of the following categories:—

I.—(*a.*) Closed carriages with two places.
(*b.*) Open carriages with two places, with hood.
(*c.*) Mixed carriages, with two places, able to shut or open instantly.

II.—(*a.*) Closed carriages with four places, with place for luggage (30 kilos. each traveller).
(*b.*) Open carriages with four places, with hood.

III.—Closed carriages with six places, with place for luggage (30 kilos. each traveller).

Art. 5.—The vehicles must be constructed so that the number of travellers indicated can be comfortably seated. They must be furnished with a kilometrique meter, with two brakes, one progressive and the other instantaneous. They must be capable of moving backwards. The position of the driver will be such that, having the steering and the levers beneath his hand, he is yet able to conveniently see the road in front of the carriage.

Art. 6.—The number of vehicles to be entered by each competitor is not limited, but a constructor cannot enter several vehicles of the same type and similar dimensions.

Art. 7.—For every vehicle engaged there will be paid an entrance fee of 200 francs up till February 28th, 1898, and a double fee after that date. The list of entries will be closed on March 15th, 1898, at midnight. Every application for entry should be accompanied by the fee for entry, which will remain in every case at the office of the Automobile Club of France.

Art. 8.—At least three days before the meeting each constructor will send to the Committee a note accompanied by:—

1. The description of the vehicle and its motor.
2. The distribution of weights on the axletrees.
3. A specification of the motive power operating the motor, and the quantity necessary for the day's work; indicating further if the charging of the carriage should be renewed during the prescribed course, which will comprise a duration of 10 hours.

Art. 9.—The competitors must send, at convenient times, to the localities designated by the Committee the supplies for motive power necessary to effect the whole of the competitive trials. Under the direction of the Committee there will be delivered to each driver :—

1. A printed book.
2. A sheet of the daily route.

On one of the leaves of the book the driver will give a receipt for oil, fuel, or the motive power which will be delivered to him on departing from the depôt, or in the course of the service, if he requires to renew his supply. The quantity of water necessary for the working of the motors will be entered in the book under the supervision of the manager or the Club's agents; if this water should be renewed in the course of the route it is also to be entered in the book. The daily route sheet is to be returned in the eveuing to the Coutroller's office, signed by one of the managers or by the Club's agent, who will have accompanied the carriage during the day. It will relate any iucidents which may have arisen during the day. Any excess of supplies will be deducted each evening upon the return of the vehicle.

Art. 10.—The trial will be composed of a service of 15 consecutive days. Fifteeu different routes will be selected, and each one of the vehicles engaged should accomplish these routes in the order indicated to them on the daily route sheet. The route sheets will be arranged upon the basis of ordinary horse vehicles, so as to approach as nearly as possible the practical daily routine of a hackney carriage. The speed in Paris should not exceed 20 kilometres an hour. The speed on certain inclines indicated on the route sheet to be noted. A special commissary, chosen among the members of the Automobile Club of France, will accompany each of the carriages during the time of these trials. The vehicles should accomplish the number of journeys and carry the weight of baggage indicated, or the corresponding weight (whether 70 kilos. by passengers and 30 kilos. of baggage) in dead weight.

Art. 11.—In the special localities approved by the Automobile Club, and where all the carriages should be housed, properly commissioned agents will be stationed with full control. These agents will deliver the supplies to the competitors, and will collect every day for the Committee the route sheets of the day before and the receipts of the drivers. They will superiutend the repairs which are to be made to the carriages or to the motors, pointing out the nature of the repairs. The repairs should be made before putting the carriage into the coach-house. These repairs should be recorded in the book.

Art. 12.—The recharging of the accumulators of the electric carriages will be made uuder the supervisiou of the controlling agents, but the responsibility will rest with the representative of the competitor, who should assist at it. The current will be furnished either by the means of a special installation, or by the nearest street sector. A special electric metre, of a type to be agreed upon by the Committee for each carriage, will iudicate the quantity of electricity absorbed, and the duration of each recharge. The expenses sustained by the electric charging will be borne by the competitors in the proportion of the energy which will be furnished to them.

N.B.—The Electric Sector of the Place Clichy has offered the *Kilowatt*, from midnight to 5 o'clock in the evening, at a price of 30 c. It is at this price that the cost of recharging an electric carriage will be calculated, in whatever way the recharge is accomplished.

Art. 13.—A jury composed of 12 members, taken from among the members of the Automobile Club of France, will be elected; six members by the Committee and six by the competitors. The competitors cannot form part of the jury. This jury will draw up a report, giving the net daily cost of the traction of each carriage and the regularity of the service. It should record its judgment on the elegance of the appearance, the noise of the vehicle, and the convenience for passengers. This report will be communicated to the Society of Civil Engineers of France and to different societies, and an extract from it will be addressed to all the Mayors of the chief towns of the department and district.

Art. 14.—Medals and diplomas will be given to the vehicles which are recognised as presenting the required conditions for the service of hackney coaches in towns. If prizes are offered for the competition, the conditions of acceptance will be regulated by the Commission, and the awards will be made by the jury.

Art. 15.—The competitors must conform to the decisions of the Committee of the competitions, particularly in the details of organisation and tests.

Art. 16.—The ordinary civil and penal responsibilities attaching to road locomotion will rest with the competitors, it being well understood that the Automobile Club of France declines all responsibility of any nature whatever. The competitors should conform to all the ordinary regulations and decisions of the police in force for hackney carriages and automobiles.

Motor-Cycle Race (Criterium des Motocycles).

This annual race, originated by our excellent contemporary, the Paris *Velo*, took place on Sunday, April 4th, in terrible weather. The event was open to all kinds of motor-cycles, so long as their weight did not exceed 200 kilos. (about 450 lbs.). Prizes of £40, £20, £12, and £8 were given to the first four. Distance, 100 kilometres (62½ miles), on the road.

A start was made from Moutgeron at 10.3 a.m., there being 14 competitors only out of an entry of 85. These were M.M. Thevin (No. 1), Honry (No. 2), Giradot (No. 5), Charron (No. 7), Mouter (No. 8), Maubo-sin (No. 16), Bouton (No. 32), Comte de Chasseloup Laubat (No. 33), Pietri (No. 40), Chesnay (No. 54), Feray (No. 58), Bertrand (No. 59), Feron (No. 60), Viet (No. 62).

All these geutlemen drove Dion-Bouton petroleum motor-tricycles.

The order of arrival at Melun was :—

No. 7 at 10 h. 40 m.	No. 40 at 10 h. 47 m.
No. 8 at 10 h. 41 m.	No. 51 at 10 h. 47 m. 15 s.
No. 58 at 10 h. 42 m.	No. 16 at 10 h. 48 m.
No. 62 at 10 h. 42 m. 30 s.	No. 32 at 10 h. 52 m. 45 s.
No. 5 at 10 h. 44 m.	Nos. 1 and 2 at 10 h. 57 m.
No. 38 at 10 h. 44 m. 20 s.	No. 60 at 10 h. 57 m. 30 s.

At Ozoir-la-Ferrière, Charron (No. 7) arrived first at 11 h. 35 m. 40 s., Mouter (No. 8), second, at 11 h. 36 m. 37 s., being followed by Nos. 58, 62, &c. At Melun, on the return journey, Charron still retained the lead at 12 h. 24 m., with Mouter almost neck and neck. The finish at Moutgeron was No. 62 first, the time being 3 h. 9 m. 5⅘ s.; the rest of the survivors coming in as follows:—Nos. 7, 8, 5, 58, 40, 16, 33, 54, 60, the last arrival's time being 4 h. 37 m. M. Charron, the second in, was only beaten by about 2 feet. M. Charron had a good lead all the way, but on nearing home the motor would not run properly owing to the lubricating oil becoming exhausted, and M. Viet secured the victory solely because he was using an automatic lubricator. From a technical point of view the race had little or no interest.

ALCOLITE.

We have been shown specimens of a new aluminium alloy which, while it possesses all the beauty of appearance of the lightest of metals, is endowed with many considerable mechanical advantages over it.

Alcolite in weight compares with steel in the ratio of 2·89 to 8, while its breaking point, in teusion, is equal to 43,300 lbs., or 19·38 tons, per square inch when cast, these figures increasing to 22 tons per square inch in a finished tube. As is well known a steel tube loses one-third and upwards of its strength at a brazed joint; with alcolite, on the contrary, the joint forms the strongest part of the tube. The new metal welds easily and perfectly, and as it successfully resists the attacks of all acids, excepting hydrochlorine, it is practically incorrodible, and particularly adapted for the construction of motor and cycle frames and other parts which it is desired shall be light and strong and yet remain of a dull silvery white untarnished colour.

CORRESPONDENCE

*** *We do not hold ourselves responsible for opinions expressed by our Correspondents.*

*** *The name and address of the writer (not necessarily for publication)* MUST *in all cases accompany letters intended for insertion, or containing queries.*

A MOTOR-CAR RUN OF 300 MILES.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

DEAR SIR,—It may interest your readers to know that I have just completed a ride of 300 miles on a Peugeot autocar fitted with Daimler motor.

An average speed of 12 miles per hour was maintained without any breakdown or stoppage other than required for changing water. The consumption of oil did not exceed one gallon for 25 miles, and I may say that no autocar could give better satisfaction. It can be handled with ease, and is under perfect control; it will climb a hill 1 in 8, with four passengers, at the rate of four miles per hour.

The horse power is 3½ brake. I will send you next week photo of this car after the 300 mile journey.—I am, dear Sir, yours truly, F. J. WELLINGTON.

The Indestructible Ignition Tube Syndicate (Ltd.),
100c, Queen Victoria Street, London, E.C., *April 2nd*, 1897.

[The photograph referred to by Mr. Wellington is reproduced on page 267. We think we recognise the car as the same which we illustrated in our December issue (page 117), in which case it is the British Motor Syndicate *v.* Hon. C. S. Rolls's car, now famous by means of red ink and other advertisements. —EDITOR.]

IMPERIAL VICTORIAN EXHIBITION, CRYSTAL PALACE, MAY, 1897.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

SIR,—Having been appointed by the Crystal Palace Company with Mr. R. Applegarth, the Commissioner for the above exhibition, to organise a Motor Section, I should be obliged if you would kindly allow me space to bring the matter before your readers.

It is intended to allow carriages to run in various parts of the grounds, and if possible to organise a service between the Low Level Station and the main building of the Palace on the one hand, and the cycle track, cricket ground, and lower lakes on the other.

With such a plan as this it is thought that the carriages would be of practical use, and there would be every opportunity of showing their regular working and reliability.

One of the chief objects I had in view in taking up this matter was to be in a position to afford facilities to all interested in the motor-car movement to show their carriages to best advantage and increase business thereby.

In order to make the terms as easy as possible, there will be no entrance fee, and all that the owners of the motor-carriages will have to do will be to provide the carriage and driver with fuel required for running, while storage with every possible facility will be afforded by the Crystal Palace.

Favourable arrangements will be made with regard to the takings, so that it is quite possible that a first-class advertisement may be obtained free of cost to the owners.

I wish to remind autocarists that *The Engineer* competition takes place at the end of May, and the owners of vehicles running in the grounds prior to that date would gain valuable information of the gradients, roads, &c., to be passed over.

The owners of some vehicles have already signified their intention of sending carriages, and I hope the opportunity will be taken by the leading makers to show some of their latest manufactures to the many thousands who will be visiting the exhibition. I shall be pleased to afford any further information, and apologising for the length of this letter,

I remain, yours faithfully,
24, Budge Row, Cannon Street, H. J. DOWSING.
London, E.C., *April 2nd*, 1897.

EASTER TOUR. ALTERATION OF ARRANGEMENTS

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

DEAR SIR,—I beg to inform you that it has been found necessary to modify the published arrangements regarding the above.

The Tour will take place on Tuesday, April 27th. In order to afford a more lengthy and satisfactory test, the ride will take place from Coventry to Birmingham, a distance of twenty miles.

Below I give a synopsis of the programme:—

Mid-day, April 27th. Light Luncheon at Coventry.
Procession to Birmingham. (The Birmingham cyclists will be invited to meet us.)
Parade of all motor-cars and motor cycles in Birmingham.
Dinner at the Grand Hotel at 6 o'clock, at which the Lord Mayor of Birmingham has been asked to preside.
Demonstrations will take place, and explanatory lectures will be given, with addresses on the present position of the motor-car industry.

In all other respects the original programme will be adhered to. I regret, however, that it will be impossible to guarantee seats for members unless they have already applied. Brakes, however, will be provided for members to accompany the cars, and arrangements are being made to enable members to change places from time to time, in order to give each one an opportunity of testing the cars, if for only a short distance.—I am, dear Sir, yours obediently, C. HARRINGTON MOORE,
The Motor-Car Club. Hon. Sec.

Electric Light for Vehicles.—A new invention for lighting vehicles with electricity, generated by the motion of the vehicle itself, was exhibited last week. It is the old idea again of fixing a gearing to the hinder axle, and by an arrangement of cogs to either wheel of the vehicle sufficient power is transmitted to the dynamo to produce a light equal to upwards of 10 candle-power, according to the size and power of the dynamo. The apparatus and the lighting can be controlled either by the driver or occupant inside, and sufficient power can be stored to supply light for several hours.

THE English-speaking Americans call the man who drives a motor-car a motoneer or mutineer; the French nation calls him a wattman, or watthomme. We think a more appropriate name would be an Ohmer, or Homer, if the cockney prefers it. —*Electrical Review.*

*** IN consequence of the enormous pressure on our space this month we regret to say we have been compelled to hold over a large amount of interesting matter, including Mechanical Traction Notes, Correspondence, &c., &c.

RESULTS of all the Speed Trials hitherto held can be ascertained in full from the pages of THE AUTOMOTOR AND HORSELESS VEHICLE DIARY AND POCKET-BOOK for 1897, which contains over 100 pages of information. Price 6*d.*; post free, 7*d.*, of Messrs. F. King and Co., 62, St. Martin's Lane, W.C.

NEW INVENTIONS.

Claiming particularly to apply directly or indirectly to Motor Vehicles, &c.

Compiled for "THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL" by HERBERT HADDAN and Co., Registered Patent Agents, of 18, Buckingham Street, Strand, W.C., London.

*** *At the request of a number of subscribers we are pleased to announce that for the future we have arranged to more thoroughly cover the field of completed Patents referring to the Motor-Car Industry, by reproducing the latest Specifications and Diagrams.*

Patents Applied For.

Abbreviations: Impts., Improvements in; Relg., Relating to.

1897.

Mar. 1. 5,363. W. REYNOLDS. Interchangeable handle bar.
„ 2. 5,516. G. G. M. HARDINGHAM. Change speed mechanism.
„ 2. 5,524. TURNER, A. W., and others. Impts. chain driving wheels.
„ 2. 5,560. CORBETT, A. Chainless driving mechanism.
„ 3. 5,656. PENNINGTON and CARSE. Impts. pipe connections for automotives.
„ 3. 5,695. STEVENSON and SHOVELTON. Impts. self-propelled vehicles.
„ 4. 5,801. A. M. E. BERTHIER. Trolley motor car for training purposes.
„ 4. 5,821. S. PATISSON. Impts. motor vehicles.
„ 5. 5,848. STAFFORD and EAVES. Impts. auto-cycles, &c.
„ 5. 5,869. G. H. BOND. Impts. driving mechanism.
„ 5. 5,882. ROOTS and VENABLES. Impts. petrocars.
„ 5. 5,885. HALL and FOWLER. Driving vehicles by electro-motors.
„ 6. 5,932. E. B. OPENSHAW. Impts. mud protectors for cycles, &c.
„ 8. 6,023. E. SINCLAIR. Steam rotary motor.
„ 8. 6,105. T. G. STEVENS. Impts. brakes for velocipedes, &c.
„ 9. 6,122. H. WATERSON. New or improved handle.
„ 9. 6,125. M. R. WARD. Impts. power transmitting gear.
„ 10. 6,263. D. NEALE. Controlling switch for electrically-propelled vehicles.
„ 10. 6,277. E. TAYLOR. Joining tubes of cycle, &c., frames.
„ 10. 6,281. F. G. ADAMS. Centrifugal adjustable chain wheel.
„ 10. 6,290. HIGGINS and others. Fluid pressure engines for self-propelled vehicles.
„ 10. 6,291. HIGGINS and others. Impts. relg. self-propelled vehicles.
„ 11. 6,435. LLOYD and PRIEST. Impts. driving gear.
„ 11. 6,473. E. L. F. BOULY. Impts. self-propelled vehicles.
„ 12. 6,561. E. B. LUDLOW. Impts. road motor vehicles.
„ 13. 6,629. M. RENGELMANN. Modifying speed and direction of motor vehicles.
„ 13. 6,635. J. HUTTON. Improved friction gearing.
„ 15. 6,732. BOBBETT and others. Impts. motor-cars, &c.
„ 16. 6,798. L. CLEMENT. Impts. relg. cycles, motor-cars, &c.
„ 17. 6,938. D. NEALE. Impts. frames for under-carriages.
„ 17. 6,971. E. TAYLOR. Impts. cycle and motor-car frames.
„ 17. 6,973. E. TAYLOR. Impts. joining cycle, &c., frames.
„ 17. 7,026. M. CRAWFORD. Impts. motive power engines.

1897.

Mar. 17. 7,045. C. C. HEWETT. Minimising danger of collisions to motor-cars, &c.
„ 18. 7,117. J. V. M. y LLORCA. Impts. change gear and driving mechanism.
„ 20. 7,250. A. W. BRIGHTMORE. Impts. steering.
„ 20. 7,267. E. A. MACLACHLAN. Impts. apparatus for steering.
„ 20. 7,326. E. DAVIES. Impts. velocipedes and motor vehicles.
„ 23. 7,440. T. H. PARKER. Impts. motor-cars and road vehicles.
„ 23. 7,447. W. THOMAS. Impts. steering axles.
„ 23. 7,453. H. HARFORD. Impts. chain-driving gear.
„ 23. 7,462. R. C. SAYER. Permanent way and wheels.
„ 23. 7,477. A. C. F. and T. DANN. Impts. cranks for cycles, &c.
„ 23. 7,487. A. K. BAYLOR. Automatic speed governors.
„ 23. 7,522. J. F. McELROY. Impts. motor-trucks.
„ 24. 7,591. J. SMITH. Motors for cycles, vehicles, and boats.
„ 24. 7,639. T. G. BOWICK. Impts. connected with motor-cars.
„ 25. 7,712. J. HANDS. Impts. chain and chain wheels.
„ 25. 7,724. J. E. EVANS. Axles for motor-cars, cycles, &c.
„ 26. 7,871. E. J. BANKS. Impts. relg. oil motors.
„ 27. 7,950. F. HURD. Wheels for transmitting power.
„ 27. 7,953. BAINES and NORRIS. Impts. motor-cars.
„ 27. 7,955. SIEMENS BROS. and Co. (Limited). Impts. electric propulsion of vehicles.
„ 30. 8,165. C. R. HUTCHINGS. Impts. velocipedes, motor-cars, &c.
„ 30. 8,204. N. A. AUBERTIN. Impts. relg. cycles, horseless carriages, &c.
„ 31. 8,259. J. G. INSHAW. Impts. driving chains.

Specifications Published.

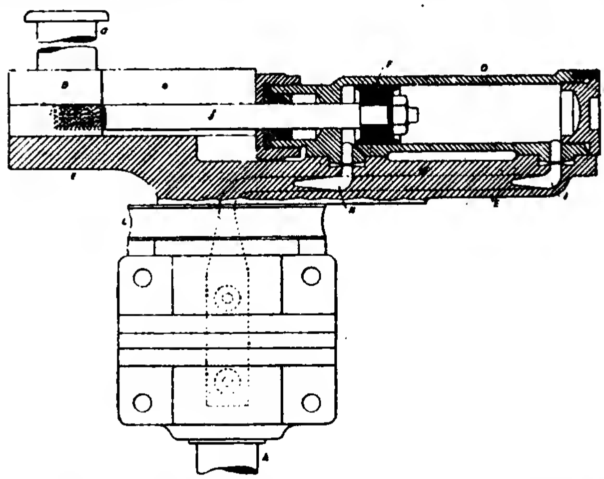
5,475. Locomotive Carriages. Ernest John Clubbe and Alfred William Southey, 16, Elm Street, Gray's Inn Road, Middlesex. March 11th, 1896.

This invention relates to the propulsion of locomotive carriages through the medium of a circulating column of fluid, whereby power is transmitted from a pump actuated by a motor to hydraulic engines coupled to the driving-wheel axles.

The invention relates, secondly, to the mode of suspending the hydraulic engines for propelling the vehicle, so as to combine lightness with freedom from prejudicial effects by vibration and jolting.

A is the shaft of the prime motor of any kind, running at a constant speed, and mounted in a bearing, B. C is the crank pin, coupled by a link to the piston of the hydraulic pump (not shown), the stroke of which is varied, for the purpose above stated, by varying the effective radius of the crank arm. For this purpose the crank pin is carried by a crosshead, D, fitted to slide between longitudinal gibs, *e*, on the crank arm, E, in one with the shaft, A, and it is attached to the rod, *f*, of the piston, F, of a double-acting hydraulic cylinder, G, mounted on the crank arm, E, and whose opposite ends are in connection with passages, H I, through the crank arms, E, and through the shaft, A. These passages, H I, respectively communicate through radial orifices with annular passages in the shaft bearing, to which are connected pipes which are controlled by a two-way hand operated valve, whereby the two ends of the cylinder, G, may be interchangeably connected with the flow and return circulation pipes connecting the delivery and admission of the pump with the admission and exhaust chambers common to two independent pairs of hydraulic engines actuating the independent driving-wheel axles. The area of the cylinder, G, must be larger than that of the cylinder of the pump, in order that the crank pin may be moved against the pressure of the pump. By suitably operating the valve the water pressure may be admitted to either end of the cylinder, G, to move the crank, C, for the purpose of altering its radius as required, and after being so adjusted the valve may be turned so as to lock the water in both ends of the cylinder, and so maintain the crank at whatever effective radius it is set. L is an eccentric on the motor shaft for working the pump valves.

Referring to the second part of the invention. In engines of the double-acting oscillating inclined cylinder type, the pistons of the two cylinders of a pair are coupled to the same crank, and in order to combine lightness and freedom from the prejudicial effect of vibration of the vehicle body and jolting of the wheel axle consequent on the play of the vehicle springs, each cylinder is mounted by trunnions at its outer end in a U-shaped sling frame formed of a pair of radius links, connected together at their outer ends by a



crosshead, and coupled at their inner ends to the crank shaft, the outer ends of these radius sling frames being suspended by spiral or other springs attached to the under-frame or body of the vehicle. The sling frames of the two engines of a pair are normally inclined at about 120° to each other, so that these frames, and the cylinders which they support, participate only in the vertical jolting motions of the axle by describing limited angular movements which do not materially affect the action of the engines, the fluid circulating pipes connected to the trunnions being of sufficient length to permit of this slight angular motion of the cylinder supporting frame.

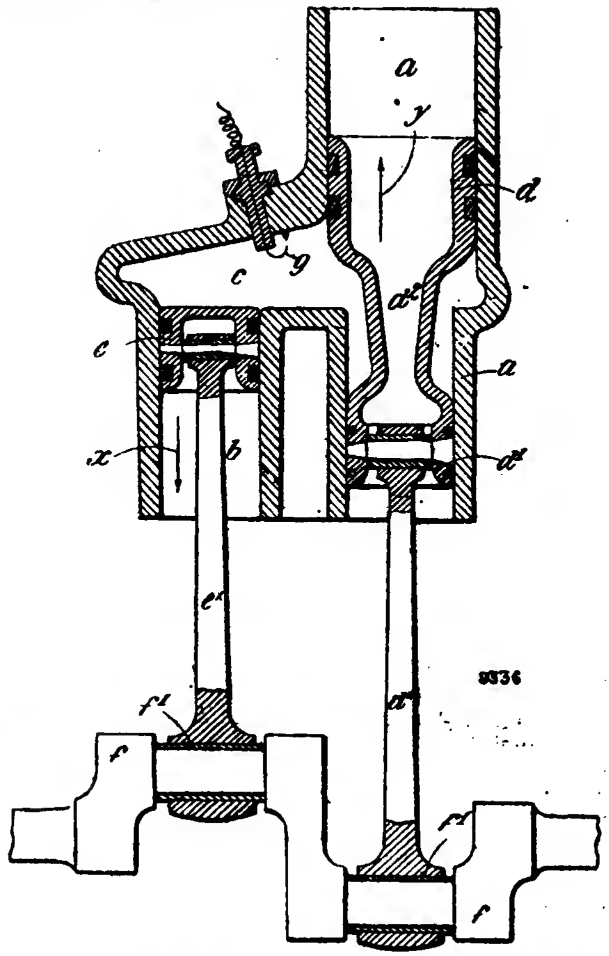
9,336. Explosion Motors. Count Albert de Dion and Georges Bouton, Puteaux (Seine), France. May 2nd, 1896.

This invention relates to improvements in explosion motors, and has for its object to obtain equilibrium of the forces exerted by the explosion of the gaseous mixture, thereby almost entirely doing away with vibrations or unsteady working.

a and *b* are the two cylinders which communicate with each other through a space or chamber, *c*, serving as the combustion chamber. The cylinder, *a*, consists of two portions, the lower of which is of the same sectional area as the cylinder, *b*, and is arranged parallel therewith, while the upper one is of larger sectional area; in this case double that of the lower portion, and is arranged axially in line with such lower portion. In the cylinder, *a*, is situated the double or differential piston, which consists of two parts, d, d^1, the former working in the upper and the latter in the lower portion of this cylinder. These parts are connected by a contracted portion or neck, d^2, and each of them is provided with suitable packing rings after the manner of an ordinary piston. In the cylinder, *b*, is arranged the ordinary or simple piston, *e*, corresponding to the part, d^1, of the differential piston.

The two pistons are respectively connected by rods, $d^\times$, $e^\times$, with the cranks, *f*, of the driving shaft, which are situated on opposite sides of the said shaft, so that the pistons travel in opposite directions. f^1 are bushes fitted in the connecting rod ends to give a proper bearing surface. *g* is an electric igniter, which is controlled, by any suitable means, whereby the explosions can be brought about at the required times.

The area of the upper part, *d*, of the differential piston exceeds that of the lower part, d^1, thereof by an amount equal to the area of the piston, *e*. In the present instance this is brought about by making the area of the upper part, *d*, double that of the lower part, d^1, since the latter is equal in area to the said piston, *e*. The effective areas upon which the explosion acts are, therefore, equal, and the weights of the respective pistons and their connecting rods are calculated so that the moving parts are properly balanced, thus more effectually minimising vibration.

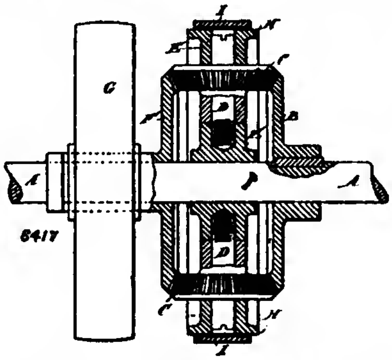


An explosive charge having been drawn or introduced into the combustion chamber, *c*, and ignited therein by the igniter, *g*, the piston, *e*, is propelled by the explosion in the direction shown by the arrow, *x*, while the differential piston is simultaneously propelled in the opposite direction indicated by the arrow, *y*.

6,417. Driving Gear for Motor Carriages. Herbert John Dowsing, 35, Queen Victoria Street, London, and Frederick Bremer, 1, Connaught Road, Walthamstow, Essex. March 23rd, 1896.

This invention relates to new or improved gear for transmitting motion from the steam, gas, oil, electric, or other motive-power engines of what are known as self-moving or motor carriages, to the axles and wheels of such carriages; and the chief objects of the invention are to provide means for applying the power gradually to the wheels, so as to enable the carriage to be started and stopped quietly and without shock; to arrange the gearing in a compact form, and obviate in some cases the use of intermediate shafting; and to combine with such gearing, when necessary or desirable, the usual balance gear to compensate for the unequal diameters, or the unequal number of revolutions of the wheels on opposite sides of the carriage.

Fixed on the wheel axle, A, is a toothed wheel, B, which gears one or more pinions, C, turning on suitable pivots or bearings, D, in a disc, E, arranged to run loosely on the said axle. Also running loosely on the said axle is another toothed wheel, F, which likewise gears with the pinion or pinions on the disc. Rotatory motion is imparted to the last-mentioned toothed-wheel, F, by means of a belt passing round a pulley, G, secured to or formed with the said wheel, F, or by means of any other suitable gearing, whenever the motive-power engine is in motion. The periphery, H, of the aforesaid disc is fitted with a frictional brake strap, I. It will now be understood that when the brake strap, I, is held free of the periphery, H, of the disc, E, the latter is free to rotate on the axle, and is so rotated, by the toothed wheel, F, causing the pinion or pinions, C, in the disc, E, to rotate so as to run planet-wise round the toothed wheel, B, which is fixed on the axle, without imparting motion to such wheel or to the axle. If now the brake strap, I, is applied to the periphery, H, of the disc, E, the latter is gradually brought to rest; but the continued rotation of its pinion or pinions, C, on its or their axes, D, causes the toothed wheel, B, fixed on the axle, and consequently the axle itself, to rotate. On again slackening the brake strap, I, on the disc, E, the latter is allowed to revolve, and its pinion or pinions



resume their planet-like motion round the wheel, B, fixed on the axle, and they then cease to drive such wheel, so that it and the axle are allowed to come to rest.

By making the wheel, F, smaller than the wheel, B, arranging the latter so that the planet pinions, C, do not come in contact with it, and providing other planet pinions connected with the pinions, C, and adapted to gear with the larger wheel, B, the wheel, F, may be caused to exert considerably greater turning power upon the axle, A, than when the two wheels, F and B, are of the same diameter, or by the reverse arrangement, namely, making the wheel, F, larger than the wheel, B, and arranging the planet pinions accordingly, increased speed of rotation of the axle, A, may be obtained at the expense of power. A modified form of gear is also described.

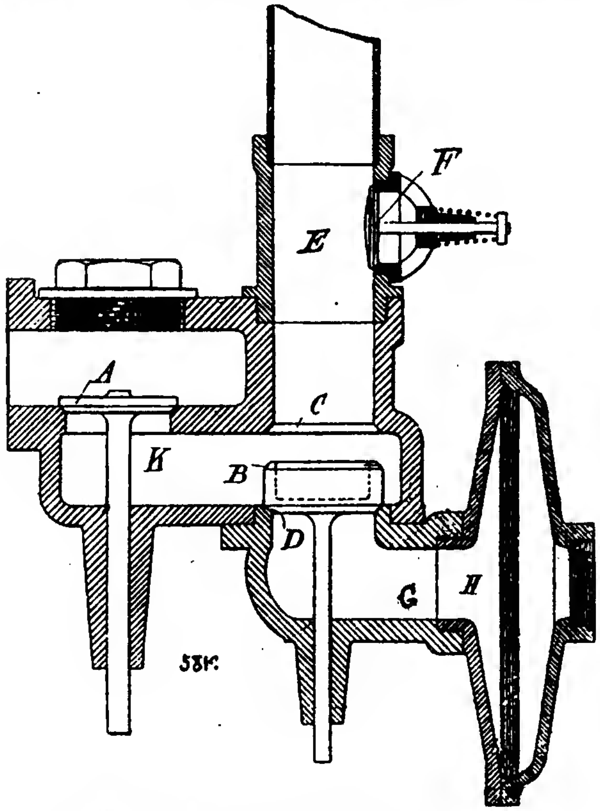
5,814. Gas and Oil Motors. Frederick William Lanchester, of Cobley Hill, Alvechurch, Worcester. March 16th, 1896.

Relates to improvements in the charging, exhausting, and governing arrangements of gas and oil motor engines.

Opening directly into or communicating with the cylinder is a main valve, A, of the ordinary lift type, this valve being operated at the proper moment from a cam on a side shaft and returned to its seat by a spring every alternate revolution of the engine. The under portion, or eduction side, of this valve leads to a short chamber, K, having two valve-seated openings, C and D, placed concentric with and opposite each other on either side of the chamber, K. These two valve-seated openings lead respectively, one, C, into the exhaust pipe, E, and the other, D, by a suitable port or passage to, G, the oil vapour and air supply. A double-seated lift valve, B, is placed between these openings, C and D, and it is made of a suitable depth, so that when it closes the opening leading to the air and vapour supply, that leading to the exhaust pipe is left clear, and *vice versâ*; a suitable lift brings it against and closes the exhaust opening, while leaving the passage free to the vapour and air supply. This double-seated valve is preferably operated by a governor of the usual gas-engine hit and miss type.

The operation is as follows:—The engine piston makes a forward or suction stroke, and during this time the main valve, A, is held open while the double-seated valve, B, is lifted so that the passage to the exhaust pipe is closed while that to the vapour and air supply is open, a charge of vapour and air being thus drawn into the cylinder by way of G and K; on the completion of the suction stroke the main valve, A, closes, and the double-seated valve, B, closes on to the vapour and air admission opening. The piston now makes its return stroke, and compresses the mixture, firing it when compression is complete, and then making a forward or working stroke. The main valve, A, now opens, and a return or exhausting stroke is made.

When the engine is working at full load the double-seated valve, D, now crosses over to close the exhaust aperture, and the piston draws in a new charge of combustible mixture to be in turn compressed and ignited. When a pre-arranged speed is exceeded, the governor gear causes the mechanism to miss operating the double-seated valve, B; and the motor piston then draws back a charge of exhaust gases from the exhaust pipe, E, and a missed impulse results. An automatic or other valve, as F, may be arranged on the exhaust

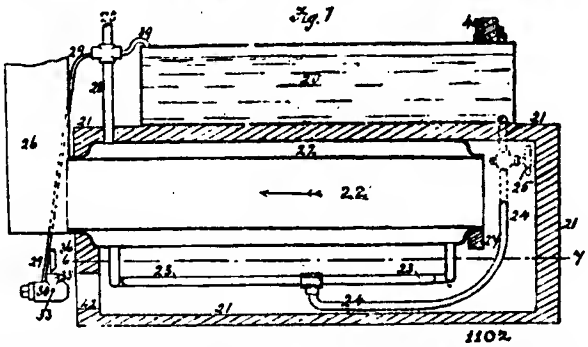


pipe, so that a certain amount of ventilation takes place at each cut out to prevent condensation of exhaust products within the motor cylinder.

To avoid back ignitions into the vapour and air supply pipe, in the port or passage, G, leading from the vaporiser, is placed a series of thick gauze copper, or other metal, screens, as H, through which the vapour and air is drawn, or it may also be drawn through granulated copper.

1,102. Road Vehicles. George Rose, Engineer, Gowanlea, Bishopbriggs, near Glasgow. January 16th, 1896.

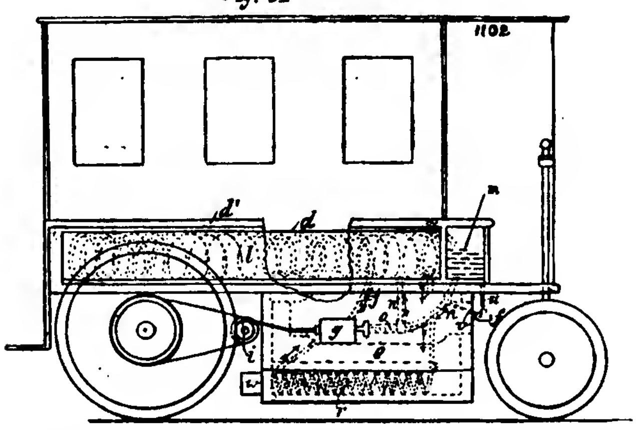
The invention especially consists in the arrangement and combination of parts of the steam generator, or the construction of same.



The generator comprises a closed metal tank, 20, for holding water to be converted into steam. It is mounted on a casing, lined with fire brick, or other suitable material. Into the casing, is fitted an annular chamber, 22, made of two metal tubes of different diameters welded together at ends, so as to constitute a strong closed main vessel, 22, for generating and superheating the steam. One end of vessel, 22, is fitted with metal chimney, 26, the other end being supported by a bridge, 27, in casing, the top being covered over by casing so that the flame shall pass along its bottom and then through its inside on way to chimney. To the underside of chamber 22, is connected the two upturned ends of a series of pipes, 23, formed on a level plane inside the combustion chamber of casing, 21, and connected at middle by a joint to the feed water inlet pipe, 24, which is led through the casing, 21, and provided outside with stop-cock, 25, and then connected to bottom of tank, 20. Fitted to top of generator, 22, is the steam main outlet pipe, 28, and connected thereto is a branch steam pipe, 29, also connected to an oil-spraying nozzle, 30.

As applied for driving a road vehicle which is mounted on two back driving-wheels and front steering wheels. A water tank, *d*, is fitted on the carriage frame under the seats, *d*[1], the steam generator

Fig. A



casing, *e*, being bolted to the underside of vehicle. Said generator may be constructed and worked by sprayed oil from a nozzle, *f*. A steam-engine or engines is mounted alongside casing, *e*, a cylinder, *g*, on both sides thereof driving the shaft, *i*, which is geared to revolve the driving-wheels in usual way. The exhaust steam is led by pipe, *j*, to a tube coil, *l*, fitted in the tank, *d*, through which the exhaust steam flows and is condensed. The condensed steam is allowed to trickle into a small tank, *m*, placed under the driver's seat, and is drawn therefrom through pipe, *n*, by a force pump, *o*, and forced into the water tank, *d*, by pipe, *n*[1]. By thus dealing with the exhaust steam noise therefrom is avoided. The two tanks, *d*, are connected together at bottom by a pipe, *p*, and at the top by a pipe, *g*, respectively, to allow the water and air to flow from each to each. A hand pump may be fitted into either tank to create pressure; the combustion products are led off by an outlet on bottom of casing into a branch flue, *w*, into which is fitted a coiled pipe, *r*, through which the water is led to bottom of steam generator in casing, *e*; oil is supplied from a tank under driver's seat by a pipe to spraying-nozzle, *f*, the steam being led thereto from the generator by pipe *v*.

2,569. Speed and Balance Gear for Motor Carriages. Ernest John Clubbe and Alfred William Southey, 16, Elm Street, Gray's Inn Road, London, W.C. February 4th, 1896.

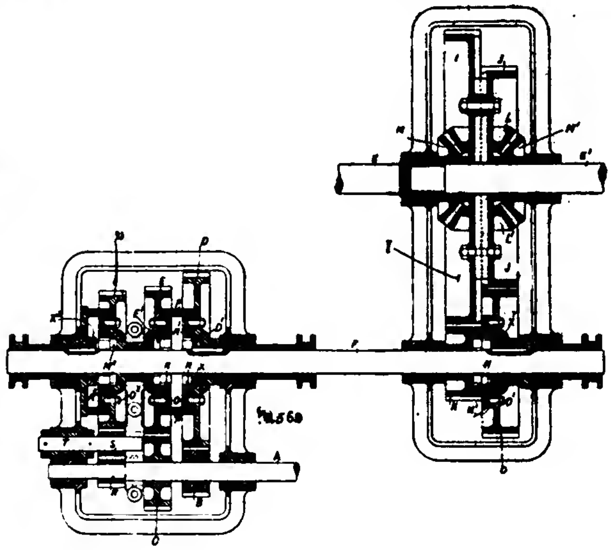
This invention relates to a combined multiple speed and balance gear for motor carriages, and it has for its object to enable the greatest number of different speeds and a balance motion to be obtained with the fewest number of parts constituting the change gear.

The first motion shaft, A, of the multiple speed gear is geared by two pinions, B, C, of different diameters keyed upon it, with two gear wheels, D, E, of correspondingly different diameters mounted loose on a second motion shaft, F, and capable of being put either the one or the other into driving connection with said shaft by a combined friction and dog-clutch of the kind described in the Specification of 2nd day of March, 1895, No. 4,518. Upon the said shaft, F, are loosely mounted two other pinions, G, H, of different diameters, which are also capable of being put into driving connection with said shaft by a similar clutch, and are in gear with spur rings, I, J, of correspondingly different diameters in one with each other, and forming the external member of a balance gear of the equational box or other form of epicyclic gear. This external member, I, J, of the balance gear rotates about the common axis of the two members, K, K[1], of the driving shafts of the vehicle, and upon radial axes carried by such external member are loosely mounted the pair of bevel pinions, L, L[1], which are in gear with a pair of bevel pinions, M, M[1], keyed on the two members, K, K[1], of the divided driving wheel axle.

By suitably adjusting the clutches on the second motion shaft, F, the following four combinations of trains of gearing may be obtained with differences of speed corresponding to the differences of ratio, viz.:—wheels B, D, G, J; C, E, H, I; B, D, H, I; C, E, G, J.

The clutch whereby either of the wheels, D, E, may be put into driving connection with shaft, F, consists of a male member, X, having peripheral dogs, and carried by a sleeve sliding upon and splined to the shaft, F, the male member engaging with corresponding dogs in a socket, D[1] or E[1], in the hub of the wheel, D or E, as the case may be. Each wheel carries a friction ring, N, also formed with dogs for engagement by the dogs of the male member, X, said ring being held friction-tight to its wheel by a spring-pressed clamping ring, N[1], secured by bolts, O, and springs as shown, the meeting faces of the friction and clamping rings being bevelled as shown so as to retain the movable friction ring, N, in concentric position and apply the pressure necessary to ensure the requisite amount of driving friction between the rings, N, N[1], so that before the male member, X, enters into, or after it passes out of, engagement with the dogs of the wheel-socket, the driving is effected during the transmission through the friction ring so as to prevent shocks. Between the friction rings of the two wheels, D, E, sufficient clearance is left in order that the male member, X, shall be free from both when in its mid position, so as to provide for the motor running free, if required.

This clutch gear is enclosed by a cylindrical casing, P, acting also as a distance-piece between the wheels, D, E.



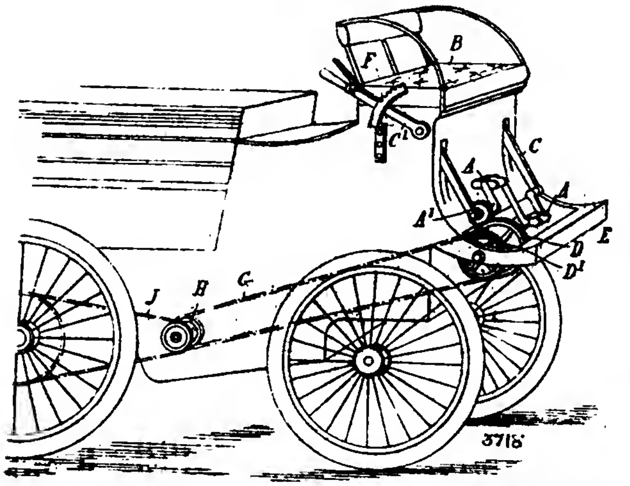
The clutch by which the one or other of the pinions, G, H, is connected with the shaft, F, is similar, except that only one friction ring, N, is employed, said ring being applied to the larger pinion, G, in the manner above described for engagement by the dogs of the male member, X[1], of the clutch which passes directly therefrom to the socket of the pinion, H, and conversely, there being in this case no need of an intermediate clearance space.

If it is required to provide for reversing the direction of running, the usual reversing device may be added, consisting of a third pinion, R, gearing through a pinion, S, on an intermediate shaft, T, with a third spur wheel, U, loose on the second motion shaft, F, and capable of being put into driving connection therewith by a clutch, X[2], M[2], similar to the one first described, except that in this case there is only one wheel to be geared with the shaft. It is essential that this clutch be not put in gear except when the clutch, X, is out of gear with both wheels, D, E.

3,718. Motor Vehicles or Traction Motors. Henry John Lawson, of 40, Holborn Viaduct, London. February 18th, 1896.

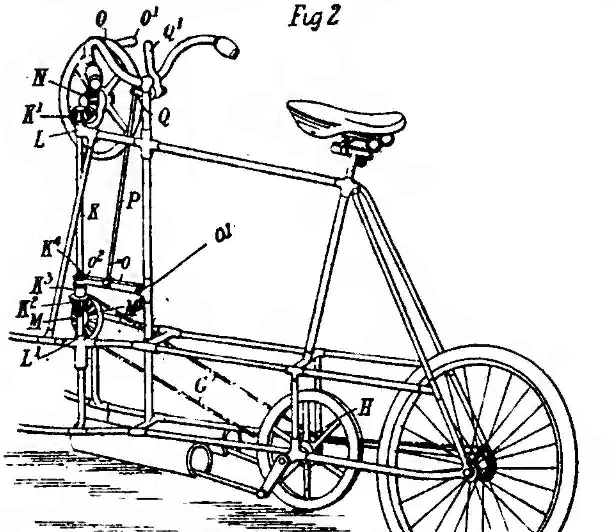
Relates to motor vehicles or traction motors, and the object is to enable the person in charge of the vehicle to back or move the vehicle for short distances so as to bring it to any required position, or to start the motor.

Fig 1



In the arrangement illustrated in Fig. 1, the pedals, A, are arranged to be put in or out of gear and operated by the driver seated on the box, B, of the vehicle. The pedals, A, together with a small pinion wheel, A^1, which is operated by them, are carried in bearings at the ends of the arms, C, of a U-shaped frame, which is pivoted beneath the seat, B, in such a manner that the frame, C, may be swung forward or back by the movement of a handle, C^1, connected thereto,

Fig 2



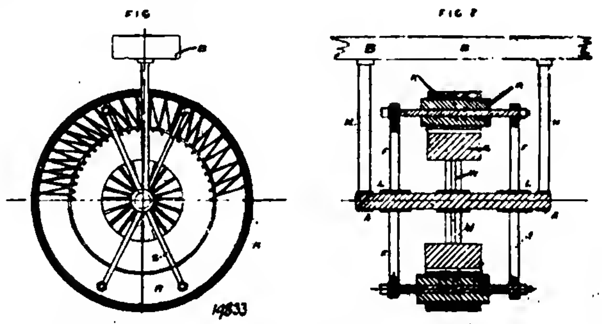
and arranged at the side of the seat. A toothed wheel, D, together with a chain-wheel, D^1, are carried by a short spindle in bearings in the footboard, E, the toothed wheel, D, being so arranged that on swinging the frame, C, forwards the pinion, A^1, may be caused to engage with the toothed wheel, D, the handle, C^1, being provided with a spring catch to engage with a toothed rack, F, in order to maintain the engagement of these wheels. A chain, G, passing over the chain-wheel, D^1, and over another chain-wheel, H, on the motor shaft, affords a connection by means of which the motor, and consequently the vehicle, the driving wheels of which are connected with the motor shaft by another chain, J, may be moved by operation of the pedals on the box. A ratchet and pawl, clutch or disconnecting gear may be used if desired.

The rear portion of the motor tricycle, illustrated in Fig. 2, is shown to be provided with an arrangement for starting or backing the same, this arrangement being adapted to be operated by hand. In this device a vertical shaft, K, carrying bevel-wheels, K^1 and K^2, is arranged to run in bearings, L and L^1, in the framing of the machine. The lower bevel-wheel, K^2, on this shaft engages with another bevel-wheel, M, carried by a spindle which also carries a chain-wheel, M^1, this spindle being arranged horizontally. A chain, G, connects the chain-wheel, M^1, with the chain-wheel, H, on the motor shaft. Engaging with the upper bevel-wheel, K^1, is a bevel-wheel, N, upon a spindle, which carries a band-wheel, O, provided with a handle, O^1. To enable this mechanism to be disengaged when desired, the lower bevel-wheel, K^2, is provided with a short sleeve, K^3, and is arranged to slide longitudinally upon the shaft, K, but caused to rotate therewith by means of a feather, K^4. A lever, O, pivoted to the framing at O^1, is provided at its free end with a fork, O^2, which engages with a groove in the sleeve, K^3, a rod, P, connects the lever, O, with a bent lever, Q, which has a handle, Q^1, by the manipulation of which it will be readily understood that the bevel-wheel, K^2, may be moved down or up the shaft, K, so as to be in or out of engagement with the bevel-wheel, M. It is obvious that other similar arrangements may be employed.

19,833. Electrical Propulsion of Vehicles. Anthony George New and Arthur James Mayne, of Palace Chambers, Westminster. October 22nd, 1895.

Relates particularly to cycles and other vehicles intended for use on roadways, and consists in arranging the rotating part of the motor or motors as the direct traction wheel of the vehicle.

The "stator," S, of this polyphase motor is shown inside the "rotor," R, the perforations for the windings alone being indicated, and is secured by the web, W, to the fixed axle of the vehicle, A. This axle, A, is secured by the standards, H, to the bottom board, B, or any other suitable portion of the vehicle. The "rotor," R, is bolted to the arms, F F, forming a second web and turning on the axle, A, in the bearings, L L.



The external rim, K, is the tyre of the wheel thus formed.

The same arrangement may be adopted with a direct current motor, S, being in that case the stationary part of the motor, while the rotating part (which would in that case be preferably the armature) is arranged as is R in the drawings, in which case it will have to be connected with a commutator in the ordinary manner.

25,210. Improvements relating to Axles and Axle-boxes. Ronald John Livingstone Hildyard, of Cue, Western Australia. November 10th, 1896.

A is the axle, provided with an internal chamber or reservoir, B, for lubricant; C is the axle-box (shown in section), enclosing the axle, A. The reservoir, B, is charged through the plug-hole, *b*, and the lubricant finds its way to the axle-box through the open end of the axle, and through holes, *a*, pierced in the axle. The axle-box, at its outer end, is closed, but it has the plug-hole, *c*, furnished with a screw plug, which plug-hole, when open, provides means for flushing out the reservoir and axle-box, when required, by hot water, kerosine, or other cleansing liquid, poured in at the hole, *b*.

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CONTENTS.

MOTOR TRAFFIC.*

(CHIEFLY TECHNICAL.)

By SIR DAVID SALOMONS.

MY audience will probably think that it is presumptuous on my part to read another paper on the well-worn subject of self-propelled traffic on the highway. An excellent series of lectures was delivered in this room by Mr. Worby Beaumont, which dealt mainly with the history of the subject. Mr. Cunynghame also read a paper here of very considerable interest, while elsewhere a great deal has been written and said on the same question by others as well as myself, covering a sufficient amount of paper to light the fires of a large household through a long winter. Probably no lover of music would be bold enough to assert that because millions of melodious combinations have already been produced from a limited number of notes on the piano, that at no future time may we expect further combinations likely to produce a pleasant effect on the mind. May I therefore venture to think that, in dealing with the various points bearing upon the question of self-propelled traffic, there yet remain possible combinations which may prove of interest to an audience? If the proposition be true, you will possibly allow that, in addressing you on this subject once more, the presumption is not so great as it might at first sight appear. I do not propose on this occasion to discuss the pros and cons of motor traffic, as to where its uses and abuses lie, but to deal with the matter rather from a technical point of view, and to examine the patent law so far as it affects the question. The former has been already attempted, but not, to my mind, in a satisfactory manner. Too much history has been mixed up with the subject, as well as loading it with pure theory. The interest I have taken in the matter has led to the forming of a large collection of books, old and new, dealing with road traction, as well as prints and engravings illustrative of the same subject. Indeed, I doubt whether anyone has a more complete collection of the kind, and a careful perusal of the various volumes and plates is most instructive.

The two chief lessons to be learned by their study are the following:—

(1) How few patents taken out recently in connection with the subject are original.

(2) How the whole tendency of the construction of light vehicles gravitates to the better types of those in existence between the years 1820–30.

We, of course, possess an advantage over the constructors of that period, inasmuch as we have improved materials to deal with, and can therefore produce a better kind of engine and boiler, in the case of steam. Much surprise has been expressed by the uninitiated, not even excepting many engineers, as to the reason why the horse-power to be carried on the motor-propelled vehicle should be greater than when the living horse is employed. I will examine this question first. You will fully realise that if carriages had wheels no larger than the ordinary reel of cotton, the usual obstructions to be found on highways would generally be as high or higher than the diameter of the carriage-wheels; so that when the obstructions were met by the wheels, if the former were loose they would be pushed along, and if fast, progress would become practically impossible, and the wheels would be destroyed or wrenched off before the vehicle had proceeded many yards. On the other hand, if the wheels

* Read before the Society of Arts, May 12th, 1897.

were to be, say, 30 feet in diameter, even considerable obstructions on the road would not be materially felt, as the wheels would pass over them with the utmost ease. In practice such large wheels could not be used. I will therefore suppose that the usual diameters as generally seen on carriages are employed when dealing with this subject, so that the wheels are from, say, three to five feet in diameter. We all know why, thanks to the careful investigations of the late Mr. Froude and others, the fish moves with such freedom in water when it is completely immersed, the reason being that the power necessary to divide the water in advance is compensated for by the closing of the water behind the fish, which gives it a push. Its curved outline is so admirably formed that the fish is capable of moving through the fluid in which it lives with virtually nothing more than skin friction to be overcome. The same might be thought to take place in the case of a carriage rolling along a rough road —*i.e.*, the extra power required to get the wheels over an obstacle should be compensated for by the downward run when descending the other side. To some extent the theory would hold good for exceedingly rapid motion, but not for speeds permitted on high roads, and for the following reasons:—It is evident that a wheel, in surmounting an obstacle, rises gradually, but it descends through a less distance as a rule, because the obstacle, a stone for instance, has probably been sunk into the ground or broken smaller by the wheel's passage. But supposing no crushing action takes place, as might well be the case with a very light vehicle, then why should the work be harder to pull it over a rough than a smooth road? The answer is, that in passing over a rough road, the speed being slow, the sum of the pulls necessary to get over the obstructions is far greater than the sum of the accelerating forces on descents, owing to the tendency of the wheel to push into the ground before surmounting the obstacle, and this applies in all cases. If the obstructions on a highway consisted of a series of symmetrical waves, switchback in form, it is clear that the carriage would run slowly up an incline, and more quickly down. The average power used, supposing these undulations to be on an otherwise good road, would be no greater than had these undulations not existed, although the carriage would have advanced by fits and starts. In giving these various explanations I have assumed that the horse is drawing the vehicle, and the line of draught is therefore at a point somewhat higher than that of the axles—in other words, inclined backwards to the road, which is a great advantage, because the pull tends to lift the wheels over the obstructions. Supposing, now, we place the horse behind the cart and make him push it with his chest, what would be the result? The wheels, instead of being assisted in surmounting obstructions by the lifting tendency, would now tend to drive themselves into the ground behind the obstruction, and the horse, which might have advanced with the greatest of ease when placed in front, would have his work cut out to push the cart from his new place. Here we have the condition imposed upon a self-propelled vehicle. This difference between dragging and pushing is well shown in the case of a railway-truck on which porters move passengers' luggage. If the truck, when loaded, meets with an obstruction, the only way to advance easily is to turn round and pull it along. I should like for a moment to consider the manner in which the power is derived from the horse. Of course, we must all admit that primarily it is muscular action, but most people think that a horse advances solely in consequence of the anchorage obtained on the road by means of its feet, whereas there is another very important action brought into play, which those who watch these animals carefully will easily observe. It is well known that a heavy horse can drag a greater load than a light horse, and I think, when you consider the special point to which I will refer, the reason is very obvious, although of the two horses in question one need not have greater muscular power than the other. Riders are aware that during a trot, and indeed at all times, the body of the horse rises and falls. The rising of the horse is due to muscular power exercised against gravitation, whereas the fall is due to gravitation alone. Since the horse is advancing during the time, a curve of a wave-shaped form would represent graphically the rise and fall of the horse's body. It, therefore, appears evident that there is during half the period of advance, a time when gravitation materially assists the progress of the vehicle, and the greater the weight of the horse the more it will be in favour of the load being pulled. Consequently, the heavy horse has an advantage over the light one for heavy loads. It appears to me that this, what I would term undulatory advance, is in a large measure equalised by the spasmodic advance, due to the horse's feet pushing against the road, and here is to be found one of the chief reasons why the carriage runs with smoothness. No motor has ever yet been devised combining these two properties. Gordon and others invented vehicles with feet to imitate the progress of the horse, but the rising and falling of the heavy weight was absent in these devices, and may possibly have been the reason why they proved complete failures. It may readily be imagined how jerky the advance would be without this compensating governor.

Pneumatic Tyres.

A few words respecting pneumatic tyres are not out of place. An ideal road would be one of a hard elastic surface capable of permitting all inequalities to sink into it without friction, when the wheels meet any obstruction lying upon it. Such a road in practice cannot exist. It is, therefore, necessary to seek a means which will produce the same result. A pneumatic tyre, suitably constructed, will give the equivalent of the ideal road, *i.e.*, the obstructions which the tyre meets will sink into it, and the travelling load will not be raised against gravity. Losses by friction, however, remain the same. The advantages to be derived from the use of the pneumatic tyre cannot, however, be gained except by encountering many other troubles, of which those who use this class of rim are well aware. They may be summed up as the mechanical defects of the system. There is a popular notion that by the use of the pneumatic tyre advantages are always gained. This is only true if certain conditions are observed. It is evident that unless the tyre is inflated to a proper degree which must be regulated by the load, also that it shall be of sufficient diameter that the stones most generally met with on the road will sink into the tyre—the pneumatic, so to speak, must swallow all the obstructions it meets with in its path—its main virtue would be gone. Personally, I do not view with the utmost favour the pneumatic tyre, on account of the mechanical disadvantages. Indeed, if the springs of a carriage are sufficiently well made and adjusted, a circumstance rarely to be found, the advantage of the pneumatic is almost absent, and I believe that for motor traffic the steel or solid rubber tyre will prove the favourite in the long run, when sufficient attention is given to carriage springs. The chief function to be fulfilled by the carriage spring is to enable the load to travel on the level whilst the wheels of the under carriage are mounting up and down as they pass over road obstructions. The weight of the portions which rise and fall are very small, compared with the vehicle and its load. Although it has been asserted that the draft is greatly diminished by the use of pneumatic tyres, my own experience does not bear this out except in given cases. On bad roads an advantage may be gained, but on good ones the steel tyre carries the palm. Quite apart from experiments, it is only necessary to watch the pull exerted by a horse on various classes of roads with the same carriage tyred in different manners. It is found that the rubber of the pneumatic tyre will burn if the load is very heavy. Whether this is due to the successive compressions of the air when meeting obstructions on the road, or whether it is owing to the friction of the air in the tube, due to lag in having to pass through a very restricted opening in a portion of a tube, *i.e.*, that part which is in contact with the road, and to friction generally, it is difficult to say. The fact is there. Messrs. de Dion and Bouton had the greatest trouble on this score with their tractors, and finally decided to fall back on the solid rubber. It is quite possible to make a pneumatic tyre suitable for very heavy roads, but the thickness and size would be so great, that the advantages to be derived would be virtually absent. In the case of cycles and motor-vehicles of that type, the pneumatic tyre is an undoubted advantage, for in one case it removes much of the vibration from the feet, which would be conducted to the body, and in the other it might be found difficult to introduce suitable springs on the ground of the weight or of expense. The pneumatic axle is the true solution to the trouble, when a satisfactory one is made. The horse is able to start a carriage by exerting his maximum power. He anchors his feet to the road, throwing forward and dropping the weight of his body. An engine, however, does not possess this property. An engine of any given horse-power has its capacity calculated for a given rate of speed. For instance, if a six brake horse-power motor is purchased with a normal speed of 300 revolutions per minute, it is understood that this brake horse-power will only be given off when the speed in question is reached, at a given gaseous pressure in the cylinder. Consequently, when the crank, or its equivalent, is turning more slowly, six horse-power is no longer given off. It is at the moment when the vehicle is to be started on the road that a large horse-power is required, and it is at this time that the engine is incapable of giving it, unless it is run at a considerable speed first, and then geared to the carriage. This is a quality, and indeed a defect inherent to all the known oil and gas motors, where a clutch of some kind is necessary. Great pains have been taken to achieve success in starting and stopping oil and other motors of this class placed on carriages, when passing through traffic, but even if this latter end were attained nothing would have been gained, because of the time necessary for the motor to get up its speed before the carriage could start running afresh. It may therefore be concluded that until some further, and at present unknown, improvement comes about, the oil-motor will have to be kept running at all times during temporary stoppages, which, apart from other disadvantages, is very wasteful. The electro-motor offers certain advantages, inasmuch that it is easy to stop and start, for accumulators possess a reserve power similar to the steam-engine, but maybe at the risk of wearing the accumulator. Of course, if large electro-motors or other forms of engines were carried than are necessary, some of the difficulties pointed out would be greatly reduced; but practical considerations, such as expense, great additional weight, bad economy in working, bar such a procedure. With the steam-engine we have a great reserve power. It is merely a question of raising the steam-pressure by the application of more heat to the boiler, or of using the heat already given to the boiler in a more advantageous manner, to obtain the additional power. It might be urged that a four horse-power steam-engine would not be strong enough to render 10 horse-power at any time; but by putting a few pounds extra weight into the working parts there is no difficulty or danger in accomplishing this, though such an engine would not be suitable for running continuously at the higher power, on the ground of want of economy, as the boiler would be continually strained to its utmost, and this, although it might not be productive of danger, would be an unfair tax to place upon it, and would necessitate earlier renewal. This is why the steam-engine, when placed upon the road carriage, can start and stop in the traffic with the same facility as the railway locomotive does with its train. It has been urged by some leading engineers that the main success of the railways has been due, not to the locomotives, but to the nature of the road, and no doubt there is much truth in this, for plate-ways, granite-ways, and other tracks of a similar nature suitable for highway purposes have been proposed, and may in the future find still more favour. But it is hard to bring one's self to imagine that the ingenuity of man cannot modify the locomotive to suit the road, when it has harnessed far more difficult problems. Many devices have been put forward for constructing a road engine which shall lay its own rails as it proceeds. Some of the methods are very ingenious. In some cases planks or rails are laid and raised as the wheels pass along; in others, the wheels travel in a large circular ring. Patents for similar methods have been taken out over and over again, and it appears to me a disgrace that a Government Department should thus take money under false pretences. All the advantages to be gained by the use of movable rails or other equivalents can be obtained by modifications in the wheels, without the auxiliary. At the same time, there is much to be said in favour of some of the proposed schemes. I will give one or two instances. If a combined locomotive and wagon is to be taken over a ploughed field to collect produce, the process might be impossible if the ground were soft; yet, if planks were laid along the route to be taken, the difficulty would be overcome. The equivalent to this would be self-laid rails carried by the locomotive. Again, the wheels running within a large circle present the advantage to be gained by the use of very large wheels, which by any other method would be impracticable, so that a locomotive could proceed over very bad roads, which might otherwise not be possible without excessive engine-power. It has become the habit to pooh-pooh these devices, but I think that there is more advantage to be gained from them than it is usual to give credit for, especially under certain given conditions.

Steam Motors.

I will now turn to steam power on the highway. After a careful study of probably every self-propelled carriage which has been made from the earliest times to the present day, I have come to the conclusion that Hancock's disposition of the working parts cannot be improved upon. This was my opinion long ago, and I was pleased to find Sir Frederick Bramwell and others uphold the same view. I pointed this out to M. Serpollet, who, having examined the matter, is in full agreement, and his new carriages are being built on these lines. I regard this circumstance as a compliment to English engineering. Of all motors for carriages at the present day, I hold that steam is by far the most suitable and advantageous for real work, and that when the Serpollet boiler or one of a similar type is employed, nothing more can be desired for many years to come. Of English manufacturers already busy at work on steam road vehicles, Messrs. Philipson and Thornycroft may be reckoned amongst the leaders. The steam carriage which has been brought nearest to perfection at the present time is that designed by M. Serpollet. I will therefore give a brief description of his vehicle with its most recent improvements. M. Serpollet has adopted the present type from the instructions I gave for the carriages constructing for me. The engine and disposition of the parts are all simple matters not subject to patents, and not capable of material improvement, as they have all been common knowledge for the past 70 or 80 years. The boiler and furnace alone have been the main difficulties in connection with the subject. Many waterless boilers appeared before M. Serpollet's time, but to him the credit is due for having devised a form of boiler, simple, cheap, and effective. The principle of the Serpollet boiler is so well known that I need not enter into it again. It will only be necessary for me to describe the boiler and furnace in their most recent form.* The earlier ones were not practical from an engineer's point of view: the furnace was large, a great weight of fuel was necessary, and fumes were produced. The present boiler is made up of several tiers of crushed bent tubes, the steam space being horseshoe in section, and a petroleum furnace. The chief improvements consist in very materially strengthening the metal of the tubes, which gives the advantage of a reserve for storing heat, which is essential, as well as for durability's sake, and the method upon which the tubes are built up is far simpler and renders repairs, when found necessary, rapid and easy to carry out. Those tubes which are nearest the fire are thicker than the elements more distant. In some forms the tubes are further bent into spirals, thus giving additional strength and an increased heating surface. The fire itself being a heavy oil petroleum furnace, offers lightness and security against breakdown and accident. A large reduction in weight, due to this form of furnace, gives an all-round advantage, especially now that the engines are constructed to condense. The ton of fuel and water which at one time it was necessary to carry, is now largely dispensed with, and in consequence the carriage does not require to be so strongly built. Ten hundredweight, at least, are saved in the weight of the carriage and furnace. In consequence the older carriages, which weighed at least 2 tons

* See THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL for January and April.

when prepared for a long journey, could now be constructed to weigh 10 to 20 cwt. laden But as the carriages at present beiug made weigh nearly double the lower weight mentioned, it may be asked why should this be so? The reply is, that there is a growing tendency among French manufacturers to build on English lines of solidity rather than elegance and lightness, and a great deal more weight is being put in those portions where the strains come. Six cwt. is very soon accounted for when this is done, and in order to secure the convenience of a movable body, portions of the framework are duplicated, *i.e.*, the underframe must be there as usual, and the frame for the body must be a separate one, so that additional weight is found in this direction. The modern steam carriage weighs about 18 cwt., and is far more satisfactory than the old forms, and decidedly superior to any of the oil-driven motor-carriages which have appeared before the public. There are many points of importance in the construction not new in themselves, in which strength and lightness are the main features obtained. The guiding bar does not act directly in steering operations, but by means of a multiplication wheel, for unless some method such as this is adopted there is a danger when meeting a large stone on the road of overpowering the driver and throwing the carriage to one side when travelling at a fair speed. The multiplication arrangement gives better control to the driver rendering such an accident impossible. Another way is to place the turning point of each wheel within or over the axle. The body of the carriage, so far as the eye is concerned, appears as one. In reality it consists of three divisions: the conductor's seat with a place beside him in front; a boot at the back, similar to that of the phaeton, but no seat in it; and between the boot and the box seat the space is occupied by a Victoria, brougham, van, or any other kind of body that may be desired, these bodies being removable without recourse to tools, and interchangeable at pleasure. The front place can be covered by a glass cab to protect the driver and his companion from the weather. At the back of the boot are two doors. On opening the right hand one the boiler is seen, and the left hand cupboard contains a vertical engine. The engine is a double tandem expansion type, and the reduction of speed as between the engine and driving wheels is not great, this being effected by means of a specially constructed strong single chain situated midway between the right and left driving wheels just as Hancock placed it in his carriage. This chain is dispensed with in some cases so that the driving is direct. The engine cranks, chain, and any other working parts are completely encased, so that no mud, dust, or wet can reach them. The engine is capable of giving off powers varying from four horse-power normal to 10 maximum. The boiler pressure can be raised to 16 or 17 atmospheres without danger. Briefly, the following is a summary of the advantages presented by the new petroleum furnace:—

(1) No smoke is produced when the burner is preparing to be lit.
(2) Very little methylated spirit is required for lighting.
(3) When making a stoppage for a considerable time, such for instance as paying a call, the petroleum is cut off from the main burner whilst the auxiliary burners keep the former hot for starting afresh.
(4) The burner can also be cut off when descending a hill.
(5) The expenditure of heavy petroleum, which can be obtained in this country at from 3*d*. to 4*d*. per gallon, would not, on the average, exceed in the case of a carriage such as described $1\frac{1}{2}$ gallons per hour when carrying four people at a speed of 12 miles per hour on average roads.
(6) The weight of the carriage unladen will not be greater than one ton.
(7) Six minutes only are necessary to prepare the carriage for running, and being free from all complications any intelligent man can drive it.

The natural question suggests itself, should the boiler or burner wear out how often is renewal necessary? In the case of the boiler it is only the lowermost tube which requires occasional renewal, though, of course, in time the boiler will wear out. The present cost of this tube is about £1 10*s*., and, perhaps, one or twice a year it might be necessary to replace it if the carriage is greatly used. The whole boiler is priced at the present time at £30, but total renewal is necessary only after many years of wear. I should estimate that even with hard work, *i.e.*, working the boiler harder than is fair, the annual expense would be considerably under £5. These boilers when made in England will undoubtedly be cheaper. The expense of renewing any part of the burner is exceedingly small, a few shillings would be the outside, and it would probably not be necessary to do this every year. The repairs and expense of certain renewals in the case of petroleum driven carriages is far greater than this, as all those know who own these vehicles, so that steam possesses the advantage over all such motors, although I am ready to admit that when a light, cheap, and lasting high-capacity accumulator makes its appearance, electricity will stand before steam for attention and comfort, if changing and charging etations exist throughout the country at easy distances. There are several points in connection with steam-carriages which cannot be over-rated, and greatly to be appreciated, by those who have been in the habit of using petroleum-driven motors. The chief one is that the crawling process up a hill is dispensed with, and 12 miles an hour up the steepest hill which horses and carriages at present climb, can be obtained without an effort. Secondly, when stopping and starting in the traffic, the engine is stopped and started as would be done in the case of a horse. Since the whole of the steam is condensed none of it passes into the atmosphere. Should by chance any do so, being superheated, no vapour escaping is visible, and days may go over before it becomes necessary to take in a fresh supply of water to make up for any slight waste there may be. There are no valves to grind, no cylinders to clean, no inflammable material to store at home or carry when on a trip, no unpleasant smell is produced, there is absolute freedom from vibration, no chance of a breakdown when least expected, no accumulator to charge, or platinum points to be renewed, no ignition lamps and tubes requiring attention and occasional renewal, all repairs that may become necessary at any time, the carriage builder, or even the village smith, can carry out. Quite apart from the advantages mentioned there is another which is of great practical importance; and is, that any moderately intelligent man, with a few hours' instruction, becomes master of the engine and carriage. It is possible to find men who have been accustomed to steam-engines in large numbers. There ought, therefore, to be no difficulty in finding a supply of drivers in proportion to the demand. This is not the case with oil-driven vehicles, on account of the complexity of the working parts, combined with a quality unknown to the steam-engine—that of developing some new defect when least expected.

Oil and Gas Motors.

All motors may be divided into balanced and unbalanced sections. By "balanced," I do not refer to the parts of the machine being duly poised, such for instance as additional weight placed on some part of the fly-wheel to balance the weight of the crank and any rods on the opposite side. I use the expression in regard to the primary force. For instance, we all know that in the gas-engine the running is spasmodic, and can only be overcome by the use of enormously heavy fly-wheels, so great indeed that in practice a certain amount of jerkiness is preferred. All oil-motors are gas-engines, and nothing more and nothing less. They may, therefore, all be classed under the one head. Steam and compressed-air motors come under another category. It is well to point out the difference between the two classes of engines. With the gas-engine, the pressure starts at a maximum and falls. With steam and compressed air, the pressure may rise gradually to a maximum, and then fall. This is why steam and compressed-air motors run so smoothly. It may be contended that the same result could be obtained in the case of the gas-engine, by using a separate vessel to explode the gas in, and then admit such gases into the cylinder, under steam-engine conditions.

Many years ago I made a large number of experiments in the hope of obtaining success in this direction, and many others have done the same. Although the results are successful in one sense, it is at the expense of efficiency and extra weight. There is a method of obtaining smooth motion from gas and oil motors, by counterbalancing the explosion. Many such engines have been constructed, and consist as a rule of two cylinders in each of which there are two pistons moving away and towards each other. Complete success can be obtained by this means, but only by the introduction of great complication in valves and gear so that in practice it is probably more convenient to be subject to vibration in an oil or gas motor-carriage when running at low speeds than to incur the risk of difficulties which must arise with still more complex machinery. When oil motor-carriages are running at a moderate speed the vehicle becomes the fly-wheel, and the greater part of the vibration disappears, but there is no means of obtaining regular and steady motion at slow speeds, however good the governor may be. There will always be a tendency for the engine, when the full power is not necessary, to run faster than the governor allows, and the speed is arrested. This action keeps on repeating itself, consequently the carriage advances by fits and starts. The oil motor-carriage is only comparable with the horse-drawn vehicle for comfort when running at high speeds. With steam, compressed air, and electricity, these disadvantages are completely absent, likewise the necessity of a clutch or its equivalent. I have made some experiments with my oil motor-carriage on roads covered with snow and ice. It is known that many possessed of such carriages have traversed portions of Switzerland and elsewhere covered with snow. I am ready to admit that such carriages, lightly laden, travel well over snow, but after a thaw, succeeded by a frost, hill climbing becomes a dangerous proceeding. I have found on several occasions, although the motrice wheels were revolving, the carriage body slipped backwards, and naturally no brakes are of any avail under such conditions. I took the safest course at such times, and turned the carriage gently into the hedge, and waited for help, or procured sand to get a grip on the road. It is evident also, under such conditions, the power of the engine is not a factor in the case. I would strongly recommend possessors of these carriages to supply themselves with an ice brake similar to that which I have put on my own carriage. It consists of two rods of iron with prongs at the free ends, the other ends of the rods being hinged to the carriage. When mounting a hill covered with ice, the rods are lowered to the ground, and if by chance the carriage cannot advance, the spikes at the free ends of the rods stick into the ground and prevent an accident. This brake is inclined at an angle of 45° to the road when resting on the ground. Ice wheels may also be required in some climates.

Electric Motors.

A few words may now be said in regard to carriages driven by electric energy. It may be desirable to point out why electricity is not in the competition at the present time, except to a very limited degree, so far as independent traction is concerned. The only known practical method now for storing electricity is by means of batteries, either primary or secondary. The primary batteries are too troublesome and expensive in the present state of knowledge to call for any remarks. The secondary battery is either too heavy, and if light, too costly for repair to be regarded otherwise than as a luxury. It is claimed by some makers that the vibration to which they would be subjected, both in the case of the heavy and the light type, does no harm and the maintenance is greatly reduced. I have no desire to let it be thought that all these statements are false, but I would point out that there is absolutely no evidence to bear out such assertions. All the evidence of the past is against the probability of such statements being fulfilled, and no new discovery has come to light to reverse past experience. Moreover, the only proof which can be brought forward contains the factor of time, and this has been so far impossible on account of the supposed improvements being very recent. It is only fair to state that some of the accumulators which have appeared of late, are more suitable for traction than the earlier ones. The modifications consist in using celluloid pots, which are lighter than glass, transparent, and not brittle. These pots can be closed effectually. The plates in the sections are made thinner, and in some cases wrapped round with perforated celluloid, the intention being to prevent possible contact between plate and plate. The most promising separator is the material devised by Mr. Joseph Swan. It is like cotton wool in appearance, though in reality celluloid. This "wool" is packed between the plates and around the section, converting the cell into practically a dry one. Notwithstanding these improvements, there is yet an element of possibility that the maintenance will work out higher than is anticipated, but at any rate, the mechanical advances referred to have greatly improved matters, although the electrical properties and efficiency remain much the same. But to leave the subject of maintenance out of the question, the light accumulator is very heavy, and the losses for any type cannot be estimated at less than 20 per cent., and in practice 30 per cent. is much nearer the truth. Hence it would be unfair, from a commercial point of view, to regard the cost of the energy otherwise than one-third more than that at which it can be produced. There would be few who will disagree with me when I state that a very fair price for the electric energy per unit is 3*d*. Although I do not contend that under exceptional conditions it cannot be produced for less, yet the figure given is by no means an unreasonable one, from the extensive knowledge we have of the cost of the production of electric energy at lighting-power stations throughout the kingdom. Consequently, if the electric energy is to be carried, about 4*d*. per unit is a fair estimate of the cost when used on a moving vehicle. Roughly speaking, three-fourths of a unit is a theoretical horse-power. In practice, unless the motor is very large, say, exceeding six horse-power, one unit per horse-power is the approximate expenditure of energy per hour. No doubt many will say that this is excessive for a carriage carrying a six horse-power motor, capable at times of giving off a larger power, but I would point out that when the roughness of the roads comes to be considered, and the stops and starts necessary when approaching and running through towns, my estimate is an exceedingly fair one. To sum this up, I contend that, as matters stand to-day, it is impossible to reckon the power delivered in an electric carriage at less than 4*d*. per horse-power per hour, which, of course, is enormous, when it is further considered that maintenance has not been taken into consideration at all, and that only a short distance can be run before the accumulators must be re-charged, and that unless charging stations are to be found throughout the locality where such carriages run, a useless mileage must be added for getting the vehicles to the charging station and back to the points where they have to be used.

Benzine and Steam Carriages.

Now compare these conditions with those of benzine and steam carriages. The cost of benzine gas may be roughly taken as equal to coal gas at 3*s*. 6*d*. per 1,000 cubic feet. Hence a gas-motor using benzine works out nearly one-fourth of electric energy. In the case of steam, using petroleum for the furnace at, say, 6*d*. per gallon (in large quantities, however, it can be purchased at about half this price), the cost per horse-power per hour would not differ materially from the cost of the benzine-motor, and consequently far cheaper than electric energy. In steam-engines using coal or coke, taking the price of fuel at £1 per ton and the consumption at 12 lbs. of fuel per horse-power per hour, the cost is about the same as crude petroleum.

It has, however, been found in the case of locomotive engines that the petroleum fire is nearly double the price of a coal one. In this case it must be remembered that coal was costing about half the figure I have just given, so that if coal, say, at 12*s*. per ton, can be obtained for road traction, the working cost is still further diminished. Practically benzine and steam come out four times cheaper than electric energy. All these facts should be borne in mind by those who think of embarking money in electrically propelled vehicles. In round figures the efficiency of a good steam engine may be taken at 10 per cent., but for a

x 4

road carriage this would probably not be better than from 5 to 7 per cent. A gas engine, whether using coal benzine, or other gas, has an efficiency of about 25 per cent. Electro motors have a commercial efficiency of from 80 to 85 per cent., but in this latter case so many conversions of energy are made between the coal and the electro-motor, that the actual efficiency is very low indeed.

Electric Motors.

I have always held the view that a perfect accumulator will not appear until the discovery of some new and cheap metal, not that the ideal accumulator cannot be produced to-day, but only at forbidding expense. At the same time discovery may lead to the production of a battery of some type, quite different to that to which we are at present accustomed, depending possibly on some new principle. It must not be thought from the various remarks I have made on the value of electrically driven vehicles, that necessarily they have no future as matters stand. My remarks apply to those instances where the carriages are to be used commercially, to obtain a good money return. Omnibus horses have to earn a certain amount per day. But this is not the case with a pleasure horse, or with an animal kept by a professional man. In such instances the maximum commercial output of the horse is not sought for, and under these conditions electric energy may do very well, provided that the following conditions can be obtained :—

(1) A guarantee from a Company to keep the accumulator in order.
(2) That conveniences for re-charging the accumulator exist.
(3) That the distance to be travelled in one day shall not utilise more than the electric energy stored at one charging.

M. Jeantaut was one of the first in France to make an electric carriage, though many had been constructed in England previously. M. Duracq's carriage, which was shown at the Salon de Cycle in December, 1896, is undoubtedly the best carriage of the kind which has yet appeared. I have had the opportunity of examining the vehicle closely, as well as riding in it, and it is admirably adapted for town use. M. Duracq, in a pamphlet, gives calculations to show that electric energy is cheaper than living horse power. The whole of his estimates and allowances are faultless, but an error creeps in, according to my mind, at the start, where he assumes too small a power to pull one ton at eight miles per hour along a road. The figure he gives may be true on a level asphalte road, but my experience, which is verified by that of others, would go to show that at least three times the power allowed is required in practice, taking roads as we find them. Neither is any allowance made for re-starting after stoppages, when considerably more current is necessary; and since an electric carriage is more likely to be used in towns than elsewhere, such stoppages in the traffic will be frequent. If these various points are taken into consideration, instead of electric traction coming out, as M. Duracq makes it, 40 per cent. less than horse traction, it will be found to be very much greater. In order that there shall be no misunderstanding I will quote the figures upon which the calculations are based. M. Duracq takes a well suspended carriage, and estimates 35 kilogrammetres per ton, for speeds varying from 12 to 15 kilometres the hour. In English this means less than ½-h.p. to do the work named, and all those who have experimented with self-propelled vehicles know that this is much too small an allowance, except under the most favourable conditions.

The Power of the Engines.

I will now turn to the question of the power of the engines to be placed upon motor vehicles. It cannot be too strongly impressed upon those who intend to take advantage of this class of traffic that the following conditions are essential for success :—

(1) That whatever is the proposed speed decided upon, it should be calculated upon the assumption of being an average speed, whether the country be level or hilly and the roads good or bad. Climatic changes must also be taken into consideration. Thus, if for a light vehicle, weighing when laden, say one ton, twelve miles per hour has been fixed upon for the speed, then the power carried should be sufficient to run at this rate in all weathers and over all highways, and to climb every hill with a maximum ascent of say one in ten, at the proposed rate. The vehicle should also be able to mount a hill of one in five, but at a less speed.
(2) That the mechanical construction shall be such that any intelligent man after a few hours' practice shall be able to manage it.
(3) That there shall be nothing about the carriage likely to prove a danger to the occupants, or the general public.
(4) That the vehicle shall be strongly made, and no part likely to wear out quickly.
(5) That dangerous fluids and fuels be excluded as far as possible.
(6) That the construction be such, that when repairs become necessary, they can be carried out either temporarily or finally, by any intelligent village smith.

In respect to the above considerations, there is only one which needs special comment. It is evident that the power required to obtain a given speed on the level and down-hill, needs no consideration, for if the engine is strong enough to mount hills of one in ten, ample power exists to do the rest. I have come to the conclusion from experiments, and practice, that for every ton, not less than ten horse power should be carried. This does not necessarily imply that a 10-h.p. engine is required. It means that the engine shall for considerable periods, and without injury to itself, be able to give off 10-h.p. It must be remembered that when the carriage is started, a far larger amount of power is necessary than when it is running. It is therefore very important to have a good reserve. I have examined with close attention probably by far the greater majority of the benzine motor carriages in existence, and have ridden in a large number of them. I think it is quite unnecessary to give scientific evidence to disprove the various clap-trap which has been put before the public by company-mongers, in the hope of drawing money. Statements as to 60 miles per hour, and a variety of other nonsense, needs no comment. Anyone present is capable of running a carriage strongly made at 60 miles per hour, without a motor, and without a horse, by merely starting the vehicle down a long steep hill! In fact all statements as to speed, in connection with motor carriages, are worth nothing. There is no difficulty in obtaining enormous speeds with very small power, under favourable conditions. The real test is: Will the vehicle mount a hill, say one in ten, when the thermometer is 90° in the shade for a distance of five miles, at the respectable speed of twelve miles per hour? Any test short of this, supposing this speed is desired, should end in a decision to reject the vehicle as unpractical and probably worthless. You must not understand that I necessarily fix twelve miles for the rate, for many would be content with a lesser speed; and for haulage where vans and similar vehicles are employed, five or six miles per hour would be deemed sufficient on steep hills. It may prove of interest to give a few statistics, calculated by some of our greatest engineers. They were compiled with reference to haulage on roads in general, and the figures must not be accepted for self-propelled vehicles, for the many reasons already referred to, the chief one being that when the motive power is self-contained, the haulage factor must be multiplied two, three or four times, according to circumstances, but the tables will hold good for self-propelled traffic when the factors are multiplied by a constant.

Experiments made by Telford showed that draught for a wagon weighing about 21 cwt., was a follows :—

	lbs.
(1) On well-made pavement	33
(2) On broken stone surface on old flint road	65
(3) On a gravel road	147
(4) On broken stone road on a rough pavement foundation	46
(5) On broken stone surface upon a bottoming of concrete formed of Parker's cement and gravel	46

Babbage has stated that the friction or resistance of roads are as follows :—

Well-paved roads	$\frac{1}{77}$ part of load.
Gravel road	$\frac{1}{35}$ "
Fresh earth	$\frac{1}{16}$ "

By his experiments the following results were obtained :—

Loose sand	$\frac{1}{4}$ part of load.
Fresh earth	$\frac{1}{8}$ "
Bye roads	$\frac{1}{9}$ to $\frac{1}{10}$ "
Dry meadow	$\frac{1}{25}$ "
Dry high road	$\frac{1}{40}$ "
Hard macadam	$\frac{1}{35}$ "

Telford's Table gives in round numbers as the difference between the lowest and greatest figures a proportion roughly of one to four-and-a-half. Babbage's Table for equivalent roads by theory gives the ratio roughly one to two, and by experiment, taking hard macadam and a bye road as an eqnivalent comparison, the ratio is one to three. Strikiug a general average, it may be assumed that the power required to draw a vehicle over a good level road as compared with a level rough road, wonld be four times greater in the latter than in the former case. Here is another table of considerable interest which deals with a stage coach. It may be observed how very close the figures are to those I gave in an article published some time since in *The Engineer*, although I had not seen the statistics in regard to the stage coach at that time.

With a stage coach weighiug 18 cwt., exclusive of seven passengers, the following were the results :—

Rate of Inclination.	Rates of Travel'ing.	Force Requ red.
1 in 20	6 miles per hour	268 lbs.
1 in 26	6 "	213 "
1 in 30	6 "	165 "
1 in 40	6 "	160 "
1 in 600	6 "	[illegible] "
1 in 20	8 "	296 "
1 in 26	8 "	[illegible] "
1 in 30	8 "	196 "
1 in 40	8 "	166 "
1 in 600	8 "	120 "
1 in 20	10 "	318 "
1 in 26	10 "	225 "
1 in 30	10 "	200 "
1 in 40	10 "	172 "
1 iu 600	10 "	128 "

The following experiments may also be giveu as affording some further idea of the power required for haulage :—

An engine drawing 18 tons on a fairly level road. Separate locomotive 18 tons, when charged with fuel and water, must give i.h.p. of 30 to reach speed four or five miles an hour.

Another engine, 12 tons, drawing 25 tons load, for same speed, 40 h.p.

Another engine, 15 tons, drawing 32 tons, same speed, 50 h.p.*

Although the question of rapid mechanical traction has come to the fore after a lapse of about half-a-century, it cannot be said that the interregnum has been due to any failure in regard to this mode of traffic. It is right to point this out, because the French and Germans claim to have revived this class of traffic, and that it had never been done before with success. The French also claim that the first self-propelled vehicle was made in France, by Cugnot. The latter point may be conceded, but I claim that the English nation were the first to make really practical road carriages, as they were the first to construct railways, and that the early motor traffic of the period about 1830, was killed, partly by the attention drawn to railways, but in a large measure by the monstrous Acts which were passed, dealing with the tolls to be imposed on them when travelling ou the turnpike roads ; and although these Acts were modified at a later date, the definition of a locomotive, as laid down in the Act of 1865, finally stopped the way until the passing of the Act of last year. I have no hesitation whatever in saying that the steam coaches of Hancock, and of many other former designers, could be run to-day with perfect success, and that the only improvements we can now add to their designs are due to the better and cheaper material we have at our disposal. That this view is reasonable let me give you the parallel. Compare the locomotive of to-day, with that of 1830. The improvements are those simply due to the increased demands placed upon the railway system. The general principles aud design remain the same. It is mainly in detail and size that the alterations are to be fouud. To expect, as some people do, an extraordinary invention will sooner or later appear to render motor traffic on the highway a success, is simply ridiculous. Not that wouderful discoveries may not be made, but I think that all engineers will agree with me that at the present time we have everything at our command to make this class of traffic all to be desired. The only thing now wanting is practice, with the relegation to the background of the Company promoter. Our great manufacturers are perfectly competent to deal with the question, and it will be these firms which will not only survive, but will also bring the whole matter to a happy issue, in conjunction with such factories which may come into existence, placed upon an honest commercial basis, and as already stated, I do not believe there is any chance, as matters stand to-day, of benzine, oil, gas or electricity competing with steam, where real work is to be done with certainty. I should like to refer to the evidence given before the

Parliamentary Committee of 1831.

Telford, Gurney, Macadam and others were witnesses. They appear to have agreed in regard to two points, viz., that the wear from the horse shoes was greater than that from the carriage wheels, and they also expressed the opiniou that there should be one inch width in the tyre for every ton carried, inclusive of the weight of the carriage. Of course we know the roads of to-day are not made in the same manner as they were at that date. We believe that our roads have been greatly improved since that time. My observations do not bear out the two points mentioned. I do not think that the general law of one inch width of tyre per ton must necessarily be followed up the scale. A proper width of tyre for a carriage weighing oue ton, I think, should be two inches instead of one inch ; then add oue inch for every ton up to say three tons. At this, the tyre would stand at four iuches, and on high-roads this is ample width for very much heavier weights. Then again in regard to the wear and tear due to horses' feet, I believe that the wheels do far more mischief, particularly in the case of a narrow road, as it will always be found that the ruts are the worse portion of the road, and not where the horses tread. Even ou wide roads, the wear of the wheels appears to do the mischief. I am quite ready to take a different view if the road is practically perfection, and "quartering" is coustantly taking place. Then the wheels will wear the road very equally. The remainder of the evidence before the Committee tended to show that steam carriages were at that period a success and likely to contiuue so.

Electric Traction for Canals.

I cannot refrain from pointing out a possible mode of traction, which appears to have been completely neglected. When the construction of railways was on the *tapis*, great opposition was offered to their construction, on the ground that England was well served with canals, and that the companies, owning these, would be greatly injured if the railways were made. I have, in my possession, copies of some remarkable letters which appeared early in the century on this subject. I have not the least hesitation in saying that if electric traction could be applied to the existing canals, they would be made far more useful, as well as more profitable, to their owuers. Electric traction could be applied in this case at a comparatively small expense, and it is worth while to have an experiment made on an extensive scale. For light traffic on railways, the self-propelled vehicle has a fair opening ; and abroad, experiments are being made in this direction. One or more railways in

* See "Fletcher."

Germany are making trials, also the Northern and other railways in France. For compulsory service, as in the case of postal mails, and for lightly-laden night trains, the French Serpollet Company have constructed carriages to carry from 40 to 50 people, with a sufficient engine power to run at about 30 miles an hour for such purposes. It is estimated that the cost of running these compound carriages is about one-third the cost of an ordinary train, and the wear and tear to the permanent way is far less On almost every railway system in England there must be an opening for this class of traffic. It may also be mentioned that these French steam carriages are capable of drawing one or two ordinary railway carriages, but at a reduced speed, say at 18 to 20 miles an hour.

The Revival of Motor Road Vehicles.

Without doubt, a great many people are puzzled why self-propelled traffic has again come to the fore. In England this traffic has been going on unostentatiously for years, traction engines being largely in use, but their speed is so limited by law, and they are so surrounded by legal technicalities, such as a license necessary in every county, and taxed, that no advance could be made in the direction of light traffic. In residential districts these restrictions have proved a blessing. In France and Germany, although there are laws affecting self-propelled traffic, they are far more lenient. The great success which cycling had in France, following upon the prize given by *Le Petit Journal*, which also gave so large an advertisement to that newspaper, led to the energetic proprietors offering a prize for quick self-propelled carriages, with the result which is so well known. Consequently the revival is not due to any new discovery or special invention, but simply that many minds were turned to the subject in the hope of gaining the large money prize. The French nation, possessed of a character highly enthusiastic, always goes to extremes. A perfect rage set in for the class of vehicle under consideration, and those who became possessed of these carriages, being wealthy, gave a great impetus to manufacturers. You have here in a nutshell, the whole history of the revival of self-propelled traffic of the lighter kind. A great deal of agitation took place last year to obtain a satisfactory Act of Parliament, to enable the same freedom to be given in England as abroad for the use of motor vehicles on highways. It was generally expected that as soon as Englishmen obtained this freedom, a great nuisance would be produced by the presence of vast numbers of motor carriages in the streets of towns. I never took this view myself, but always thought that the change would come slowly but surely. There is no doubt, that the position taken up by certain of the motor companies, has, for the moment, created a lull. Nobody, when purchasing a carriage, desires to buy a legal action at the same time. Tremendous opportunity is therefore offered for honest commercial companies to start at the present time, and I find that this fact is well appreciated in financial and commercial circles. The Society of Arts may be said to deal more largely with commercial interests than with any other. It has taken part in many of the great movements during the Victorian Era, which have so materially increased the wealth of this country.

Master Patents.

I therefore feel that it is not altogether out of place to say a few words in regard to patents, so far as they touch the particular question under consideration, as well as on patents generally, as they affect the manufacturer and the public. The present hesitation to take full advantage of the Locomotives on the Highways Act, 1896, is due in a large measure, to the blemishes existing in our Patent Law, which enables any set of people to bully or blackmail, not by right but by might, the assumption being that the threatened parties will not fight. In dealing with the question of patents, it is not my wish to deliver a legal discourse upon the subject, and the numerous "ifs" and "provided" are omitted. My object is to give you a general view rather than a complete technical analysis of the subject. There is too much tendency in the present day to patent an article in the hope of it accomplishing something for which it was not intended. There is no doubt that our Patent Law does a good deal to prevent useful inventions being made in regard to any particular matter where a number of patents already exist. No man will turn his attention seriously to develop a piece of machinery where he thinks he may be stopped from reaping the harvest he may deserve, by finding that in some little detail a patent has already been taken out. That my view is correct is corroborated by manufacturers on all sides. It may be contended that the present Law would permit him, notwithstanding, to work his invention, and no doubt this contention is true if the inventor can afford to enrich a number of lawyers first and hand his profits over to others. It is not the question of patents which I attack, but the method by which they are worked, and a great improvement could be made in this respect. Much of the advance which has taken place in foreign countries, to our disadvantage, has I think been due to defects in our Patent Law. Our Patent Law is evidently unsatisfactory. How could it be otherwise expected, when the principle by which our Governments work is to deal with these matters in a kind of political way, and place men in charge of the work, who as a rule know nothing about the special subject they have in hand? I could give innumerable instances of this process, but to do so would open me to the charge of personalities, which I am anxious to avoid, because I know well that those who carried out the work did so under instructions, and to the best of their ability, often limited. All practical men will recognise that no Patent in England is of value until there have been decisions in the Law Courts in regard to infringements, and that if a defendant instead of fighting, gives way and perhaps pays agreed damages, the Patent stands exactly where it did before the Action arose, since it has not been upheld nor has it been overthrown. Again, if a good fight is made and the defendant loses, there is nothing to prevent another infringer being proceeded against, and he might be more successful in the Action and overthrow the Patent. Then there follows another injustice, that the first defendant who lost his case obtains no relief, although the Patent has been declared invalid subsequently. Any article which is patented in England cannot be brought from abroad except under two conditions, firstly that the individual doing this is willing to pay what may prove to be blackmail to the holder of the English rights, or to submit to an Action with the possibility of losing his case. The patented article moreover is liable to confiscation without claim for damages. This state of things, although it exists in many other countries, is eminently unjust and against the interests of the nation. I will give two instances bearing upon what I have said to show how unfair things are at present. A few years ago I took out a Provisional Specification for an improvement in keys. It was brought to my notice about a week or a fortnight later that another Provisional Specification had been lodged identical in character. Indeed I learnt the circumstance by pure accident. The question to decide was whether I had been anticipated or not. If so, it was not my intention to proceed any further. I then found that my Specification had been lodged a few days—not a week—earlier than the other one, which had been entered in the name of some one living at Norwich and a stranger to myself. Here was a case of two persons hitting upon the same idea practically at the same time and each applying for a Provisional Specification which was granted to each within a week. The sole difference between the two Specifications was that the Norwich application included watch keys, and this was covered in mine by using words to the effect that the improvement was to apply to every form of key, for whatever purpose it might be used. According to common sense and equity the Norwich man ought to have had his money returned, which of course was not done A second instance is the following: A desire was expressed to me by a gentleman living in France to give him all the information I could, to render agreeable a proposed trip in England to be made in his horseless carriage. I wrote to him to say that if his carriage came under certain Patents it might possibly be confiscated if it came to the knowledge of the owners of the English rights. Failing this, he might have to fight the matter out in the Law Courts, and as neither of these conditions were likely to render his journey to England pleasant, he had better ascertain from the makers whether anything about his carriage was patented in England, and if so, whether the rights were held in this country by hostile persons, and further to request the manufacturer to make arrangements for him with any holder of English rights to permit the carriage to enter without molestation. It appears to me that apart from the larger question, the following amendments should be made without delay in the Patent Law :

(1) If it can be shown by the applicant for a Provisional Specification or Patent, within twelve months from the date of first paying the fees he has been anticipated, the fees shall be returned. Provided he can shew that at the time of application, he was ignorant of the anticipation.

(2) That if in any action, a Patent is declared invalid in consequence of anticipation by the issue of prior patent, the fees shall be returned. With the same proviso as in No. 1.

(3) That a patent shall become void, unless the present holder be registered.

(4) That English patented articles may be imported into England on the following conditions: that the individual so importing gives notice to the Patent Office or some other selected Government Department, of his intention to do so, with a declaration that the article imported is for his private use, and that he shall deposit a sum equal to 10 per cent. of the cost of the article, which will be handed over by the Government Department to the holders of the Patent rights, and that the owner shall not be precluded from selling the patented article provided he does not import more than two in a given year, there being a *bonâ fide* understanding that the importations have not been made with a view of trading.

(5) That if a patented article enter the country for a short period with no intention of trading, that providing it does not remain more than one year in England, the sum paid shall be one instead of ten per cent.

(6) That in no case shall a patented article be liable to confiscation, but the aggrieved party may have the power of applying to the selected Government Department who shall ascertain whether more than ten per cent. shall be regarded as the fair compensation, the costs to be apportioned according to circumstances.

(7) That patented articles may be made by any manufacturer with the same freedom as if they were not subject to rights, provided that the manufacturer declare to the selected Government Department his intention to manufacture, and that department shall enquire whether a royalty of ten per cent. paid to the holders of the rights is deemed to be sufficient, and that the Department shall not take into consideration the amount of capital which the holders of the Patent may have invested in or watered their business, but determine the question simply on commercial principles. This condition may be said to exist now, but with insufficient freedom.

(8) That a patented article in the *bonâ fide* possession of a member of the public, *i.e.*, private person, shall not be confiscated under any conditions whatever, but in the event of the Patentee gaining an Action, the damages shall be paid by the manufacturer, and if the goods are foreign the private individual may be called upon to pay 10 per cent. of the value of the article, unless he desires to defend an action with a view to upset the Patent, in which event, if he loses, he shall be liable only for the costs beyond the 10 per cent. mentioned.

(9) That no back royalties extending beyond 12 months shall be claimed.

The above amendments are greatly needed, and if they could be obtained with possibly certain variations, considerable impetus would be given to British trade, apart from benefit to individuals of the general public. It often occurs that a good invention is held by parties who are incapable or unwilling to manufacture, thus establishing the position of dog in the manger, simply to levy blackmail. A new manufacture which might employ many hands, and bring capital into the country is stopped for a number of years, and perhaps for ever if the invention or inventions in question have been superseded before the expiry of the Patents. It is well known that many inventors of a low type take out patent after patent in regard to various matters, few of which are really original ; but the process is carried on in the hope that some one will be caught, sooner or later, in the net. It is a means of speculation most disadvantageous to the industry of this country. It must be evident that no inventor can sit down and solve problems with a pile of patent specifications at his side for continual reference. No man could produce useful work by such a process. It is therefore obvious that inventors should receive the greatest freedom, which can only be attained if patents are not granted for trifles according to the present system, and only after some kind of reasonable investigation. The present Government would do much good if they would look into a matter of this kind, which is affecting the employment of the working classes in a large degree, as well as the introduction of those economies which save the nation money. With a better patent law, opening for the employment of capital at home would be extended. Such subjects, which Ministers probably consider trivial, have a more far-reaching effect than the passing of Party legislation, or a variety of other Measures before the House, which a twelvemonth's delay would add to the peace of all parties. The Patent Laws can be made a blessing to the inventor and the public, or the reverse, according to their nature ; and those of England partake rather of the latter character. At Liverpool, I used the following words :—" One opinion from which I have never swerved upon this question is that no Patent connected with Self-Propelled Traffic is worth the paper it is written upon, whether the Patents will bear the test of the Law Courts or not." The above remark was very rightly made use of by the majority of the newspapers when criticising the various Companies which had been formed, and were being formed about that period, and I was led to understand that those connected with the Companies in question complained grievously of what I had said, it being contended by some of them that they held Master Patents and monopolies. I think it therefore right to say something more upon this question, for to set up such untenable claims is unfair to the English manufacturer and to the English public. I intend, with your permission, to examine the whole question of patents more narrowly than I have done, and to prove that there is no Master Patent or Monopoly whatever, which can apply to the construction of motor carriages generally, whether they be driven by steam, oil, or electro-motors. I will not ask anyone to go further than to consult a book published by the Patent Office, and which may be purchased for a shilling from any bookseller by giving the order. This book is the Abridgements of Specifications, Class 7, Oil and Gas Engines, period 1877-83. Here will be found patents connected with the subject, all of which have now lapsed. There are other volumes of abridgements dealing with velocipedes, and with other matters, which also bear upon the subject, but the book mentioned is sufficient for the purpose, while if every detail is sought for, the original Specifications can be consulted as well. I will first examine whether any claim can be made for a Master Patent, in regard to motor vehicles. The possession of a Master Patent would mean a monopoly on the part of those holding the rights. Let us see what a Master Patent means. Without entering into technicalities, it must be a " manufacture, useful, novel and ingenious." Consequently if the patent is a Master one, this useful, novel and ingenious manufacture can only and solely be made under the patent specification, or may be, under a group of such patent specifications. The patent might, in certain cases, be the embodying of some new idea of great value and novelty. To explain more clearly, I will take the well known case of the Edison-Swan electric incandescent lamp. Quite apart from the morality of the case, we find a Master Patent (or rather group of patents), *i.e.*, a lamp of special form suitable for a definite purpose, which can practically be made in only one manner for commercial success. These patents are of the class termed a combination, which means a combination of old things to form a novel, ingenious and useful new one. Incandescent lamps can be made in other ways it is true, but they have not the same value commercially. Hence the only lamp of practical value was covered by the patents, and was of a particular type, viz., a high resistance carbon filament in a practical vacuum, enclosed within a case of glass, hermetically sealed, with platinum leads passing through the glass, and the filament strengthened by the process of flashing. Here we find a combination which has not been improved upon to the present day. In the history of the world there has occasionally appeared a Master Patent, but these are comparatively rare, and always for some entirely new invention or discovery. We will now examine whether it is possible for such a patent to exist for motor traffic, in the present state of things.

The only possible Master Patents which could exist would be of the following nature :--

(1) The combination of a motor, other than steam, with a carriage suitable to run on highways.
(2) Combination by which gas in the cylinder of a gas engine can be ignited at any suitable time by means of an electric spark.
(3) The use of a carburetter, when the gas is produced from an oil or spirit.
(5) The use of a silencer for the exhaust in the case of gas engines, when applied to a road carriage.
(6) The existence of a gearing which is only and solely suitable for light traffic.
(7) The use of a clutch in connection with light traffic.

This list is sufficient without dealing with other points which have virtually no importance. In the majority of cases no distinction is drawn between the gas engine, oil engine, and benzine engine, since the word gas covers gas produced from any material suitable for the engine in question. But, suppose a judge, who was not a technical man, were to hold a different view. Then his attention would be called to the existence of a list of patents, dealing with engines which used gas produced from coal gas, oil and benzine, all of which have expired, so that no claim whatever could be made by any living man of rights connected with coal gas, oil, or benzine engines, of an exclusive character. Further, if a judge were to hold that a combination of an oil engine, with a carriage, was "useful, novel and ingenious," he would again be confronted with several old patents, which have expired, in which this combination was claimed. The same remarks apply to the whole list of various possible claims, which I have enumerated above. Patents have been taken out more than 14 years ago, for oil motor tricycles and bicycles, for electric ignition, for ignition tubes, for clutches, and as for gearing, we all know that there cannot be an exclusive right, as various forms have been used in connection with road traffic since the early part of the century. It may be inferred from these remarks, that no patent taken out in connection with motor traffic is valid, but this I do not say. Some special device for doing a particular work may be a valid patent, but it will not be a Master Patent, and therefore will not prevent anyone else doing the same work by a modified device. To show you more clearly what I mean, I will analyse a de Dion and Bouton tricycle. I will not say that there may not be some parts in the tricycle which are patentable, but if these were upheld, it would not prevent anyone else making a motor tricycle, leaving out the patented portion. The motor itself, as far as I can see, has nothing novel about it. Its success depends on good manufacture. If there was any point in this motor upon which a valid patent could exist, a motor could be made just as good leaving this point out. The electric ignition has nothing particular about it to commend itself, although it is said that current is saved by the method adopted. It is an old laboratory device, namely, a tetanus spring set in motion by a rotating cam, which was "common knowledge" when the patent was granted ; but from an electrician's point of view there are far better ways of achieving the same result, supposing it to be held that the ignition device is a good subject for a patent, and these are open to all. To sum this up, an equally good tricycle can be made to do all which the one in question will do, without being subject to patents. The success of the tricycle in question is unquestionably due to excellence of manufacture, and not to any novel invention. I will not weary you by going through all the types of carriages, whether driven by steam, oil, compressed gas, compressed air, or electric energy, but I could prove with the greatest ease that the same remarks which I have made in regard to the tricycle, hold equally good as regards other types, and consequently there is no such thing as a Master Patent for motor traffic, nor can anyone claim a monopoly in this respect. At the present juncture a few words of advice to existing or intending manufacturers of motor carriages will no doubt be acceptable, when offered by one who stands in a completely independent position. When a manufacturer is threatened with an action for infringement, if he desires to continue to manufacture and place upon the market the article complained of, there are the proverbial three courses open to him :

(1) To knock under and make terms.
(2) To continue to take no notice and risk an action.
(3) To take steps to compel the patentees to start an action first, and oblige the threatening parties to prove their case.

I strongly advise the latter course to be followed in every instance, and the method of procedure which I would recommend is the following : When a manufacturer has the slightest doubt as to his position, he should make one of the articles stated to be an infringement, and place it on the market, then give notice of the fact to the parties who claim the rights and demand a reply within seven days. The reply must definitely state the intention to commence an action for infringement, or some equivalent form of proceeding. If not, it is evident that the parties claiming do not intend to face the Courts. If the answer takes the form of a threat, and no further action is taken, then the manufacturer should start an action on his own account to compel the parties to go into Court. It is a very simple matter to prove or disprove whether the device which has been made is an infringement or not. There is a general idea that an enormous expense attends these matters. This is quite unnecessary. There is no doubt a judge is very apt to look upon any mechanical device with a certain amount of awe, because he is not a technical man, and probably has admiration for what he thinks is ingenious. The manufacturer, therefore, should ask for a technical assessor to sit with the judge. A technical man is hardheaded and will probably see no particular virtue in a device which is commonplace, and unworthy of a Patent. The assessor has not to be paid for by the contending parties. If it is then decided that the device in question is not the same, nor a colourable imitation of the article claimed to have been infringed, or that the patent is not valid, then the manufacturer is free, and may continue to manufacture without risk. If, on the other hand, the decision is in the contrary sense, it is open to the manufacturer to make terms, or, which might prove the better course, to use a device outside the patent which would be more modern. This could only be done if the patent upheld were not a master patent, and such cannot exist in connection with motor traffic. In fact, any manufacturer with £100 at his command can thus protect himself against any individual or company, who may have hundreds of thousands to threaten with. Quite recently a small company which was threatened by the Dunlop Company, brought an action against them for undue interference and won their case. I trust that the above remarks, brief as they are, may assist in clearing away doubts and hesitation on the part of many intending manufacturers. If the present clouds could be lifted, not only would the coming industry show signs of life, but even those who now seek to obtain all the profit, must benefit with the crowd. The Self-Propelled Traffic Association, of which I have the honour to be President, effected good work last year in helping to obtain for the general public, an equitable Act for light motor traffic, and now it is equally desirous to secure for every Englishman that which he so highly values—his freedom. This is a fitting occasion to pay a tribute to the memory of an able engineer and a leader of the motor-traffic movement. Monsieur Levassor expired suddenly last month, leaving a gap which may never be filled again with such intelligence. As a man he was upright and honest; as an engineer he was able and clear headed; as a manufacturer he was conscientious; and as a friend he was true.

Summary.

I will now conclude by summing up in a few words what I have said in regard to motor-traffic.

For motor-cycles, benzine motors probably have the advantage.

In all other cases, steam promises to be the motive power when real work is called for, and where a return upon capital expenditure is required.

Electric energy, if the necessary adjuncts exist, has a great field open in towns, as a luxury, where the question of upkeep is not a vital item.

Finally, the best existing motor the world has yet seen, for its power, method of fueling, suspension springs, and travelling long distances before recharging, is one which is likely to remain with us for many a long year to come, whatever may be the future development of motor-traffic. It is known and loved by all, young and old, under the name of the Horse.

The Motor-Car Club.—On the 5th inst. a contingent of members and friends journeyed from Euston to Coventry, where they boarded, at the Motor-Car Works, several motor-cars, and journeyed to Birmingham. About 20 cars took part in the procession. Birmingham was reached at about 5.30 p.m., and after a drive round the environs, the club dined at the Grand Hotel, and, judging from the enthusiastic reports in the local papers, the entire outing was a great success.

NEVILLE'S MARINE OIL MOTOR.

MESSRS. J. NEVILLE AND CO., of Water Street, Liverpool, have designed and manufactured a very compact and well-arranged motor for launches and other small craft. This motor works on the "Otto" cycle, the explosion being determined by an incandescent tube heated by a special lamp, the outcome of many years of study and experiment, the products of combustion being exhausted through a tube overboard. There is, of course, a fly-wheel and the starting is easily effected by giving a half turn either way. A small pump is attached for circulating the jacket water. Reversing is effected by the device of altering the pitch of the propeller blades. Motion to the shaft is transmitted by means of a friction clutch. The special advantages claimed for this motor are:—Positive diaphragm valve motion, tube ignition, reliable burner lamp, no smell from exhaust condenser, no gear wheels, compact, and self-contained, no loose parts, uses common lamp oil, less weight, and less space occupied than by steam, no danger, no smoke or soot, no heat, and no stoker required.

Ordinary lamp oil is used about ·8 specific gravity, and the consumption is about one pint per brake horse-power per hour.

NOTES OF THE MONTH.

MR. JAS. E. TUKE gives a very favourable account of his experience with a motor-car during the past six months. In a recent communication he says:—"I have been using one since the commencement of October and during all the bad weather; during this time I have found it very satisfactory. I have run one 60 miles a day for several consecutive days, and in all sorts of weather, and all sorts of roads. The vibration when running is less than with a horse and trap, and the speed averages 10 to 12 miles on the level, and 5 to 6 miles an hour up hill. (The cost of running is about $\frac{1}{2}d.$ per mile for a two-seated car.) These have $1\frac{1}{2}$ horse-power motors, on the gas-engine principle, using petrol vapour, and give off practically no smell. As such large numbers of persons are desirous of having information about them, and as I am an enthusiast in regard to this new development, I have written a small book giving a short history of their development and present position, with descriptions of steam, oil, and electrical methods, and hints on management and working, illustrated."

LIVERPOOL is just now vexing its soul about the propulsion of its street cars. It seems that public opinion will not tolerate trolleys and overhead wires. Storage batteries are regarded as being too heavy and occupying too much space (a conclusion singularly at variance with the experience of the Hanover Tramway authorities). The choice lies between an underground cable or haulage plant, and one or the other electrical conduit systems. There is little doubt but that the latter, probably that known as the "Simplex" form, will be adopted.

THUS *The Engineer*: "As to electrical engineers, no word that can aid a misguided young man to enter their ranks shall flow from our pen."

AN electric motor-cycle has lately beaten tho record for all distances up to six miles. On Good Friday last, at the Catford Cycling Club Sports, an electric tandem motor, driven by Messrs. Dacier and Hunter, succeeded in beating all previous records for all distances over two miles to six miles, the length of the test, the six miles being covered in 10 minutes and 34 seconds, which is $28\frac{3}{5}$ seconds inside the world's record for any class of machine. It was stated the electric motor tandem had been tried capable of covering 40 miles an hour. The only point calling for criticism was the inability of the motor-cycle to graduate its speed to that nicety required.

SAYS the *Leeds Mercury*:—"The boom in motor-cars, which most people expected after the Bill allowing light locomotives to run at a fair speed on public roads became law, has not yet come off. Some of the reasons for this were hinted at at the last meeting of the Yorkshire College Engineering Society. The motor has evidently not yet been brought to such a degree of mechanical perfection as justifies popular faith in its general utility and efficiency. Mr. Frederick Grove, of the Institute of Civil Engineers, gave the College Society some idea of the difficulties that have to be overcome, and of the great divergence of type among motor-cars. The opinion was expressed at the meeting, that if the chemist and the engineer were to put their heads together they might be able to devise something of value in the way of a motor-car driven by an oil-engine; and another speaker gave utterance to a wholesome and timely truth when he said that the development of the motor-car should be taken out of the hands of the company promoter and the faddist, and placed in the hands of the practical engineer." With the last sentence we cordially agree. We give a *précis* of Mr. Grove's paper in another column.

FROM the results obtained by the Hon. Chas. Parsons in the *Turbinia*, as recorded in the paper that he read at the recent meeting of the Institution of Naval Architects, we have formed a high opinion of the suitability of this motor for road locomotion. It certainly possesses many distinct advantages; there is no gearing, all the motion parts being completely enclosed. Perfect expansion of the steam is obtained in one stage. We hope to describe this motor at length in a future issue.

WITH a view to rendering the common use of acetylene less dangerous, Messrs. Claude and Hess have proposed to store it in solution. The solvent chosen is acetone, which is capable at atmospheric pressure and at 60° Fahr. of dissolving 25 times its volume of the gas, whilst at a pressure of 12 atmospheres it can hold no less than 300 times its volume in solution. Thus 1 lb weight of acetone is capable of storing practically the whole gas which can be generated from 1 lb. of calcium carbide. The solubility of acetylene in acetone is only about half as much at a temperature of 120° as it is at 60° Fahr.

IT is stated by the *Journal of Gas Lighting* that calcium carbide may be manufactured by heating calcium tartrate to 930° Fahr. in a cast-iron retort. A dry, hard, grey, spongy mass, effervescing freely on contact with water, is obtained, and is stated to be composed of calcium carbide.

THE Thames Valley Launch Company (Limited), of Riverside Works, Weybridge, are delivering a 45-feet electric launch to the Corporation of Southport to run on the artificial lake at Southport, and also one of 30 feet in length, a cabin boat, and a small open electric boat to the Chester Boat Company to run on the Dee. They have delivered since last season six launches and one large down-river sailing craft of entirely new design, among the launches being one for the War Department. We understand that the electric launches are very popular on the Thames; their cleanliness and absence of smell and noise greatly recommending them.

ACCORDING to the newspapers, a motor-car, an air-propelled car, a traction-engine, and a boiler exploded at Charing (Kent) recently, severely injuring the owner, who is also the maker of this apparatus. From more reliable sources we learn that the owner, with considerable ingenuity, had mounted an oil-engine of a somewhat obsolete type upon a framework on wheels, and, as so arranged, it was very convenient in driving sawing machinery or other operations. Owing to some cause not clearly ascertained there was a premature explosion, the plummer blocks were broken from their places, and the shaft, connecting rod, piston, &c., were by the force of the explosion hurled some distance away. A portion of the *débris* struck the owner. It will be seen that the machine was not a motor-car, but in many quarters the story that it was had been implicitly believed, and the public duly warned against the dangers of all vehicles not pulled by the "friend of man."

ANOTHER accident, near Scarborough, to an electric motor-car, the property of Messrs. Walker and Hutton, has been extensively circulated through the Press of the country, and made much of as usual because it was a motor-car. Mr. Hutton, writing upon the subject, says:—"The real cause of accident was an ignorance (which, I believe, is fairly widespread) of the principles upon which curves in the road are constructed. There is a prevailing impression that such curves should be banked up towards the outside edge, but theory and practice evidently disagree, and if we are to take a lesson from the particular road on which the accident occurred, we now know that the proper way is to bank up the road on the inside edge, this having the effect of varying the monotony of existence both to residents in the neighbourhood and travellers along such roads. Indeed, one of the above residents told me that this accident was the third that had occurred at that corner within a week. Evidently, therefore, such mishaps are not entirely confined to motor-cars, although all others are too usual to merit headlines and large type in a newspaper. As near as I can judge our speed at the time would be about seven miles an hour, and although we had the brakes on going down the hill we had just taken them off prior to ascending the hill round the curve when the accident happened. The only damage done was the buckling of one of the wheels, and the incident has served the purpose of demonstrating that such accidents are not necessarily attended with the disastrous results that some people have pictured, and during our involuntary ariel flight we had the satisfaction of knowing that our steed would neither kick nor run away, as the engine stopped immediately. I thank the gentleman who—obviously for our consolation—remarked that a horse and cart had just dropped over the cliffs on to the sands."

THE Dublin Corporation evidently does not attach much importance to the adoption of electric traction by the United and Lucair Tramway Company, although, in the opinion of those claiming to judge, its installation would be of great benefit to the inhabitants of the city. Recently a special meeting was convened to meet the representatives of these companies, who, after waiting a considerable time, were perforce informed no business could be gone into in consequence of their being "no house," *i.e.*, no quorum. The general welfare of the taxpayers, it would therefore appear, is hardly of sufficient moment to bring a solid gathering of the Corporation together, and possibly the Lord Mayor, who patiently waited for a "house" to assemble, may another time when he wishes to ensure a quorum take the hint naively put forward by the *Dublin Express* to "put on the agenda paper that the first business would be to pass a resolution calling upon the Queen to celebrate her Diamond Jubilee by letting out all the political prisoners."

MOTOR COMPETITIONS.

HAVING in view the motor-car tests that have, with such public spirit, been inaugurated by our contemporary *The Engineer*, we are not sure that our other contemporary the *Irish Field* is well advised for the present in instituting a series of motor-car races in order to test the merits of the various machines. The object of our Irish contemporary is laudable enough. The motor-car industry has extended to Ireland under the auspices of Mr. Pennington, and before investors are required to "sink" (*sic*) their money, our contemporary thinks very rightly that the public should know more about the subject, so as to be able to use some discretion in investing. But we would point out that the question of merit cannot be altogether solved by means of a "great race," as our contemporary suggests; at the same time, such a test undoubtedly has value as indicating speed and endurance. The merits of motors will be authoritatively analysed in the forthcoming *Engineer* contest, when a committee of leading engineers will undertake the investigation. On the reports of this committee the public may rely for accurate and unbiassed information. A further examination of the various motors will also form part of the programme of the Royal Agricultural Society's summer meeting, so there will be no lack of scientific analysis. Investors would certainly be well advised to exercise extreme caution in subscribing to motor company shares till they are better in a position to estimate the commercial value of each machine.

THE Great Horseless Carriage Company have taken extensive showrooms at 47, Holborn Viaduct.

MOTOR-CAR AND CYCLE EXHIBITION.

IT is a pleasing sign of the growing popularity of the automotor industry that, from time to time, it is found necessary to indicate the progress that is being made by means of an exhibition. For some time past an energetic committee, of which the Hon. W. F. B. Massey-Mainwaring, M.P., is president, and Mr. W. M. Paterson is secretary, has been arranging details, and the St. Stephen's Hall, better known as the Royal Aquarium, Westminster, was selected as the site. The Exhibition was officially opened on May 1st, and closes on the 22nd. Owing, however, to the press of work under which manufacturers are labouring, it was not found possible to open quite so early as was intended. It is rather a difficult matter to bring motors from France, and many exhibitors experienced considerable trouble in getting their machines over. However, after a deal of hard work a very satisfactory collection of self-propelled vehicles has been got together. As most of them have at various times been fully described in the columns of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL, any detailed description would be out of place. We notice, however, that in many respects, chiefly in matters of detail, there has been an improvement. Thus springs, levers, nuts, bolts, &c., now bear a more finished and workmanlike appearance than formerly. There is a marked absence of what we may term amateurism about the machines. These remarks are especially applicable to such well-finished vehicles as Arnold's "sociable," and Arnold and Hewetson's victoria. These cars are in their appointments, &c., equal to anything which is seen in the park. They represent the carefully finished fashionable carriage. An equally well-appointed car is that built by Peugeot, and owned by the Hon. C. S. Rolls. Th. Gambier and Co., whose sole representative in England is Mr. F. Frentzel, show a serviceable and well-built motor-car, which is especially interesting as showing how little a well-designed motor-car is affected by hard work; this car has travelled for over two years, and beyond looking rather faded in its upholstery, it is as good as ever. Messrs. Leutzman show a large and substantial looking motor-car, while Mr. Carl Oppermann has a very fine electric motor-car. Messrs. Hildebrand show two well-finished specimens of a motor-tandem and a motor-cycle; as do Messrs. Duncan. A peculiar-looking motor-cycle is the Kane-Pennington motor. As an ingenious piece of mechanism it is interesting as indicating early effort in motor-cycle construction. Mr. Powell, of Hoxton, shows a well-finished model gas-engine. Among motor accessories we may mention a wheel intended for heavy motor-car work designed by Mr. G. Jobson. There is a large and varied exhibit of cycles, the principal exhibitors being the New Howe Company, the Griffin, the Yost, the Wilkinson, and Victor. Although small, the show is well arranged, and will bear careful inspection. It is quite a new departure and hence the originator and manager, Mr. August Villers, has been well advised in not engaging a too large space. We understand that this Motor Exhibition is to be an annual affair, and as the industry grows so will the Exhibition. Owing to the pressure upon our space and that we are going to press at the time of writing, our notice has necessarily been short and incomplete. We hope, however, to describe the more important novelties in our next.

"The Engineer" Road Carriage Competition.

IN its issue for May 7th *The Engineer* publishes the following notice:—"We are now in a position to announce that the judges have decided to make their preliminary examination of the vehicles entered for competition on Friday the 28th, and Saturday the 29th May, at the Crystal Palace, and that they will start the competitors on the long-distance run on Tuesday, the 1st June. Mr. H. Graham Harris, M. Inst. C.E., will act as secretary during the trials."

A full report of these trials will appear in our June number. As the subject is so important, we have arranged to issue a special supplement describing the trial as fully as possible.

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A MOTOR WAGONETTE.

The accompanying illustration shows an exceedingly useful design of a Daimler motor-car, well adapted for hard work in the country. Most of the mechanism is out of sight, and well enclosed against dust, &c. The starting handles, brakes, &c., are all conveniently placed within reach of the driver. We are informed that the design has given great satisfaction to the inhabitants of Brighton. One day last week Mr. Monk, of the Brighton Cycle and Motor Company, Limited, Marine Parade, to whom the car belongs, drove to London and back, conveying five passengers and himself, very comfortably in 9½ hours, inclusive of stoppages. They started at 7.30, reached Horley at 9.30, where they stayed half an hour, arriving at Peckham at 12.30. The return journey was completed in 4½ hours. The oil consumed was exactly 7 gallons, which cost 7*s*., or about 1*s*. 2*d*. per passenger, and little more than ¾*d*. per mile.

Cycle Tyre Patents.—The action brought in France by the Welch-Dunlop combination against the French manufacturers of pneumatic tyres for infringement of patent rights was on the 7th instant finally decided by the Third Chamber, after dragging on for over two years. The judgment of the Court was against the Dunlop Company on every point.

EFFICIENCY OF STEAM-ENGINES.

Hardly any word excepting that of "gentleman" is less understood and more misapplied than "efficiency." In steam-engines a high efficiency is always claimed by makers naturally enough, but, according to how the word is employed, it is difficult to say what is really meant. The Institution of Civil Engineers have had a committee at work for some time past on this subject, and this committee reports :—

1. That the statement of the economy of a steam-engine in terms of pounds of feed-water per I.H.P. per hour is undesirable.

2. That for all purposes except those of a scientific nature it is desirable to state the economy of a steam-engine in terms of the thermal units required per I.H.P. per hour (or per minute), and that, if possible, the thermal units required per brake H.P. should also be given.

3. That for scientific purposes the thermal units that would be required by a perfect steam-engine working under the same conditions as the actual engine, should also be stated.

The proposed method of statement is applicable to engines using superheated steam as well as to those using saturated steam, and the objection to the use of pounds of feed-water, which contain more or less thermal units according to conditions, is obviated, while there is no more practical difficulty in obtaining the thermal units per I.H.P. per hour than there is in arriving at the pounds of feed-water.

For scientific purposes, the difference in the thermal units per I.H.P. required by the perfect steam-engine and by the actual engine shows the loss due to imperfections in the actual engine.

A further great advantage of the proposal is that the ambiguous term "efficiency" is not required.

TRAVELLING WITHOUT HORSES IN 1770.

MOST students of the history of self-moving carriages are familiar with the name of Francis Moore, the London linen-draper, who in 1769, the date of the construction of Cugnot's steam-carriage, obtained two patents for motor-carriages. The first of these was to be "put in motion by fire, water, or air, with a small assistance of horses or manual labour," the second was "constructed upon peculiar principles, capable of being wrought or put in motion by force or power without being drawn by horses or any other beast." Unfortunately no specifications were enrolled, so we have no means of ascertaining what the inventor had in view.

Moore is referred to in the correspondence of James Watt (*see* Muirhead's "Life of James Watt"); thus, in a letter dated April 28th, 1769, Watt writes:—"If linen-draper Moore does not use my engine to drive his chaises he can't drive them by steam. If he does I will stop them. I suppose by the rapidity of his progress and puffing he is too volatile to be dangerous." Further on in the same letter, apparently in a jocular mood, he writes: "Here I work five or more years contriving an engine, and Mr. Moore hears of it, is more *éveillé*, gets three patents at once, publishes himself in the newspapers, hires 2,000 men, sets them to work for the whole world in St. George's Fields, gets a fortune at once, and prosecutes me for using my own invention."

There is no evidence, however, that Moore actually did set to work upon the construction of a motor-carriage, or at any rate that he completed one, although some references in the public journals of that period have been read, and not unreasonably too, as referring to such carriages. Thus in the *Leeds Mercury* of April 11th, 1769, the following paragraph appeared:—

"A correspondent writes that Mr. Moore's new invented machine to go without horses, for which he has obtained His Majesty's patent, is not only adapted to wheel carriages in general, such as coaches, chaises, carts, wagons, &c., but to ploughing, harrowing, and every other branch of husbandry, also to all other machines and engines now in use throughout the kingdom, in various branches of manufacture wherein draught horses are now employed. We hear that the ingenious inventor has sold all his own horses, and by his advice many of his friends have done the same, because the price of that noble and useful animal will be so affected by his new invention, that their value will not be one-fourth of what it is at present."

The *Gentleman's Magazine* for the same year informs us that "Mr. Moore, the ingenious contriver of the carriage to travel without horses, waited upon His Majesty, at Richmond, with one of them, who was graciously pleased to express his approbation of it."

These references, however, in point of fact, notwithstanding the employment of such terms as "self-moving," "to travel without horses," &c., refer only to horse-drawn vehicles, to the improvement of which Moore devoted much time and money.

This view is confirmed by an article in the *Scots Magazine* for 1771, which refers to "the coach Mr. Moore had invented to be drawn by one horse having been a subject of general consideration." And still more strongly by the accompanying illustration, copied from a print in the possession of Mr. Rhys Jenkins, and entitled "Mr. Moore's New Invented Machine for Travelling without Horses." There is no denying the presence of the horse; possibly what was meant was that one animal did the work of two or more usually employed. The novelty appears to have consisted in using a single pair of wheels of great height.

DEATH OF M. LEVASSOR.

ALL interested in the evolution of the automotor will regret to hear of the death of M. Levassor, who has done so much to make horseless traction a practical success. The deceased was an engineer of considerable distinction, but his *rôle* lay rather in improving existing machinery than in inventing new types. It was in 1888 that M. Levassor turned his attention to road locomotion, and, being impressed with the possibilities of the then new Daimler motor, he took it in hand and effected many improvements in detail which have rendered it, or rather, in its improved state, the "Phœnix" motor, one of the most reliable petroleum motors in the market. Applying it to road carriages M. Levassor achieved the most remarkable success. His feat of riding from Paris to Bordeaux and back last year was not less a proof of mechanical ability than of physical endurance and courage. M. Levassor was the junior partner in the firm of MM. Panhard and Levassor, whose motor-carriages are too well known for excellence and durability to need any commendation from us. In engineering and especially in motor circles M. Levassor was deservedly regarded as an authority, while his personal qualities made him a distinguished friend to all who sought his advice. In the Automobile Club he was especially regarded, and it was largely due to his enterprise and tact that this club has become so influential. M. Levassor was taken ill quite suddenly with an affliction of the brain and expired soon afterwards at the comparatively early age of 54. His obsequies took place on April 18th at the Church of Ivry. A very large number of professional and private friends, including a large contingent of the Automobile Club, attended to pay respect to the remains of their late distinguished colleague. Among those who sent floral marks of respect was Sir David Salomons on behalf of the Self-Propelled Traffic Association.

The "Master Patents" of the British Motor Syndicate and Roots and Venables.

EXTRACT FROM THE ADVERTISEMENTS OF THE BRITISH MOTOR SYNDICATE.

"WHEREAS the British Motor Syndicate have acquired and are now further acquiring by purchase a large number of valuable inventions and discoveries in the manufacture of motors, the results of many years' experiment and research in this and in other countries, and

"WHEREAS the said inventions and discoveries include the first master patents for the first successful application of oil and explosion engines to vehicles as a means of their propulsion, and

"WHEREAS the said discoveries which have taken place in Great Britain, France, Germany, and America, include in combination all the various methods of tubular ignition, electric ignition, and explosion by heat in motor vehicles, and

"WHEREAS the said inventions cover the latest improvements in motor vehicles, and motor vehicles propelled by electrical motors, and

"WHEREAS the acquirement of the same has cost the said British Motor Syndicate over £250,000, and

"WHEREAS the said British Motor Syndicate has and is expending large sums of money in creating and establishing the motor-car industry in this country, and in the tuition of mechanics, the teaching of drivers, the holding of exhibitions and various competitions, and in other ways advertising and causing a popular demand for the said business of motor-vehicle construction, and

"WHEREAS the said Syndicate has caused by advertisement notice to be given to persons to discontinue the infringement of their patents,

"THIS IS TO GIVE NOTICE that a sum of £50,000 having been specially set aside by the said Syndicate for the purposes of defending and supporting the said patented inventions, proceedings will be immediately begun against all persons importing into this country motor vehicles, also against all persons riding or using the said motor vehicles, also against any persons manufacturing or offering for sale the said motor vehicles, the inventions of which belong to this Syndicate, and that the Syndicate hold all persons liable for heavy damages in the matter of such infringements."

As an example of the manner in which the intimation cited above is enforced, the following correspondence is instructive. It refers to an action which we suggested in our March number as being imminent. But evidently we were not fully acquainted with the methods of the British Motor Syndicate in upholding their rights. The last letter to hand, now published under date May 4th, apparently postpones the issue of a writ until long subsequent to *March 12th*, the original date which peremptorily granted four days' grace to Messrs. Roots and Venables in which to climb down, or supply the names of their solicitors to receive service of process for alleged infringement. To-day is May 14th (nearly two months), and still the British Motor Syndicate writ has not arrived. Therefore, all ye who are concerned read, mark, learn, and inwardly digest the contents of the following correspondence, and understand the true value of any threats of legal action which may be hurled promiscuously at the head of any innocent manufacturer who is desirous of further qualifying himself for duly discharging his duty to the public and otherwise increasing his income by means of securing some of the large profits foreshadowed by the British Motor Syndicate, and likely to be earned by either that body or traders in general, or both, from the rapidly approaching trade likely to be transacted in connection with automotor vehicles:—

12, New Court, Carey Street,
London, W.C., March 12th, 1897.

Dear Sirs,—We have been instructed by our clients, the British Motor Syndicate (Limited), to write you with reference to your infringement of their patents as applied to motor-cars, and also to call your attention to the advertisement which appears on the last page of the *Autocar* of the 13th inst. Unless we receive by the 16th inst. an undertaking that you will discontinue the infringement of our clients' patents and also the advertisement of your machines, we are instructed to commence proceedings against you, in which case we shall be glad if you will let us know the name of a solicitor who will accept service on your behalf.—Yours truly, SHARPE, PARKER, AND CO.

Messrs. Roots and Venables,
100, Westminster Bridge Road, S.E.

100, Westminster Bridge Road,
London, March 13th, 1897.

Messrs. Sharpe, Parker, and Co.,
12, New Court, Carey Street.

Dear Sirs,—Your favour of yesterday's date to hand. Kindly inform us the number and date of the patent or patents you allege we are infringing, and in which part of our motor or car the infringement lies.—Yours faithfully, ROOTS AND VENABLES.

We have pleasure in enclosing you our lists.

March 16th, 1897.

British Motor Syndicate and Yourselves.

Dear Sirs,—We have now seen our clients with reference to your letter of the 13th inst., and they inform us that the patents they claim under, and which they say you infringe, date from 1884.

We are also instructed to inform you that our clients claim, firstly, the invention of an oil-engine suitable for the propulsion of vehicles; and, secondly, the application of such engines to vehicles.

We understand that you are infringing about 47 of the patents belonging to our clients.

Kindly let us know by return of post whether you are prepared to give the undertaking asked for; if not, we are instructed to commence proceedings against you.—Yours truly,
SHARPE, PARKER, AND CO.

Messrs. Roots and Venables.

March 17th, 1897.

Messrs. Sharpe, Parker, and Co.

Dear Sirs,—Your favour of the 16th instant to hand. You have not replied to our letter of the 13th instant asking for the numbers and dates of the patents you allege we infringe, also specifying what part or parts of our car infringes, and which particular patent such part or parts are alleged to infringe.

Without these particulars you must perceive it is not possible for us to take your letter seriously.

The claims you say your clients make, headed "firstly" and "secondly," are really too absurd for us to reply to.—Yours faithfully, ROOTS AND VENABLES.

March 25th, 1897.

Messrs. Sharpe, Parker, and Co.

Dear Sirs,—We should be glad to have an answer to our letter of the 17th inst. with reference to our alleged infringement of the British Motor Syndicate's patents.—Yours faithfully, ROOTS AND VENABLES.

In the sixth letter, dated April 1st—a significant date—Messrs. Roots and Venables reiterated their request for particulars of the alleged infringements, and in their communication expressed their opinion of the value of the Syndicate's patents, and suggested that their own patents (more particularly No. 23,786, dated December 24th, 1892, which covers the conveyance of the jacket water for cooling purposes through the frame of the carriage) were being infringed by the Syndicate; this letter being simply acknowledged as under:—

April 2nd, 1897.

British Motor Syndicate and Yourselves.

Dear Sirs,—We have your letter of yesterday's date, and have forwarded a copy to our clients.—Yours faithfully,
SHARPE, PARKER, AND CO.

Messrs. Roots and Venables.

Their request being still disregarded, they again wrote as follows:—

April 27th, 1897.

Messrs. Sharpe, Parker, and Co.

Dear Sirs,—As you have now had ample time to communicate with and receive a reply from your clients, the British Motor Syndicate, we shall be glad to hear what they have to say with regard to their infringement of our patent No. 23,786, dated December 24th, 1892. An immediate reply will oblige.—Yours faithfully, ROOTS AND VENABLES.

April 28th, 1897.

British Motor Syndicate and Yourselves.

Dear Sirs,—We have received your letter of yesterday's date, and have written our clients for their instructions thereon.—Yours truly, SHARPE, PARKER, AND Co.

Messrs. Roots and Venables.

April 30th, 1897.

British Motor Syndicate and Yourselves.

Dear Sirs,—We have now heard from our clients on your letter to us of the 27th instant, and are instructed by them that they are not using, and do not intend to use, the alleged invention covered by the letters patent No. 23,786/92, and they are not, therefore, infringing, and do not intend to infringe, your rights thereunder.—Yours truly, SHARPE, PARKER, AND Co.

Messrs. Roots and Venables.

This communication was immediately followed by a further letter direct from the Syndicate, as under:—

Hertford Street, Coventry,
May 1st, 1897.

Messrs. Roots and Venables.

Dear Sirs,—Referring to your communication of April 1st, addressed to Messrs. Sharpe, Parker, and Co., we beg to inform you, for your satisfaction, that we have never used your water-cooling patent, No. 23,786/92, nor have we any intention of using it.—Yours faithfully,

The British Motor Syndicate (Limited),
CHAS. MCROBIE TURRELL, General Manager.

May 3rd, 1897.

The British Motor Syndicate (Limited).

Dear Sirs,—We were glad to receive this morning your assurance that you are not using our water-cooling patent, No. 23,786/92.

Kindly inform us if, in any of the Daimler motor-carriages the jacket water is conveyed through the tubular frame of the car.

Your attention will oblige.—Yours faithfully,
ROOTS AND VENABLES.

May 4th, 1897.

Messrs. Roots and Venables.

Gentlemen,—Regarding ours of the 3rd of May, so far as we are aware, and we consider we have good grounds for making this statement, none of the Daimler carriages convey their cool water through a tubular frame, for the obvious reason that the frames are not tubular.—Yours faithfully,

The British Motor Syndicate (Limited),
CHAS. MCROBIE TURRELL, General Manager.

It is significant that in neither the letter of April 30th from Messrs. Sharpe, Parker, and Co. (on behalf of the British Motor Syndicate), or in the letters of May 1st and 4th, signed on behalf of the same body by Mr. C. McRobie Turrell as general manager, is one word of reference to the very peremptory demands set forth in Messrs. Sharpe and Co.'s original letter of March 12th. We shall, therefore, await with restrained curiosity and suspended interest, the threatened but oddly enough still deferred enforcement of the British Motor Syndicate claims, as it is obvious, we submit, that they must either enforce their original demand, or for ever hold their peace.

MARINE MOTOR NOTES.

MESSRS. THORNYCROFT AND Co., of Chiswick, the well-known torpedo-boat builders, are just completing a steam turbo-life-boat for the R.N.L.I., named the "Queen," and which is to be stationed at Liverpool. The new vessel is 55 feet long and 16 feet beam. At the draught of 3 feet 3 inches she displaces 30 tons. She is propelled by a steam turbine driven by engines of 250 horse-power indicated. The boiler is one of Thornycroft's well-known type, and is fitted for burning either oil or coal; the steam pressure being 145 lbs. per square inch. The speed attained under favourable conditions is, we understand, from 9 to 10 knots. There is a large rudder which can be raised if necessary. The hull is built of steel, and is divided into 18 water-tight compartments. In a future issue we hope to fully describe and illustrate this craft.

Now that the House of Commons is investigating by means of a Select Committee the administration of the National Life-boat Institution, we should be pleased if some competent naval architect would draw the Committee's attention to the fact that propulsion by oars is about the most inefficient form of propulsion known. There is no reason why lifeboats should not be propelled by screws suitably designed and carried, driven by automotors. This form of propulsion is cheap and efficient. The fact is there is a prejudice against the use of screws, because it is alleged that they would be fouled by floating wreckage, and would also render the boat unable to be beached. It all depends how you carry the screws; and how and who designs the vessel. It is quite possible to propel lifeboats by screws, and beach them too without in any way risking damage to the propellers. At present the steam turbo-lifeboats are enormously costly; while the method of propulsion is very inefficient. Fancy 250 indicated horse-power to move 30 tons at nine knots! So many people resent any criticism directed to public or semi-public institutions engaged in "good works," that we shall no doubt be thought captious in drawing attention to this matter; but to show what a waste of power there is in the present mechanically-propelled lifeboats, we may mention that a coasting steamer 200 feet long and 26 feet beam, and of 1,550 tons displacement, can be propelled at nine knots with the same power; that is, a vessel 50 times heavier, and nearly four times longer than the latest lifeboat, only takes the same power to produce the same speed. As another example, we might mention that some Admiralty steam pinnaces now being built by the Thames Ironworks Company, of Blackwall, are 56 feet long, 9 feet 9 inches beam, and 4 feet 7 inches deep, at the load displacement of 27 tons they are propelled at 14·6 knots by engines developing 214 indicated horse-power.

WHEN so much is being attempted to resuscitate our canal traffic, it is surprising that the propulsion of barges and small craft by gas-engines has not been tried. That there are difficulties in the way we know, so there are before anything can be achieved in this world. We are sorry to observe that our French friends have in this, as in so many naval methods, shown us the way; and canal boats propelled by gas-engines are not uncommon in France. A new boat of this type has recently been put in service for the Havre-Rouen-Paris line, the speed attained being seven knots. It is 100 feet long, with 7 feet draught, divided into four water-tight compartments. The gas is supplied from on shore, and is stored on board in a steel holder, an accumulator composed of steel pipes, under a pressure of 95 atmospheres, about 850 lbs. The engine employed is a two-cylinder one, of 40 horse-power. The gas is stored in tubes or receivers, each of which is about 5 metres long, and weighs about 715 lbs., the gas being compressed to a pressure of 100 kilos. per square centimetre, or about 1,400 lbs. per square inch.

THE MOTOR-CAR IN SOUTH AFRICA.

THE credit of having been the first to introduce the motor-car to South Africa belongs to Mr. J. P. Hess (brother of the editor of the *African Critic*). Mr. Hess has lately arrived in London, and has furnished us with an interesting account of the commotion and excitement caused by the appearance of the motor-car. It appears that it was first exhibited at the Berea Park, Pretoria, hardly a month after the famous Brighton run.

Mr. Hess had invited the principal officials to witness the turn out, and, amongst others, his Honour the State President, with his staff, accepted the invitation, as did the State Secretary, Dr. Leyds. The former seemed highly delighted when the mechanism was displayed to him, but he had evidently not studied "motor-cars," as he shook Mr. Hess heartily by the hand and expressed his pleasure that Mr. Hess had introduced such a clever invention into the Transvaal, and said, "You deserve a gold medal." This we reproduce. The inscription, which is in Dutch, says:—

"Presented by H. H. PAUL KRÜGER, State President of the South African Republic, to MR. J. P. HESS, in remembrance of his introducing the First Motor-car to South Africa, Monday, January 4th, 1897."

We have inspected this valuable medal, which is of solid gold, carrying on one side, beautifully enamelled, the arms of the South African Republic, and on the obverse the inscription, and is the first medal ever presented to an Uitlander. After Mr. Hess had thanked the State President, he invited him to take the first ride, but his Honour jocularly remarked, "I am afraid a dog might bark, and it might buck and run away with me." Mr. Hess then invited Dr. Leyds, the State Secretary, who at once consented, and went whirling round the track at excellent speed, amid cheers of the spectators. From the time of the landing of the motor-car at Port Elizabeth until the successful exhibition, the South African papers, both English and Dutch, simply teemed with references to motor-cars.

The motor-carriage which Mr. Hess exhibited came direct from Messrs. Benz and Co.'s works at Mannheim. It was only a 1½ horse-power dog-cart. He, however, has arrived in England to specially study machines most suitable for South African roads, and several influential people out there are also greatly interesting themselves in connection with motor-carriages suitable for that country. Mr. Hess's address is—c/o the *African Critic*, 156, Leadenhall Street. The historical motor-car imported by Mr. Hess was at once purchased after the show by Mr. A. H. Jacob, a well known coffee manufacturer in South Africa, and although he paid a high figure for acquiring the same, he admitted he was perfectly satisfied, as he never had had a better advertising medium. The Sanitary Board of Johannesburg tried to stop the car being used in the streets, but Mr. Hess advised Mr. Jacobs to ignore their officious interference, as the Government of the Republic had hailed the introduction of the motor-car with satisfaction, and this view was expressed to Mr. Hess by some of the high officials at Pretoria. The Republic will soon have the opportunity of getting used to motor vehicles, as we understand upwards of 200 delivery vans have already been ordered for South Africa.

MOTOR-CARS.

By Mr. F. GROVER, Assoc. M.I.C.E.

THE following is a *précis* of a paper read on the 26th ult. by Mr. F. Grover, Assoc. M.I.C.E., before the Yorkshire College Engineering Society:—

"Cars might be driven by steam, gas, oil, or spirit, and electricity, or by compressed air, though he regarded the latter as being out of the question for a considerable time to come. He was of opinion that no one of the other four sources of power could be regarded as fulfilling the conditions required by different persons in pursuit of their business. The steam-engine, to his mind, was the most suitable form of motor hitherto designed, for the following reasons:—(1) Heavy traction on ordinary roads by means of specially designed engines, engines and boilers being contained in a separate vehicle; this was typified in the ordinary traction-engine of to-day. (2) Transport motors for the carriage of heavy cargoes, such as parcels or luggage in bulk, or for the use of tradesmen whose wares were of considerable weight. (3) Vehicles for passengers, and built to accommodate more than six persons. The present form of traction-engine was capable of improvement in such details as the introduction of three-speed gear for high speed on good, level roads; but the regulations recently issued by the Board of Trade precluded development along this line, for no carriage weighing over two tons unloaded was allowed to travel at more than five miles per hour. If, therefore, speed was required, as was, indeed, necessary for the rapid distribution of goods, they must seek a type of engine that would enable the weight to be reduced so as to run at 12 miles an hour, and in that case engine and boiler and carrying space must be included in one carriage."

After discussing the regulations affecting speed he proceeded to discuss the question of boilers:—

"The combination he regarded as best fitted to meet the requirements stated was steam raised in a water-tube boiler, preferably of the flash type, of which the Serpollet boiler was the best practical example. The steam turbine, either of the Parson or Laval type, was very suitable for driving, absence of vibration being its great recommendation. Among the advantages of tubular boilers of the flash type was that there was no danger of serious explosion, no large weight to be carried as water in the boiler, no fear of the fire-box crown overheating, and no trouble in keeping the feed at a constant level. Disadvantages were that the tubes were liable to make up, the engine cylinders were liable to score, and that the tubes in the bulk were heavy. Nevertheless, he considered the balance was in favour of this type of boiler. He considered the ordinary tubular boiler as the next most suitable. Its advantages were the rapidity with which steam could be raised, the small bulk of water to be carried, and the small space occupied. Its disadvantages were the great fluctuations of pressure, the absence of steam reserve, and the very careful stoking required. With respect to the engine, it should certainly be reversible, and that was one drawback of the Serpollet carriage. As to the compounding of engines for cars, it was advisable in flat country, but of little use in hilly districts. Before leaving this part of his subject, he would urge the following advantages which steam offered:—(1) Simplicity of mechanism; (2) no necessity to carry large quantities of water or fuel (for both could be procured in any out-of-the-way place); (3) large power available when wanted; (4) starting quite easy; (5) when the carriage was standing, the engine was also stationary; and (6) certainty of action unknown to many gas or petroleum-engines. He did not consider compressed gas at all suitable, except for driving tramcars running on rails, and only then in special circumstances."

Passing on to oil-engines, he said :—"Oil-engines were divided broadly into two classes—one working with heavy oils and the other with light oils or petroleum spirit. He knew of only one case in which heavy oil had been successfully applied to small motors of the type usually applied to motor-cars and cycles, and as to light oils the danger was great, the smell objectionable, and generally speaking the design of the engines was not good. Nevertheless there was a great future for the oil-engine as a motor for cars, but he thought it would be restricted to very light carts or vans, and to pleasure vehicles carrying less than six persons, including the cycle. As to the form of ignition to be adopted, he thought the electric spark was greatly preferable to the hot tube. There was, however, great need of a good storage battery for purposes of ignition. As to electricity, the weight of the accumulator was out of all proportion to the power obtained, and the cost of maintenance was larger. With reference to the subject of motor-cars in general, there were many points, such as the value of pneumatic tyres, the limitation of load, the disposal of exhaust steam, gearing, &c., any of which was sufficiently important to mar the success of a design if not properly carried out."

INDIARUBBER.

Few vegetable products that grow without the aid of artificial cultivation are in more demand than Indiarubber. Not many years ago its use was so restricted that it hardly paid to import it from such distant places as the basin of the Congo, but now rubber trees are among the most valuable products of Central Africa, and formerly, when expeditions would set out for ivory, gold dust, &c., they are now undertaken in search of rubber.

Needless to say it has been the Submarine Telegraph and the Cycle that has chiefly occasioned the enormous demand for rubber. To such an extent has this demand grown, that in many quarters it is feared that the supply will in a few years become unequal to it.

Except in a few instances the rubber tree is a perfectly natural growth and owes nothing to human aid for cultivation. It is found in nearly all tropical forests, but the principal sources of supply are Central Africa, the East Indies, and Tropical America. Owing to the reckless manner in which it is collected, and the absence of proper measures for conserving the forests, whole districts have been denuded of their trees, and hence the supply of the natural gum has in these places fallen off. About 100,000,000 lbs. are annually collected, and of this, 21,500 tons, worth about £16 10s. per ton, are consumed in this country alone. It is perhaps unfortunate for the cycle industry that only the best kind of gum is suitable for pneumatic tyres, and this is known as Para rubber. We, of course, do not assert that every tyre is made of Para rubber, but if a tyre stands a long course of hard work well the probability is that it is. Para rubber being so expensive and so indispensable—there being really no efficient substitute for it, it is evident that any diminution in the supply of the gum will seriously affect the light motor industry. Another unfortunate thing about rubber tyres is that after use they are practically of no value. In the process of manufacture the rubber is vulcanised by which process it obtains its great permanent elasticity and stability, under extremes of temperature, but this very process renders the rubber all but useless for any other purpose but that for which it is shaped. The chemistry of rubber is not well understood, and apparently light and air exercise some subtle harmful influences. However, at present there is "nothing like rubber,"—at any rate for the electrician and cyclist. If there are any enthusiastic inventors, possessed of great patience, good chemical and mechanical knowledge, but principally ample means, they might well investigate rubber, and if they can devise a substitute which will do all that rubber will, and which can be produced at a reasonable price, they will be benefactors to the cycling world.

PRACTICAL HINTS.

In using oil motors pains should be taken to prevent, as far as possible, any leakage of oil. Owing to the great diffusive power of oil, absolute oil tightness is very difficult to ensure; and in all metallic holders or vessels more or less "creeping" of the oil takes place. In this way a thin film of oil gets deposited on hot surfaces, and in evaporating gives off a pungent smell, at the same time depositing a layer of carbon. This oil creeping cannot wholly be avoided, but its effects may be lessened by instructing the attendant to keep all hot surfaces frequently wiped with waste. In designing tanks for carrying oil too great care cannot be bestowed upon the rivetting, as if this is at all inferior leakage will take place; the rivets should be closely spaced, and if the tank is likely to be subjected to much vibration chain rivetting should be employed. Tanks for oil are best well galvanised, as the deposit of zinc acts very effectually in caulking the seams. The joints of hand holes, pipe flanges, &c., are best made by using brown paper steeped in glue. Indiarubber insertion should never be used for joints, as the oil softens it. For the same reason care should be taken that the oil does not get spilt upon the rubber tyres. Special care should be also taken to see that the tank containing the oil does not get heated by the motor, as, should the temperature of the oil reach the flash point, vapours are generated, which, mixing with the air in the tank, form an explosive atmosphere, not necessarily dangerous in itself, but unquestionably so in the vicinity of flame.

MR. J. H. MANN ON AUTOCARS.

At the last monthly meeting of the Leeds Association of Engineers, Mr. J. H. Mann read a paper on motor vehicles. He said that French engineers had been running motor-cars for two or three years with at least sufficient success to encourage the idea of a new industry in this country, providing a cheap and convenient method of locomotion. He briefly referred to the new Act of Parliament for legalising their use, and criticised some of its clauses. As an engineer, he was disappointed at the slow progress motor-cars appeared to be making, which he attributed to the fact of well-established firms being too busy to experiment with them. Perhaps, also, many of them were keeping in the dark with a view to the forthcoming competition promoted by *The Engineer*, and that some were waiting to see how others succeeded. It was not a difficult thing to make a machine that would run on the roads, the difficulty was in making one that would do its work better and cheaper than horses. Mr. Mann drew a comparison between the cost of the two. Horses and their keep were never so cheap as at the present time; and stony roads, especially in winter and wet weather, would tell considerably against motor-cars, in the use of which increased attention and less comfort would be involved. In order to succeed, simplicity in construction was a prime necessity. As a means of propulsion, electricity could only be used in limited areas, and he thought steam-engines met the requirements more completely than oil-engines. The Serpollet boiler, or instantaneous steam-generator, was a move in the right direction, on account of its simplicity and freedom from danger. He described various methods of using liquid fuel, the most successful he had tried being to burn it with an injector over a slow-combustion coke fire, but he thought the use of coke alone better still. By means of wall diagrams he showed the details in construction which he recommended, pointing out what to avoid and where trouble was likely to arise. He looked forward with keen anticipation to a great future for autocars, but at the present time, from a manufacturer's point of view, he should not care to put into inexperienced hands a complicated machine, especially with a guarantee for any considerable time.

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THE TYRES OF MOTOR-CAR WHEELS.

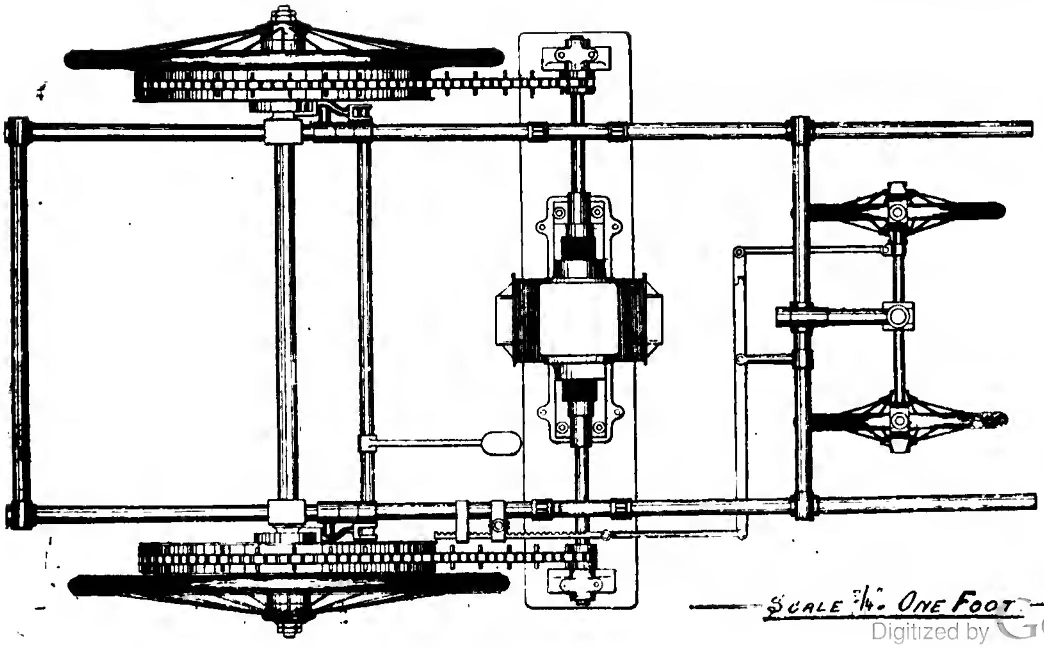
It seems to us that with the application of motors for the propulsion of the heavier types of road cars, such as railway vans, brewers' drays, &c., some modification in the design of the wheels of such vehicles will be necessary. It must be remembered that with horse haulage the wheels merely roll on the road; the tractive effort being exerted by the horse. In a motor-van the tractive effort is exerted through the wheels, or at least by those termed the drivers, and hence the wheels must be capable, not only of sustaining the ordinary stresses set up in it when passing over a rough road, but also of transmitting the necessary tractive power. It can hardly be expected that the usually accepted design of wooden wheels can be much improved; but what can be done is to give greater strength and rigidity to the whole structure by careful tyreing. The ordinary system of shrinking on the tyres by employing the enormous natural forces of expansion is theoretically perfectly correct; in practice it involves subjecting the periphery of the wooden wheel to a charring process—not conducive to the improvement of the structure itself, and unless the operation is most carefully conducted, distortion of the wheel through irregular contraction is bound to result, at any rate it often occurs; while the rapid quenching process, as every metallurgical student is aware, sets up intense molecular stresses in the tyre itself, which in inferior metal manifest themselves in sudden fractures. The old system, in spite of these disadvantages, when properly used by conscientious mechanics is no doubt suitable for ordinary purposes, but for passenger traffic where compensation for injuries is a contingency to be provided for, and for locomotor vehicles in which the tractive effort is transmitted through the wheels, too much attention cannot be given to, not alone correct design of wheel, but also to proper tyreing. The points to be considered in the design of motor-car wheels are of course those which determine the similar problem in locomotoric and cycle wheels. In both of the latter we see great accuracy of form and manufacture attained, all the operations nearly being effected by mechanical means. In both, too, the tyre is perhaps the most important part of the wheel, but so long as the tyre was a matter of handicraft neither was satisfactory. It was the use of the hydraulic press and of high grade steel that enabled the present perfection to be attained and for motor-car wheels a similar means will have to be adopted. Already mechanical means have been applied to the tyreing of heavy horse-drawn carts and vans with, we understand, very good results, the tyres being put on cold by hydraulic pressure. Not only does this put a uniform compressive stress upon the periphery of the wheel, but it ensures correctness of form and prevents distortion. We should, then, strongly advise those of our friends who are interested in heavy motor-car traffic to see that in the specification for the wheels it is stated that they must be tyred by hydraulic means.

Jezeli Pan zechcisz oglaszac w pismie naszem prosze podac nazwe "The Automotor and Horseless Vehicle Journal."

ELIESON'S ELECTRO MOTOR-CAR.

We recently inspected an electro motor-car, the invention and manufacture of Mr. C. P. Elieson, of the Lamina Accumulator Syndicate, Camden Town, London, N.W. As this new motor-car has several ingeniously worked-out mechanical details of great interest and of considerable novelty, an account will be interesting. Its general appearance is illustrated in the accompanying engravings. From these it will be seen that the framing of the car is composed of jointed and braced Manessmann steel tubes. Thus not only is great strength and rigidity obtained, but lightness also. Suspended from the two side girders is a small double armature series Wound motor, the connections so arranged that the coils can be placed either in series or parallel. On each end of the armature spindle and suitably supported by bearings is a bronze sprocket-wheel so formed as to its teeth as to engage with a specially formed chain. This chain has a steel pin passing transversely through every third link. This chain passes round a driving wheel attached to each hind wheel of the car, but the manner in which motion is transmitted from the fast speed and small-sized sprocket on the armature spindle to the slower moving car wheels is novel, ingenious, and, as we can testify, very efficient. On the periphery of the driving wheel are two bands of leather between which the chain passes, the latter being kept in position by the leather, but the friction or grip being obtained by the steel pins passing through the bulks as before said. It certainly took us some little thought to overcome our engineering prejudice, but after having seen the gear at work we have no hesitation in recommending it. Its great merits in our opinion are: it obviates the necessity for differential gear, it transmits the motion, and, lastly, it overcomes a serious difficulty in road traction. Should, as in turning a corner, or going over an obstacle, one wheel be checked, the other revolves at its normal rate, while the chain slips on the former, and, as soon as is necessary, is revolved, by friction, like the other. Current is supplied by a battery of 28 Lamina cells, having a capacity of 80 ampère hours. These cells are packed in what is the "boot," and occupy but little space. They are discharged at the rate of 20 ampère hours, and hence suffice in the car in question for a run of four hours, or about 40 miles at 10 miles. We should say that a feature about these cells is, that they are discharged always in series, the current being varied by putting the motor coils in series or parallel. We tested this motor-car on a pretty steep gradient and amid some heavy traffic, and found that it maintained a fast speed and was easily manœuvred. We think that this type of electro motor-cars has a distinct field for its operation, especially in the city.

SIDE ELEVATION.



SCALE 1/4. ONE FOOT

NOTICES.

Contributions and articles likely to prove of interest to our readers will receive due attention, but in all cases the name and address of the writer must be given, not necessarily for publication.

All matter intended for publication should reach us not later than the 10th of each month. Stamped envelope must be sent if the manuscript is required to be returned. The Journal is published the middle of each month.

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The Automotor and Horseless Vehicle Journal.

A RECORD AND REVIEW OF APPLIED AUTOMATIC LOCOMOTION.

MAY 15TH, 1897.

ANSWERS TO CORRESPONDENTS.

McCONNELL (Co. Donegal).—We think the only power at present likely to be successful for your purpose would be steam. If you are unable to secure a Serpollet motor, possibly Thornycroft's might be able to supply what you want. For smaller vehicles the Daimler motor or Roots and Venables heavy oil motor should meet the case.

J. OLIVER (Edinburgh).—Messrs. J. and C. Stirling's address is Hamilton Carriage Works, Hamilton.

J. H. (Streatham).—If your invention is any good a small advertisement should soon bring you a purchaser. You might also answer inquirers in our JOURNAL who are anxious to purchase motor-car patents.

R. W. B. (Godalming).—The address of the Wolseley Autocar is Sydney Works, Alma Street, Birmingham, and we believe they are taking orders for delivery in rotation.

MOTOR DRIVER (Brighton).—Yes, oil-motors have been applied to the propulsion of small boats with marked success. Several can be seen on the Thames.

JAS. WEST (London).—You should always carry a small bag of tools on your motor. A shifting spanner, a cold chisel and hand hammer, a flat file, and a few clips will occupy little space and may save much expense.

F. YOUNG (Liverpool).—No, we do not hold any personal interest in any motor. We, however, are strongly interested in promoting and encouraging the industry.

J. B. (York).—We do not think your idea is feasible.

PETROL CYCLE.—If you use a very light lubricating oil, and occasionally wash the moving parts with ordinary paraffin, you will find the gummy matter disappear.

SUBSCRIBER (Bradford).—We do not know the Carmont Motor Attachment. If we obtain any information, will let you know.

J. RICHARD.—A Company has lately been formed for the supply of calcic carbide. Their address is Queen Victoria Street, London. A copy of our Automotor Diary has been sent as requested.

THE BRITISH MOTOR SYNDICATE'S "MASTER PATENTS" AND ROOTS & VENABLES.

IN the face of the correspondence in the above matter, conducted through Messrs. Sharpe and Parker, acting for the Syndicate, which we publish on page 310 of the current issue, the conclusion forces itself upon one that the threats of instant action and confiscation of cars, &c., in the case of suggested infringement, so publicly advertised, are all bark and no bite, and that the real value of any patent rights which the British Motor Syndicate claim to possess is not altogether clear in the minds of those controlling the affairs of that body, although appraised at a substantial figure, presumably for the public benefit (?). With respect to the correspondence, it will be noticed that, after charging an honourable firm with the infringement of patent rights, the British Motor Syndicate have so far not, we believe, furnished particulars of the alleged infringements, but appear to us to content themselves with a general statement that the patents alleged to be infringed date from 1884, and number some 47. The first letter fixing a definite date (March 16th) for legal proceedings to be instituted, implies that they are fully prepared, after consideration and with sufficient evidence, to establish the alleged infringements. Having reference to the vast number of patents connected with motors taken out since 1884, it is surely the duty of the Syndicate to furnish the fullest and clearest particulars of the alleged infringements. They have not done so, and the only conclusion one can come to is that the Motor Syndicate realise that the charge of infringement cannot be sustained. The vaguely comprehensive claim that the Syndicate make to the invention of an oil-engine suitable for the propulsion of vehicles and the application of such engines to vehicles, looks to us in the circumstances, as Messrs. Roots and Venables observe, "really too absurd" for discussion. According to an advertisement that the Syndicate are publishing, it appears that they claim "the first master patents for the first successful application of oil and explosion engines to vehicles." For these inventions they state also that they have paid the very respectable sum of £250,000, and they are still buying! Not only do Messrs. Roots and Venables claim that their patents are of anterior date, but that they refer to *oil* motors, whereas they suggest that the Syndicate patents refer to *spirit* motors; the distinction that Messrs. Roots and Venables draw is thoroughly scientific and correct. There is all the difference in the world between the physical properties of oil and spirit; the latter evaporates, whereas the former does not, at least not appreciably under ordinary temperatures. Ordinary petroleum (lamp oil) often contains naphtha, as much as 5 per cent. or more, but this does not make petroleum a spirit. Again, as regards the invention of using the frames of the car as a kind of condenser, this is claimed by Messrs. Roots and Venables, and it appears to us with good reason; at any rate the Motor Syndicate does not appear to lay any claim to it. We cannot but think that in advancing such claims and failing to comply with the perfectly reasonable and repeated demands for particulars, the Motor Syndicate have been most injudicious, and also in their manner of attempting to prevent competing firms from manufacturing motors by threats of legal proceedings for alleged infringement.

If the British Motor Syndicate have any real novelties under their alleged patents, by all means let them enjoy the full benefit to which they are legitimately entitled, but let the vague and sweeping claims and disquieting cautions now being issued be things of the past if they are to eventuate in a series of letters of the character we now publish. We repeat what we said in an earlier issue —that any action which will set at rest the real value of the patent claims of the British Motor Syndicate must be of material benefit to the industry generally, whether the result be for or against the British Motor Syndicate. If successful in upholding their alleged rights, then they would receive their royalties and profits; and, moreover, we should be the first to congratulate them and support them in every legitimate way to enforce their legal claims, the possession of which so far there has been practically no serious attempt to demonstrate, as the nominal "consent to judgment" in the case of the British Motor Syndicate *v.* The Hon. C. S. Rolls (a minor) can hardly be regarded as conclusively defining the right of the British Motor Syndicate to the "master patents" of the motor-car industry. On the other hand, should the judgment be against the British Motor Syndicate, the result would be that the industry would practically be thrown open to the entire engineering trade, including a large number of eminent firms who, provided they are not within measurable distance of saddling themselves with a prospective law suit for infringement of patents, are not only prepared but anxious to manufacture motor-cars of such a nature as to be a credit to their already well-earned reputation and a guarantee of safety and quality to the public; and the British Motor Syndicate should still be able to earn plenty of money for its shareholders by prompt delivery of good motor-cars from their works in the ordinary course, which earning power should be greatly enhanced by the advantage which a good start and being first in the field always affords.

We sincerely trust, therefore, that Messrs. Roots and Venables will not allow the matter to rest where it is, but will insist on the British Motor Syndicate either establishing or withdrawing their claims. Sir David Salomons, a great authority upon the subject, in his paper on motor-cars read on Wednesday last before the Society of Arts (a full report of which appears in another part of our JOURNAL), sums up the principles involved in patent law very lucidly, and Messrs. Roots and Venables, by following up their apparently present advantage, would undoubtedly earn the gratitude of a vast number of people in Great Britain who are deeply interested in this already firmly-established industry. The "greater world" looks to England, as usual, to supply the ideal motor of the future, and therefore let there be no unnecessary obstacles or delay placed in the way of what promises to bring substantial profit and real benefit to the world at large, and particularly to the English-speaking race—greater even than the immense advantage realised from the rapid development of the cycle trade in recent years, or any other industry which has helped to build up the industrial and material prosperity of the empire.

A MUNICIPAL TRIP.

DOUGLAS (Isle of Man) rejoices in two things and is not satisfied. The inhabitants live in a lovely town and seaside resort, and they are paternally governed by a Model Corporation, but they thirst after such vanities as Electric Traction and Electric Lighting. Now you can obtain information in two ways: You can instruct your engineer, who ought to know, to prepare a report, or you can go and see and prepare your own. As a rule, providing you are not an engineer of high standing (and usually you are not) it is better to instruct someone who is to act for you. If, however, you are a member of a Town Council, such as that of Douglas or Birmingham, you will in your zeal for the public welfare not be content with a mere engineer's report, but will see with your own eyes and use your own judgment. It does not matter at all that you will see things and pass and form opinions on things you don't understand, but you will just see. Hence the Town Council of Douglas appointed a deputation (fortunate fellows!) with "instructions" to visit Continental towns for the purpose of inspecting various descriptions and methods of tramway traction. The deputation, so we learn from a local paper, before returning from the Continent decided by a unanimous resolution not to make any communication to the representatives of the Press with regard to the conclusions at which they had individually or collectively arrived as regards the objects of their mission. Then follows a description of the visit, *viâ* London, to the Continent. London was reached at 8.30 p.m., and we read:—"Some two hours were subsequently occupied in inspecting the electric lighting installation which has recently come into operation under the St. James's Vestry in Regent Street, Piccadilly, Pall Mall, and the immediate neighbourhood." Oh, Paris was also reached in the evening:—"Fully three hours were occupied in closely inspecting the installations of electric light and incandescent gas which are identified with Paris. The places visited included the Champs Elysees and Place de la Concorde, about which so much has been said by the *Gas World* in commenting upon the visit of the Corporation of Leicester."

After wandering through Germany they reached Brussels, and spent a quiet sabbath in inspecting Waterloo and its environs; all received reverent and respectful observation, and every man left the field proud that he belonged to the great British nation, and could claim a personal interest in the field of Waterloo. So on to Dover, thence to Bristol and Liverpool, inspecting electric light plant all the way. "The members are unanimous in stating that their journey was one involving a considerable amount of hard work, and was by no means one of pleasure. A very large portion of the time, either by day or by night, was occupied in railway travelling in carriages which at times were overheated to such an extent as to be very uncomfortable for the deputation. Other members suffered from colds, and even now for some little time some of them will be unpleasantly reminded of the expedition from that particular cause. One member, and he by no means the oldest of the party, was desirous of giving the Town Clerk three months' hard labour because that gentleman gave the members no rest day or night, but persistently kept them to the grindstone of duty. They have travelled considerably over 3,000 miles; they have laboured very hard at high pressure rate; they have seen and inspected every description of traction in use; they have gleaned the opinions and collated the experience of the various municipalities and authorities consulted on the subject; and they have come back with an abundance of material for the guidance and consideration of the committee and the Council." We shall await anxiously the result of this municipal trip; in the meantime we would ask, how much did it cost?

THE USE OF PETROLEUM IN PRIME MOVERS.

THOSE who have so far watched the development of the automotor industry without being in any way biassed in favour of particular methods of obtaining power have, speaking generally, arrived at the conclusion that the problem of heavy motor-car propulsion, such as, for instance, that required in the Liverpool-Manchester trade, will eventually be solved by some motor using petroleum. For reasons which need not be enlarged upon, steam is not always the most suitable agent for this purpose; were this not so, we may be sure that it would have been more largely adopted than has been the case. It is quite true that steam at present is preferable to petroleum for large powers; but we must recollect that four generations of engineers have been working at steam, and so by this time it might be a perfectly understood thing, whereas the use of petroleum in motors is a matter of merely a few years ago, and to assume for one moment that the fast-running unequal-turning-moment oil-engines of to-day represent their highest point of development is to confess one's self unaware of or unable to appreciate the after all slow progress of engineering science. At present the oil-engine, considered as a gas-engine, has a very high theoretical efficiency. By efficiency we, of course, mean the ratio between the difference of absolute temperatures and the final temperature. The steam-engine even in its most perfectly developed state has a low efficiency, the figures being for oil-gas 70 per cent., and steam 30 per cent. On the other hand the *actual* efficiency of an oil-gas engine is much less than that of an ordinary steam-engine. Bearing in mind, however, experience as well as theory have amply demonstrated that liquid hydro-carbons, such as petroleum, may be employed in prime motors as a substitute for either coal or steam, or both, it will be seen how very wide is the field for further improvements in petroleum-motors. In fact, it is not too much to say that in the course of another decade the present methods of utilising the energy contained in petroleum will be more or less obsolete. We have thus briefly glanced at some of the elementary science of the matter in order to impress upon the investing public the necessity of using caution in taking shares in motor-car undertakings formed to purchase and work a type of motor which in a few years may, in all probability, be superseded by others of an improved type. There are, of course, many excellent motors in the market for road traction purposes; but we must not forget that in reversibility, graduation of speed, starting, stopping, &c., the best oil-motor is inferior to the steam-motor. This need not deter the capitalist from supporting a legitimate and promising industry in which the possibilities are so great. Oil-motors are but yet in their embryonic stage, and we think their development will be similar to that of the dynamo which in less than a generation has reached, practically, perfection. Those who are familiar with the electrical industry will not forget how it was crippled by unsound and injudicious financial methods. Vast sums were paid for patent rights which, however valuable at first, quickly lost that quality by the rapid march of improvement. Those then that have invested money in patent rights in oil-motors will be well advised in seeing that their directors set aside out of earnings a proper sum for depreciation of patents; how much this should be it is, of course, not for us to say, nor indeed could we give any useful opinion; but this much we may suggest, that the proportion so set aside should be substantial, because it is certain that owing to the large field of employment for a reasonably efficient petroleum-motor that will be as simple and as controllable as a steam-motor the want is bound to be supplied. Scientific inventors are everywhere busy in this direction, and improvements are continually being made. At present owing to their inferiority in many respects to steam-motors the employment of oil-motors is somewhat restricted. In this respect they stand on the same footing as the Otto gas-engine. As is well known this motor has been for those firms that owned the patent rights a most valuable property, and even now that these rights have expired its manufacture is very profitable. But there are certain things that no motor using the Otto cycle can do well, and there are certain purposes for which petroleum-motors are not well adapted such as, for instance, heavy road traction and canal boat propulsion. As soon as the imperfections of the oil-motor for these purposes are removed there will be an unlimited field for its employment.

THE POLICE AND THE MOTOR-CARS.

It is only to be expected that many people will find themselves in the Police Courts for running their motor-cars at high or excessive speeds contrary to the laws made and provided. Lots of giddy youths think furious driving to the danger of the public a most exhilarating pastime, but an ever-watchful police usually manages to restrain such persons before much damage is done, and magistrates, as a body, manifest no undue leniency to the perpetrators of the always stupid, and frequently dangerous, practice of furious driving. What, however, is really "furious driving" in the case of a horse and trap, may be a perfectly safe speed in the case of a motor-car, even allowing that the speed is the same in both cases, because once a horse gets up a speed of, say, 12 miles an hour, his natural excitement makes it extremely difficult to check his career; with an automotor the case is widely different—the source of power can be at once shut off and the brakes applied with the result of bringing up the vehicle "all standing," as a sailor would say. Indeed, to apply the adjective "furious" to any mechanically-produced speed is simply absurd. Who ever heard of the "furious" speed of a torpedo-boat, or who ever speaks of the "furious" speed of an express locomotive? Yet an animal can indeed be very furious. Leaving this point, we would as strongly deprecate as we can the employment of anything like excessive or even very fast speed by the users of motor vehicles, and we are sure that all those interested in the new locomotive share our opinion and would co-operate with local authority in putting down anything in the nature of "scorching," which has created not a little prejudice in the case of cycles. Between seeing that drivers go at a moderate speed and exercising an undue discrimination against them merely to gratify prejudice or dislike to the new locomotion there is all the difference in the world, and we are not at all sure that this prejudice does not operate in more than one provincial town to the detriment of those who are engaged in running motor vehicles. In most county towns the local magistracy and the local police are not distinguished for liberal views of any kind, and both frequently exercise an intolerance which often comes near illegality in matters upon which they entertain views the result of usually ignorant prejudice. We are led to make these remarks in consequence of some prosecutions against the users of motor-cars which have recently been conducted in Coventry, Dublin, and Warwick. It is unnecessary to state that the charges were for furious driving and not obeying a policeman, and so forth. In the Coventry and Warwick cases Mr. Charles Turrell, described as the Secretary of the British Motor Syndicate, was the defendant. In the first place, it is in the last degree improbable that any responsible person who is so interested in the motor-car industry as Mr. Turrell would so far encourage the prejudices of the ignorant as to break the law, and we do not for a moment believe that he did, or if he did, it was an offence which might well have been met by a caution. The majesty of the law in the case at Coventry is reflected in the person of a gentleman who occupies the lofty position of being the Deputy-Clerk to the Warwickshire County Council. This person was, it seems, driving a restive horse in the streets, and seeing a motor-car approach held up his hand as a signal for the driver of the latter to stop. The driver in question, Mr. Turrell, probably seeing no cause for alarm, did not, we regret to say, appreciate at its proper value a minatory hand held up by a "deputy-clerk," and continued on his way. With the assistance of the local and energetic police, who naturally entertain proper feelings of respect for deputy-clerks, beadles, magistrates, and other lawfully-constituted authorities, a charge was laid, and it appears that not only had the law-breaker committed three distinct offences, but he had, we regret again to say so, been rude to the "deputy-clerk" in question. It was evident from the proceedings that all this was very seriously regarded, and a substantial fine was inflicted. Mr. Turrell had, however, hurt the feelings of the local Bumbles, and so the next time he appeared on a motor-car he was naturally guilty of something very wrong. In this case, too, he did not obey a policeman, and was driving "furiously." As his counsel contended, it was evident that the police were making a dead set against motor-cars, and the Warwick magistrates, finding that the defendant was not in charge of the car, had to dismiss the case. In the Dublin prosecution an employé of the Pennington Motor Company was charged with driving at a greater rate of speed than six miles per hour. This was proved in the wholly crude and unscientific manner of accepting a policeman's word to the effect that he had paced the distance, and this policeman gave the speed as being in one case 18 and in another 20 miles an hour. If this evidence is reliable of course the offence was serious, but we doubt it. Apart from its inherent improbability, very few people can estimate speed approximately, and pacing is a distinctly improper and unreliable method of estimating distances unless done by a trained walker. In such cases as these no pains should be spared to get at the facts, and while we feel sure that no responsible person will give cause of offence we feel equally certain that in many country towns the local authorities will for some time yet be not indisposed to regard with a prejudiced eye the proceedings of those who drive motor vehicles. Perbaps a Motor-Car Defence Association and a few appeals to the High Courts, the collecting of exact evidence, &c., will have the effect of making proviucial magistrates, "deputy-clerks," and local police be careful in their treatment of automotor drivers.

A PARK PHAETON MOTOR.

We are indebted to our contemporary, the *Coach Builders', Harness Makers', and Saddlers' Art Journal* for the accompanying illustration and description of a park phaeton motor. Although somewhat *outré* in appearance to English ideas, we should explain that this phaeton is designed for Oriental use, and those familiar with India will recognise that the design is quite in accordance with Eastern ideas and requirements. No doubt when built the frame will be of a more substantial nature than the lines given in the sketch. Says our contemporary :—

"The body is hung low and poised at such an angle of inclination as cannot fail to give the greatest comfort in sitting room to ladies, together with a reclination harmonising with a polished and cultivated deportment. The dash is of the broad old-fashioned style peculiar to this kind of carriage, and which gives an important and aristocratic air to the vehicle; the dash is fitted with bottom foot wings projecting down the front of the body for about a foot, thus protecting the body from the mud coming from the front wheels; this is not only a necessity but also improves the general appearance of the carriage; those little details have a wonderful effect in the aggregate, whether on a motor or horse-drawn carriage.

"The front under-carriage is fitted up to work with compensating gearing, therefore requires no transom wheel plate nor perch bolt, the front part being fitted solidly to the springs, the axles being pivot-jointed as heretofore explained.

"The canopy should be at such a height as to give at least the clearance of a Landau or Victoria head in the sitting room, it is an accessory that should receive careful attention as to proportion in every way, so as not to look top heavy, nor to have the appearance of being an after-thought; the front support stays are curved to harmonise with the design of the carriage, with the old-fashioned ornamented swaged centres prevalent 35 years ago.

"The motor case would have to be made the sizes to suit motor, but detached from the body, with the exception of the bottom stay fixing; the side fixing of the case would take the solid inside flap of the pump haudle, in this way the motor case would lend relief to the body as a fixture, and could be let down as near to the axle top as convenient or the axle could be cranked to still further help its necessary and harmonious fixing."

THE WEDDING MOTOR-CAR.

On Tuesday, April 20th, a wedding, which excited much interest, was solemnised at St. Augustine's Roman Catholic Church, Solihull. The contracting parties were Mr. Albert Edward Day, eldest son of Mr. Edward Day, of Radnor Road, Handsworth, and Miss Irma L'Hollier, daughter of Mr. Leon L'Hollier, of Robin Hood House, Hall Green. The ceremony, which was attended by a large number of people, one party coming in a motor-car, was conducted by the Very Rev. Canon McCave. At the conclusion of the ceremony the wedding party adjourned to the house of the bride's father, where motor-cars were employed in the diversion of the company.

We may add that Mr. E. Day is assistant manager of the Anglo-French Motor-Carriage Company (Limited); while Miss Irma L'Hollier, the bride, is the daughter of Mr. Leon L'Hollier, one of the pioneers of the autocar industry in England.

Among those recently elected as members to the Automobile Club of France we notice the names of Baron Henri de Rothschild, of Paris; Mr. P. Peacock, of London; M. le Baron de Leyssac, director of the International Bank; M. Siegfried Singer; M. P. Deschamps; M. G. Renard; and M. G. Dupont. In fact, it is not too much to say that many of the leading men in science and industry are members of this prosperous club.

A 52-page diary, printed on excellent paper, is one of the features of The Automotor and Horseless Vehicle Diary and Pocket-Book for 1897, which contains over 100 pages of information. Price 6*d.*; post free, 7*d.*, of Messrs. F. King and Co., 62, St. Martin's Lane, London, W.C.

CONTINENTAL NOTES.

Electrical storage batteries for propelling tramcars do not find much favour with us, and just now all the rage is for overhead wires and trolleys. Before municipal guardians of the public purse go in for the latter, or even the conduit system, we should advise them to study a report recently published by the directors of the Hanover Tramway, in which they narrate their experiences with accumulators as the source of power for their cars. In Hanover both overhead wires and accumulators have been used for a considerable time, so that the managers are in a position to institute a reliable comparison. Taking everything into account, they pronounce in favour of the storage cell. The cost of maintenance has been determined with the utmost exactitude for the year 1896, and the average comes out at 40 marks per wagon per month, equivalent to 75 groschen per kilometre. The estimate includes the cost of renewing the plates. Having regard to the expense involved in the maintenance of the overhead line and its accessories, as well as to other circumstances, the managers arrived at the conclusion that the additional cost of accumulators does not exceed one groschen, or one-tenth of a penny, per mile. Consequently it has been decided that the entire system shall, as soon as the requisite arrangements can be made, be driven by secondary batteries.

French railway companies are not quite so conservative as ours; thus Le Chemin de Fer du Nord has lately purchased a Panhard and Levassor motor quadricycle fitted with a four horse-power Phœnix motor.

We understand that a Motor-Car Company is in course of formation at Amsterdam. Mr. W. Smith, Assoc. M.I.C.E., is the consulting engineer; his address is 8, Doclenstratt, Amsterdam. He will be glad to hear from manufacturers of motors, &c.

The Serpollet motor-car employed in connection with the postal service on the Northern Railway (France) gives great satisfaction to the authorities.

La Locomotion Automobile for April 29th contains a most interesting and instructive article by M. E. Hospitalier upon the influence of plain and pneumatic tyres on the co-efficient of traction.

The Conseil Générales of Calvados and La Mouche are not unlike many of our own bucolic provincial bodies. They are interested in maintaining the breed of horses, and hate the automotor with a fervent and sincere hatred. We learn from *Le Sports* that these two bodies have expressed a wish or voted that a tax should be placed upon automotors, and the proceeds devoted to horse-breeding. Our contemporary devotes considerable space to discussing this insane project, which it calls "automobilophobic" (good word that). So say we. We do not know how they manage these things in France, but here, in spite of all the power of local authorities, such a proposal could not be carried out unless with the sanction of the Imperial Parliament. Still, the good people of La Mouche are quite right to preserve the horse while he is yet to be found. In another century he will be a curiosity seen only in local Zoos and museums.

According to our contemporary *La Locomotion Automobile*, French provincial authorities are, in many instances, just as narrow-minded and as prejudiced as our own in their treatment of the motor-car. Great as our own magistrates, "deputy clerks," policemen, and other governors of the earth manifest a disposition to put their own interpretation upon the law, so do the French "Dogberry's." Human nature, or rather police nature, is evidently much the same everywhere.

In *La Locomotion Automobile* for May 6th is an illustration and description of the "Avant Train" Motor and the "Attelage" Motor. As their names imply, the former is a motor placed under the fore part of a vehicle and driving the front wheels, while in the latter case the motor is suspended or carried by the transverse axis of two wheels, and thus forms an independent autocar. In its latter form it can be attached to any vehicle, and replaces the horses. For many purposes this system of M. Amiot would have advantages, but we do not think it is likely to be largely taken up by motor-carters in general, as in both cases the motor is much exposed to damage from collision, and the arrangement is, moreover, anything but satisfactory from the æsthetic point of view.

The motor-car parade that had been arranged to take place in Paris under the auspices of the Automobile Club was hardly the success that had been expected owing to the rainy weather. Out of 80 entries only about 30 turned up. The cars were gaily decked out with flowers; those of Baron de Zuylen, M. Archdeacon, M. Peneau, and M. Trouette being much admired. After lunch at the Club's villa the cars returned to town, but their flowery embellishments were somewhat marred by the bad weather.

L'Industrie Velocipéderne does not entertain a very high opinion of the much talked of Brambel motor. After describing it very fully, our contemporary, whom we render freely, says Brambel's principal invention is his new system for preventing the steam from escaping upon the sides of the piston. This is accomplished by having concentric grooves both on the rotating piston and upon each side of the casing. The oil is forced into these grooves by centrifugal force, thus forming an hermetical packing. It is upon this point alone that the Brambel motor presents any patentable novelty and not upon its general working, which is not after all anything more than a fortunate application of well-understood principles.

As the result of a meeting of engineers a technical Association for the Study of Automobilism, or as we prefer to call it motor-traction, has been formed at Lyons. M. Victor Cambon is director of works, &c.

In his work, "La Traction Electrique," M. Paul Dupy describes some very interesting experiments upon canal propulsion that have been carried out on the Burgogne Canal by the Society for Electric Traction on Canals. It seems that a dynamo driven by a turbine fed by the canal supplies current to an air conductor, from which it is led by suitable means to the armature of what is really an electro-locomotive, but which has but three wheels, and would be termed an electric tricycle. The experiments have been very satisfactory, and have demonstrated that with an expenditure of energy at the rate of 1 kilo. watt hour per 100 tons, a speed of 2½ kilometres is obtained.

The President of the French Republic has promised a prize for the Automobile Race from Paris to Dieppe, while the Council of Seine Inferienre has voted 300 francs as a prize. It is very satisfactory to observe the support which the enlightened French superior authorities accord to the automotor industry.

President	Sir DAVID SALOMONS, Bart.
Secretary	ANDREW W. BARR, Esq.
President of the Liverpool Centre	The EARL OF DERBY, G.C.B.
Hon. Local Secretary	E. SHRAPNELL SMITH, Esq.
Semi-Official Journal of the Association	THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

SELF-PROPELLED TRAFFIC ASSOCIATION.

LIVERPOOL AND DISTRICT CENTRE.

THE Annual Meeting of the Self-Propelled Traffic Association (Liverpool and District Centre), was held on Tuesday evening, at the Royal Institution, Colquitt Street. Mr. Alfred Holt presided.

Letters of apology were read from Messrs. F. C. Danson, A. L. Jones, and A. G. Lyster.

The CHAIRMAN, in opening the proceedings, said that for some time past the question of self-propelled traffic had attracted a great deal of attention, and there were many people interested in the conveyance of goods who seemed to see salvation from the rather onerous railway rates in the advent of self-propelled vehicles. He earnestly hoped that that salvation would be obtained, and that the Association might have its fair share of the honour and glory. The Association was yet young, but they had already had many interesting papers, and had learned a good deal that would be valuable in many respects.

The first session's report, 1896-7, was then presented by Mr. E. Shrapnell Smith, the Honorary Secretary. After pointing out that the objects of the Association were particularly for "the scientific investigation of self-propelled vehicular and locomotive road traffic," it states that the accounts to April 30th, 1897, have been duly audited by the London Secretary, Mr. Andrew W. Barr, and that under the auspices of the Association, Mr. W. Worby Beaumont, M. Inst. C.E., M. Inst. Mech. E., gave an address to the members of the Liverpool Incorporated Chamber of Commerce, upon the subject of "Motor Vehicles for Heavy Traffic," on September 9th, 1896

The session was opened on October 26th, 1896, by Sir David Salomons, Bart., President of the Association, who was entertained at luncheon at the Exchange Station Hotel by Mr. Alfred L. Jones (Vice-President), who also invited the members of the Council and a number of leading citizens to meet him.

In the evening Sir David Salomons delivered an inaugural address entitled, "Self-Propelled Traffic," in the course of which the position of affairs up to that date was reviewed. After glancing at the legal restrictions, shortly to be removed, the question of patent rights was dealt with, and it was pointed out that so-called "master" pateuts which some persons were putting forward in connection with motor vehicles had no existence in point of fact.

Various incidents of the Paris-Marseilles road race were referred to at some length, and it was claimed for steam that it would prove the most convenient and serviceable power.

In conclusion, the numerous important uses to which self-propelled vehicles might soon be put were briefly considered.

The President, the Right Honourable the Earl of Derby, G.C.B., was unexpectedly but unavoidably prevented from presiding, and his place was taken by Mr. Alfred L. Jones, one of the Vice-Presidents.

Subsequent meetings were held, at which papers were read and discussions were conducted upon the several subjects enumerated in the following summary :—

1896.

December 1st.—Prof. H. S. Hele-Shaw, M. Inst. C.E., M. Inst. Mech. E.—"The Pneumatic Tyre." (With experiments and lantern illustrations.)

December 15th.—Mr. William B. Cook, C.E., and Mr. Frederick Willoughby, M.A. (Joint Authors).—"A new method of utilising canals for traffic—with special reference to the canals of Lancashire and Yorkshire."

1897.

January 5th.—Mr. Geo. F. Thompson.—"The Motor Wagon Scientifically Considered."

January 19th.—Mr. W. Worby Beaumont, M. Inst. C.E., M. Inst. Mech. E.—"Mechanical Haulage on Common Roads."

February 16th.—Mr. Rhys Jenkins, M. Inst. Mech. E.—"Compressed Air as a Motive Force for Road Vehicles."

Unfortunately, through unforeseen circumstances arising from various causes, four papers which were intended to have been read were unavoidably cancelled or postponed.

The Inaugural Address was specially printed and issued in pamphlet form, and the proceedings of the Centre have been fully reported in THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

The Honorary Secretary is taking steps to form a library comprising books and journals of both historic and contemporary interest, and the assistance of the members is requested in this direction.

PRIZE SCHEME.

Mr. Alfred L. Jones (Vice-President) very generously offered to place £1,000 in the hands of the Association for the purpose of promoting a competition between motor-wagons capable of carrying heavy goods. A sub-committee of the Council was appointed to deal with this matter, and after considerable deliberation it has recommended that the premium be not offered at present.

EXHIBITION.

It is in contemplation to organise an Exhibition of Motor Vehicles, to be held some time in the spring of 1898, by which time there is reasonable ground to expect that makers of both light and heavy types will be in a position to take part. When the arrangements are concluded, particulars will be duly announced to the members.

The Council desires to place on record their high appreciation of the zealous services of Mr. Shrapnell Smith, the Honorary Secretary of the Centre, who then exhibited a number of slides on the screen, tracing the development of the motor-car up to the present time.

Mechanical Haulage between Liverpool and Manchester.

WE understand that Messrs. Elder, Dempster, and Co. received several tenders in response to their advertisement which appeared in THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL for February, and desired the assistance of the special Sub-Committee of the Self-Propelled Traffic Association in considering these offers. Several contractors were willing to undertake the haulage at a rate approximating to 2*d.* per ton-mile, and to start within a month of receiving the order, but owing to the fact that all the schemes submitted were limited by conditions that were regarded as too onerous, it was not thought that any one of them could be advantageously accepted.

REVIEWS OF BOOKS.

"The Law Relating to Motor-Cars." By H. LANGFORD LEWIS and W. HALDANE PORTER. (London: Butterworth and Co., 1896.) Price 3*s.*

IN the small space of 60 odd pages the authors have succeeded in compressing the by no means unextensive literature relating to locomotives on highways and exceedingly well have they performed their task. Such a small and handy volume will stow conveniently in a bag or under a seat, and is at once available in the event of meeting with, as sometimes happens in provincial towns, a too zealous policeman, magistrate's clerk, or other high officer of state, who not infrequently does *not* know all about it.

After a brief survey of the law up to the passing of the Locomotives on Highways Act of last year, the latter measure is discussed and explained in language which while sufficiently legal is yet easily understood by the layman. Thus we learn that cycles fitted with auxiliary motors are "Light Locomotives" within the Act, and any vehicle drawn by a light locomotive is referred to also as a light locomotive. A light locomotive is also a "carriage" within the meaning of *any* Act of Parliament. Indeed, a motor-car is abundantly cared for by the law, but as usual there are those *lacunæ* in the various Acts which will no doubt give plenty of scope for judicial interpretation. Thus a local authority may mean anything from a parish council to a grand jury, but in London we learn with surprise on the authority of the authors that it is doubtful if it includes the London County Council, which we also learn has no direct control over the streets of the metropolis except the Thames Embankment.

As we know, any breach of the bye-laws and regulations made under the Act may be punished by a fine of £10, but if the peccant motorer thinks that this fine settles the case he is woefully mistaken. Our authors blandly state that "this is, of course, in addition to any penalty incurred under any other Acts." A light locomotive is of course subject to a tax not only because it *is* a light locomotive but also because it is a carriage or it may be a hackney carriage; but here comes in the glorious inequality of the law—no duty is charged or payable upon light locomotives in Ireland. Naturally the law is not the same for England, Ireland, and Scotland, but this is one of those things that one requires to have experience of in order to appreciate. Our authors carefully explain the points of divergence. The Regulations of the Local Government Board are next discussed, and we should strongly advise all in charge of motor-cars to make themselves conversant with the rules, because these regulations really are to motor-cars what the rule of the road at sea is to ships. It may not be generally remembered that if the name, &c., of the owner of a motor-car is not painted on the right side of the machine in large legible letters not less than one inch high, any person may demand the name and address and the person in charge must truly state them. The Regulations as to Petroleum are dealt with, followed by a copious appendix and index. Altogether a most useful handbook.

"Motor-Cars or Power Carriages for Common Roads." By A. J. WALLIS-TAYLER, C.E. (London: Crosby Lockwood and Son, 1897.)

THIS work will no doubt appeal to that large class of readers who like popular and condensed accounts of machinery, but to those who may take it up with an idea that it, being written by a professional man, is a technical description of automotors will, we fear, be disappointed. The early history and development of road traction has not been better done by anyone than Mr. Worby Beaumont, and that so recently that we confess we see very little good in a work of the present description unless it contains original and fresh matter. Mr. Wallis-Tayler does not, however, profess "to devote any special attention to the design pure and simple of the vehicles," but contents himself with describing what has been accomplished; neither does he do "more than touch upon the theoretical side of the subject," but refers the seeker after knowledge to "the many able treatises that have been written upon the sciences of thermodynamics, chemistry, and electricity," not to mention that of the "mechanical questions which would especially apply to the several sources of energy in use." Commencing with a useful report of trials of motors made in Chicago, from which we learn that although the various motor-cars approximate in weight to a horse, yet their individual pulls were very much less than that of an average horse, we are next given an account of Hele-Shaw's experiments in tyres. Then follows a historical sketch of early steam road-carriages. The third chapter treats of recent examples of steam road-carriages, and among those described and illustrated are the Serpollet, Le Blout, De Dion's, Thornycroft's, &c. As most of these types have been dealt with in the columns of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL and are pretty well known, it is sufficient to say that Mr. Wallis-Tayler does not add to our stock of knowledge, although we have been looking out for reliable extended consumption tests of these motors. Passing in the next chapter to internal combustion-engine carriages, all the better known types are described fairly well, and little exception can be taken until we come to the Pennington motor. So much has been said and written about this and so much needless mystery has gathered round it that we are sorry not to find here a, at any rate, sufficiently full explanation of its action. The account of the motor is merely a patent specification transcribed, in which such legal, useful, but hardly, from a literary standpoint, graceful embellishments as "said," "aforesaid," "thereof," and "or other suitable material" occur. Mr. Wallis-Tayler is discreetly silent upon the *modus operandi* of the machine. He quotes, however, from an American paper which gives a really poetical account of the Kane-Pennington gasoline-engine, which considerations of space alone forbid our reproducing. Enough to say that the mystery of the Pennington motor is not solved, but the American authority quoted says: "It is in the igniter and in the double spark, or rather in the effect of the first spark apparently that the efficiency of the Pennington motor lies." This is vague enough, and it does not explain "the one great mystery"—the coolness of the naked cylinders; Mr. Wallis-Tayler is provokingly silent on the subject. There is a good description of the Roots motor and of some others, but little that is fresh. To the reader of light literature the book is useful enough, but we honestly cannot recommend it to the student or engineer. The illustrations, too, leave much to be desired; they are too small to be useful, and in some cases have a suspicious look of having formed part of patent specifications.

CORRESPONDENCE.

*** *We do not hold ourselves responsible for opinions expressed by our Correspondents.*

*** *The name and address of the writer (not necessarily for publication)* MUST *in all cases accompany letters intended for insertion or containing queries.*

A MOTOR-CAR RUN OF 300 MILES.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

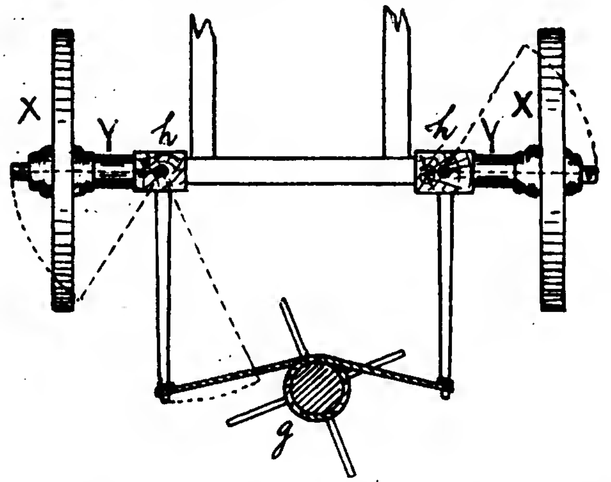
DEAR SIR,—I beg to corroborate your footnote on page 284 of your last issue to the effect that the Peugeot car which performed the above run was and is my property, though Mr. Wellington had the temporary use of same.—Yours truly,

C. S. ROLLS.

STEERING GEAR.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

SIR,—With reference to the illustrated description of Ackermann's steering gear in the last issue of THE AUTOMOTOR I should like to point out that the idea of the divided axle is much older than Ackermann's patent, and that as a matter of fact it was put into practice, and with a horseless carriage too, as far back as the year 1714.



In the "Machines Approuvées par l'Academie Royale des Sciences," tome iii, are given descriptions of carriages propelled by windmills brought before the Academy in the year 1714 by M. Du Quet. The figure herewith is reproduced from one of the drawings accompanying these descriptions. It will be seen that the wheels, *x*, *x*, are mounted upon short axles, *y*, *y*, each fixed in a vertical post, *h*, provided at top and bottom with pivots which work on suitable bearings in the framework of the carriage. Standing out from the posts at right angles to the axles are arms to which are secured the ends of a rope wound around a capstan, *g*, also carried in the carriage frame. The action of the apparatus will be quite clear from the figure.—Yours, &c.,

RHYS JENKINS.

THE LIGHTNING EXPRESS.

We wish Mr. Behr every success in developing his "Lightning Express Railway Carriage," but while we have no doubt that speeds of 120 miles per hour are quite possible, we do not think that such speeds will be reached for many years yet—not on account of any mechanical difficulties, but because of the economical conditions of the problem. Such a high speed would only be necessary over long distances, and this would mean building and equipping new trunk lines of railway or adapting the existing ones. The first alternative is practically out of the question, and the second is hardly likely to occur for many years. Also, is there any demand for high speeds such as are contemplated? It is generally admitted that 90 miles per hour is the limit of locomotives on railways when driven direct by steam. Higher speeds can be attained by electric locomotives, as has been proved in France, and that system of electric locomotion will be adopted that enables existing stock, rails, &c., to be used. We know of at least one great railway engineer who has everything prepared for the equipment of his line with electric locomotives to develop speeds of over 100 miles per hour, but his directors will not (naturally) move till the public demand these excessive speeds. Mr. Behr's system, as we understand it, involves the use of a single track built something like a continuous lattice girder. The cost of such a line would be high, to begin with, while the Board of Trade would require such extensive arrangements for signalling, &c., that the expenses would also be great. Lastly, as regards the proposed idea to build such a railway to carry the goods traffic between Liverpool and Manchester, we are extremely sceptical, because, owing to the great cost of such a line, the freight charges must be high, and the bulk of the goods that go from Liverpool to Manchester and *vice versâ*, such as cotton, metal, meat, &c., would not bear any increase in the freight, and unless Mr. Behr can show that the freight will be less than it is, we fear his scheme would not be entertained.

"PARISIAN" MOTOR-CAR.

THE INTERNATIONAL MOTOR-CAR CO.

The reproduction of the car which appears on this page is a specimen of a new design of motor-car which is now being supplied by the above Company. We have had an opportunity of riding in one of these excellently-appointed vehicles, which, under the guidance of the manager of the Company, answers every description set forth in their catalogue. The steering is exceptionally good; when in motion there is practically no vibration, and a speed of up to 10 or 12 miles an hour can be easily obtained. Upon the occasion of our run the route taken included several fairly steep gradients, which were readily negotiated. The motor used is on the principle of the well-known improved Benz system, the International Company being the sole licensees for this type of vehicle as supplied direct from the Parisian Manufactory, under whose auspices it is claimed the cars have received medals at Paris, Brussels, Berlin, &c., &c. The details of the machinery are perfectly simple, and easily understood by anybody with the slightest mechanical knowledge, and the simplicity of the working parts recommends this type of vehicle to novices who are anxious to become motor-car owners. A visit to the offices of the Company, which are at 369, Edgware Road, will ensure the fullest details and a practical demonstration of the capabilities of these cars.

THE BAZIN ROLLER BOAT.

We have not heard very much lately of the Bazin Roller Boat over which many of our contemporaries poured out their vials of praise and commendation. For ourselves we prefer to judge by facts and the teachings of applied science, and we doubt very much whether M. Bazin's ideas are possible of realisation, at any rate in the way he is said to be working. According to the accounts which have appeared in the papers he proposes to propel a vessel 130 feet long by 40 feet beam (depth not stated) at such a speed that the Atlantic voyage will be shortened to a little more than 90 hours, or a speed of 33 knots will be reached. In order to do this the hull is supported not by the water but by six hollow wheels of ungula section, each wheel being 33 feet in diameter, 12 feet thick at centre, and floating at a depth of 12 feet. There is an engine of 750 (presumably) indicated horse-power; of this power three-fourths or 560 indicated horse-power will be devoted to driving a propeller, diameter pitch and surface not stated, and the remaining fourth or 186 indicated horse-power will be utilised in rotating these immense wheels.

Let us assume that there is no skin friction, the hull being entirely out of water, then the only resistance to overcome would be that due to the air. Whether it would be possible to drive a body of the dimensions given at a speed of 30 knots against an ordinary Atlantic gale with 560 indicated horse-power is in itself a question that settles the whole thing. The resistance due to calm air is usually expressed by $R = \cdot 005\ AV^2$, where A=area in square feet of exposed surface and V speed in knots. Taking the area of the surface of the Bazin at only 1,000 square feet and the speed at 30 knots the resistance will be 4,500 lbs., which will require at least 400 *effective* horse-power. Of the 560 indicated horse-power not more than 60 per cent. can be usefully employed in propulsion, so the power provided is insufficient. Unfortunately skin friction cannot be neglected because the area of the wet surface is very large. According to the dimensions given it cannot be much less than 9,500 square feet, and although these wheels revolve yet this does not materially reduce the skin friction, and to think that 9,500 feet of wet surface can be forced over the water and through it with the expenditure of say even 1,000 indicated horse-power is so utterly opposed to the experience of our naval architects that it is useless to pursue the matter further, but, as an example, we may mention that to propel a well-formed vessel with this amount of wet surface at 16 knots or just half the estimated speed requires about 2,000 horse-power, or four times nearly that stated by M. Baziu. We, therefore, conclude that he will not obtain the results anticipated.

COMPRESSED-AIR MOTORS FOR TRAMCARS.

TRAMCARS operated by compressed air are now in regular service on some of the cross-town lines in New York, and the elevated railway authorities will soon experiment with a compressed air locomotive of the Hardie system on the Sixth Avenue Line. In length, weight, and general appearance the new engine closely resembles the steam locomotives now in service on the elevated lines, but there is no smoke-stack, and the cylinders are in the rear of the drivers instead of in front. But the most radical departure from precedent does not show from the outside. A number of tanks or flasks, which contain compressed air, are substituted for the steam boiler. The former occupy the same place and space as the latter, but are completely hidden by a suitable sheet-iron covering. There are 36 of these flasks, which are Mannesman tubes, each 15½ feet long and 9 inches in diameter. The steel of which they are composed is about $\frac{5}{16}$ inch thick. Although the highest pressure which they will be called upon to withstand is 2,000 lbs. to the square inch, they have all been tested up to twice that pressure without developing a defect. Reducing valves will give a cylinder pressure of 150 lbs., which is the same as in the steam locomotives. The combined capacity of the 36 reservoirs is 200 cubic feet, but the air contained therein when they are charged up to the limit will expand, when freed again, to 136 times that volume; and its weight, entirely aside from the vessels which hold it, is estimated at about one ton. The flasks are all in communication with each other, so that the pressure decreases or increases uniformly in them, precisely as if there was but one reservoir. The connection between them is made by means of 12 pipes, each of which has three branches. Each branch is securely attached to the pointed front end of one of the flasks, and the main pipe discharges into a hole in the side of an upright passage or header. There are six holes on each side of the header. The seventh hole, at the bottom, affords an outlet—through another pipe, of course—to the cylinder. It is estimated that the engine will develop rather more power than the steam engines now hauling trains on the elevated roads, because it has larger cylinders. Their diameter is 13½ inches, and the length of stroke is 20 inches, while the corresponding dimensions on the old locomotives are 12 inches and 16 inches. Even under unfavourable conditions of load and weather it is expected that the new engine will take a five-car train up the Sixth Avenue Road to Fifty-eighth Street and back again, a distance of 11 miles, with one charge of air. The storage capacity of the tanks on the tramcars in One-hundred-and-twenty-fifth Street is only about one-fourth that of the elevated-road motor; but each of those cars has not only its own reservoir, but its own engine, under the floor, and is not hauled by a separate machine. The tramcars run about 15 or 16 miles without renewing their supply of air. The elevated railway motor will, it is estimated, have fully 300 lbs. left on hand at the end of a round trip. In an emergency, however, the engine can run a short distance with only 60 lbs. pressure. A re-heater is provided.—*The Engineer.*

AMERICAN NOTES.

Important to Inventors.—Amendment to the United States Patent Law.

ACT OF MARCH 3RD, 1897.

IN our last issue we referred briefly to the amendments in the United States Patent Law. Messrs. Herbert Haddan and Co., of 18, Buckingham Street, Strand, have now supplied us with a digest of the new Bill, which was passed during the closing hours of the Fifty-fourth Congress. The following are the changes in the law made by this Act:—

Section 1.—Two years' publication by patent or otherwise prior to the application is a bar to a patent.

Section 2.—A defendant may plead such two years' publication as a defence against a patent.

Section 3.—The application on an invention patented abroad must be filed within seven months of the earliest foreign application; the patent will then be granted for 17 years. If the application is not filed within that time the patent, if granted, will be void.

Section 4.—Applications for patents must be completed within one year (instead of two years as formerly), and response must be made to any official action within one year (instead of two years).

Section 5.—Assignments, if acknowledged before a notary or other proper official, are self-proving.

Section 6.—In actions for infringement there shall be no recovery of profits or damages for more than six years before commencing the action.

Section 7.—This Act shall take effect January 1st, 1898. Sections 1, 2, 3, and 4 shall not apply to any patent previously granted, nor to any application previously filed, nor to any patent granted on such an application.

The Act, as passed, gives ample time to all parties whose interests are affected to protect themselves by the exercise of reasonable diligence. In every case in which an invention was made public by the issue of a patent or other publication prior to January 1st, 1896, it will be necessary to file the application for patent in the United States before January 1st, 1898. In every case in which an English or foreign patent shall have been applied for before June 1st, 1897, the application for the United States patent for the same invention must be filed before this Act takes effect, or the right of patenting the invention in the United States will be lost.

Every intending patentee should hasten to get his application on file before the Act takes effect, as thereby he will be able to enjoy the advantage which the present law gives of securing, in case he wishes it, a delay not exceeding two years for the prosecution of his application after rejection. After the Act takes effect this period will be reduced to one year, which in many cases will give rise to inconvenience, and force an earlier issue of the patent than might otherwise be desirable.

In the course of an able leading article on the above, *Engineering* says:—

"But the new United States law that is to come into operation on January 1st next provides, in effect, that no patent shall be granted in that country for an invention first patented, or caused to be patented, by the inventor or his legal representatives or assigns in a foreign country on an application filed more than seven months prior to the filing of the application for the United States patent.

"Comment is needless. But let every British inventor make a note of the fact, and, whilst taking care not to unwittingly delay until too late his application in respect of any invention he may desire to protect in the United States, let him also exert all the influence he can command in the endeavour to bring about a more just and equitable state of affairs as between the two great countries."

Horseless Cabs in New York.—According to the *Electrical Review* there are only seven or eight horseless hansom cabs in New York City, and these are not located at cab stands, but are kept in a stable ready to be brought out when ordered. While it is true that the charges are the same as for the hansom cabs drawn by horses, it should be remembered that cab hire is so expensive in New York as to make horseless cabs remunerative at similar rates. The rate of cab hire is 50 cents per mile. It is interesting to observe that although over six months have elapsed since the coming into force of the Horseless Carriage Act, motor-cars are rare in the London streets, and when let loose are generally followed by a laughing and a gaping crowd. One hardly expects a revolution of this sort to do its work in six months, but those who believed the reports of some promoters and inventors circulated last November expected something more than is to be seen to-day.

An American Street Railway Manager on Street Cars.—Mr. H M. Littell, the general manager of the Metropolitan Street Railway Company of New York, and ex-president of the American Street Railway Association, is in London on a holiday, and has been interviewed by a representative of a morning paper. In Mr. Littell's opinion our system of street car running is crude and primitive. He is astonished that in an old rich city like this we have no better facilities for travelling between the places of residence and the places of business. Why have we no tramcars on the Strand?

Continuing, Mr. Littell said:—"Of course, you will say that traffic is so congested there that the thing is not to be thought of. So said the merchants on Broadway. They bitterly opposed our scheme for a cable railroad there; said it would interfere with their business, and made other frivolous objections. The company carried their point—and their railroad. What was the result? The congested traffic was relieved to an amazing extent, and the facilities for business, instead of being curtailed, were increased. To-day I do not believe there is a single merchant who would not fight for the retention of the system, were any misguided person to attack it.

"Here you have a great many blockades—blocks, don't you call them? Three, four, and five 'buses are abreast, hansom cabs fill up the rest of the space, and the traffic is stopped for a quarter of a mile back.

"I do not know your tramway people here, but if they are of the same class as those in our country, they would be very ready to lay tracks if permission were given. You English say that there are hansoms everywhere, and that they cost next to nothing. My experience is that they cost a good deal. Your 'buses, also, I regard as very expensive. Some 'bus fares I find are 4*d*., 5*d*., or even 6*d*. In New York, by the use of transfer tickets, you can ride half a day for 5 cents. The charge is uniform—5 cents, whatever the distance. Does it pay? Of course it does. It educates a man to the conveniences of riding. He rides short distances as well as long. And he is not going to waste half a day on a car for the fun of the thing.

"Now in our cars," he continued, "you ride in comfort, and enjoy the view. What is the view from the inside of a London omnibus? Somebody's pills and somebody else's soap. In New York you hire advertising 'buses for the day. Here the American sees a 'bus rumbling towards him, and has not the remotest notion whether it's a 'bus for Piccadilly Circus or a 'bus for antibilious pills. The place for advertisements is the newspaper.

"The electric car would not be nearly so dangerous on your principal streets as your 'buses are. When the horses skid there is a pretty fair momentum on a 'bus. And coming to the worst, I would as soon be run over by a roadcar as a 'bus any day. In neither case should I take much interest in street traffic afterwards."

Om De maatte reflectere ovenstaaende Avertissement, behag da ta novne "The Automotor and Horseless Vehicle Journal."

DOINGS OF PUBLIC COMPANIES.

Mr. Pennington has succeeded in getting together some very good men for the directorate of the Motor and Cycle Company of Ireland. It comprises the Right Hon. Joseph Meade, the Right Hon. Thomas Dickson, Sir Howard Grubb, Mr. Malcolm Inglis, and Mr. Pennington, who are respectively the Chairman of the Hibernian Bank, the Chairman of the Boyne Weaving Company, the Vice-President of the Royal Dublin Society (a distinguished scientist and a practical mechanician), and, finally, the Vice-President of the Dublin Chamber of Commerce, who is also chairman of an important trading concern. It is stated in the prospectus that orders to the extent of over £130,000 have already been received. The capital of the Company is fixed at £250,000, in shares of £1 each, in preference and ordinary shares. A good feature is that the first £50,000 and one-half of further subscriptions until £100,000 shall be provided shall be applied to building, equipment, and working capital.

The Irish Motor and Cycle Company have now, we understand, acquired a suitable site in Dublin for their works. The meadow on the north side of the London Bridge Road, Sandymount, adjoining the Gas Company's Works, and bordered on the other hand by the Dodder River, is the site chosen, which comprises close on 30 acres, and the facilities for transport, both by land and water, are exceptional. The offices of the Company are in Leinster Street.

New Companies Registered.

[Under this heading we give a full list of new Companies registered which take power to make, deal, or become interested in any manner in automotor vehicles. We shall be pleased to reply with detailed particulars to inquiries through the "Answers to Correspondents" column. All communications should be addressed to the Editor. The only stipulation which we make is that where the inquiry involves a search of the records at Somerset House—as in the case of information on the subject of the holdings of shareholders—a postal order must be enclosed to cover the Government stamp of one shilling which is charged before a search is allowed to be made.]

	Capital. £
Atkinson Brothers (Limited), Sheffield	65,000
Beeston Cycle Components Co. (Limited)	100,000
Birmingham Motor-Cycle Co. (Limited)	125,000
Birmingham Motor-Omnibus Co. (Limited)	10,000
British Carbide Manufacturing Co. (Limited)....	100,000
Charles Coleman and Co. (Limited), 62, Goswell Road, E.C.	5,000
Cook's Sheffield Steel Cycle Co. (Limited)	15,000
Crossley Brothers (Limited), Manchester	973,700
Dover (Limited), Northampton	70,000
Electric Metal Working Syndicate (Limited), 61 and 62, Gracechurch Street, E.C.	40,000
Ensign Cycle Co. (Limited), 100, Bristol Street, Birmingham	2,000
G. B. Dunlop and Co. (Limited), Westgate Road, Newcastle-on-Tyne	10,000
Hawk Cycle Co. (Limited), 16, Fletcher Gate, Nottingham	5,000
Hopkinson Patent Brazeless Cycle Frame Syndicate (Limited), Broad Street House, E.C....	3,000
Intrepid Cycle and Engineering Co. (Limited), Vine Street, Stafford	5,000
"Jewel" Pneumatic Tyre Co. (Limited), Corporation Street, Birmingham	65,000
Leather Pneumatic Tyre Syndicate (Limited)....	7

	Capital. £
Maxim Cycle Co. (Limited)	2,000
Merton Cycle Co. (Limited), 32, High Street, Merton	2,000
New Aluminium Patents (Limited)	30,000
New Brotherton Tube Co. (Limited), Commercial Road, Wolverhampton....	65,000
New Reliance Tubes and Stampings Co. (Limited), Wednesfield	70,000
New Turner and Wadeley Cycle Co. (Limited)	35,000
Osmonds (Limited), Tower Works, Bagot Street, Birmingham	250,000
Paul's Animatographe (Limited), 44, Hatton Garden, London....	60,000
Progress Cycle Co. (Limited), Foleshill, Coventry	50,000
Regency Syndicate (Limited), 135, Regent Street, W.	1,000
Richard Garrett and Sons (Limited), Leiston, Suffolk	200,000
Smith Brothers, Hanley (Limited), Hanley	20,000
Smiths of Saltley (Limited), Saltley Mills, Birmingham	250,000
Universal Weldless Steel Tubes Co. (Ehrhardt's Process) (Limited)	175,000
Walter V. Scott and Co. (Limited)	5,000

"IVEL" BALL BEARINGS.

One of the best designs of a hub fitted for ball bearings that we have seen is that known as the "Ivel," manufactured by Mr. D. Albone, at his cycle works, Biggleswade. The great feature of Mr. Albone's design is its applicability to ordinary wood wheels, the balls being enclosed in a box which is easily fitted to ordinary wheels. So far as we can judge, this method of using ball bearings has been very successful, both in its application to ordinary private carriages and also to motor-cars. As will be seen from the accompanying woodcut, the iron box is tapered and fitted with a couple of feathers to keep it in place. It can be fitted to wheels of all ordinary sizes.

Petroleum as Fuel for Steam Boilers.—Those inventors who may be thinking of using petroleum for heating steam boilers may be glad of a few figures giving the result of an actual case. The petroleum was ordinary burning oil, its calorific value being 21,209 thermal units. It actually evaporated 12·93 lbs. of water per pound of oil, being at the rate of 15·218 lbs. from and at 212° Fahr. It will thus be seen that petroleum is not more than about 50 per cent. better than coal, instead of being, as is often stated, 2½ times better. It may often be a question whether the use of oil as fuel is really desirable, especially in those motor-cars used in districts where the supply is not regular, or difficult to obtain.

NEW INVENTIONS.

Claiming particularly to apply directly or indirectly to Motor Vehicles, &c.

Compiled for "The Automotor and Horseless Vehicle Journal" by Herbert Haddan and Co., Registered Patent Agents, of 18, Buckingham Street, Strand, W.C., London.

*** *At the request of a number of subscribers we are pleased to announce that for the future we have arranged to more thoroughly cover the field of completed Patents referring to the Motor-Car Industry, by reproducing the latest Specifications and Diagrams.*

Patents Applied For.

Abbreviations: Impts., Improvements in; Relg., Relating to.

1897.			
April 1.	8,365.	J. M. Hall.	Impts. steering, starting, and stopping mechanism.
„ 2.	8,466.	E. Taylor.	Motor-car, cycle, and other frames.
„ 2.	8,471.	P. Royer.	Cooling water and condensing steam in motor vehicles.
„ 2.	8,474.	J. B. Davis.	Fixing handle bars.
„ 3.	8,571.	A. Whittall.	Pneumatic tyres.
„ 3.	8,517.	J. Gardner.	Impts. cycles and motor-cars.
„ 3.	8,558.	C. Chapman.	Impts. driving mechanism.
„ 5.	8,613.	L. Wedgwood and W. Freakley.	Improved motor-car or steam carriage.
„ 6.	8,697.	L. Redmond.	Impts. cycles and motor-cars.
„ 6.	8,732.	J. M. Martin.	Guiding and stopping mechanism.
„ 6.	8,805.	J. C. Grant.	Impts. tubes for frames of cycles, &c.
„ 7.	8,819.	Thornton and Lea.	Applying power to motor-driven vehicles.
„ 8.	8,948.	W. Deakin.	Means for reducing vibration.
„ 8.	8,986.	C. Gouchon.	Impts. relg. motor-cars.
„ 8.	9,002.	J. P. Erie.	Impts. motor vehicles.
„ 9.	9,043.	R. A. T. Gregory.	Impts. convertible cycles, motor-cars, &c.
„ 9.	9,067.	H. E. Friese.	Impts. mechanically-propelled vehicles.
„ 9.	9,075.	E. B. Fenby.	Impts. mechanism for motor vehicles.
„ 9.	9,100.	J. S. and T. B. Smith.	Anti-friction bearings.
„ 9.	9,107.	E. Rossel.	Impts. automotor road vehicles.
„ 13.	9,385.	E. Taylor.	Impts. in driving chains.
„ 13.	9,428.	A. B. Blackburn.	Impts. steering gear.
„ 13.	9,463.	T. Klaus.	Impts. motor or self-propelled vehicles.
„ 14.	9,475.	E. R. Carroll.	Impts. driving gear for cycles, motor-cars, &c.
„ 15.	9,613.	Martineau and Phillips.	Impts. relg. autocars, &c., and motors for same.
„ 15.	9,646.	A. Lafargue.	Impts. motor-car engines.
„ 15.	9,667.	Ferranti and Atkinson.	Impts. driving chains or bands.
„ 15.	9,706.	Amiot and Peneau.	Impts. relg. horseless carriages.
„ 17.	9,722.	Roots and Venables.	Impts. oil motors.
„ 17.	9,739.	R. McLachlan.	Mechanism for transmitting power.
„ 17.	9,758.	F. L. Wilder.	Impts. steering apparatus.

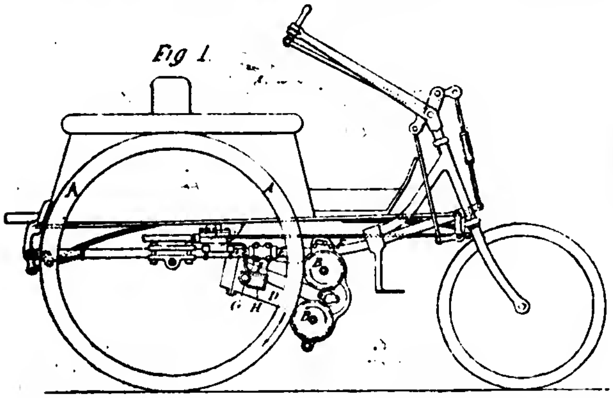
April	21.	9,963.	A. H. L. Grivel. Impts. internal combustion engines for motor vehicles, &c.
,,	21.	9,985.	R. W. Smith. Gear cases for cycles and motor-cars.
,,	22.	10,042.	F. W. Nayler. Impts. driving mechanism.
,,	22.	10,043.	F. W. Lanchester. Impts. power propelled vehicles.
,,	22.	10,069.	Coulthard and Michel. Impts. relg. driving mechanism.
,,	22.	10,080.	Symon and House. Impts. connected with driving gear.
,,	22.	10,081.	Symon and Michel. Impts. steam or heat engines.
,,	22.	10,124.	W. H. Bedlake. Speed indicator for motor-cars, &c.
,,	23.	10,152.	Mason and Goyne. Impts. relg. cycles and motor-cars.
,,	23.	10,177.	E. Phillips. Jointing tubular parts of frames.
,,	27.	10,522.	Hanssen and Brewster. Improved motor-car engine.
,,	28.	10,567.	L. Castiglione. Hand grip for motor-car, &c., handles.
,,	28.	10,581.	Perks and Perryman. Impts. driving chains.

Specifications Published.

5,009. Driving Gear for Road Motor-Carriages. Henry Percy Holt, 22, Chancery Lane, London. March 5th, 1896.

Relates to simple means of driving a road motor-carriage.

The driving wheel is made with a strong pneumatic tyre, A, against which are pressed suitably shaped rollers, B, which may be of wood or other material presenting a more or less frictional surface. The rollers, B, revolve, either directly or through suitable gear, from the motor; as shown, the rollers, B, are driven by gear from the intermediate motor-shaft at C, the motor-engine and gearing being all enclosed within a casing, D, the front of which is suspended by a sliding block, F, from one of the tubes, E, belonging to the framing of the carriage. The hinder part of the casing, D, has projecting from its side a stud, G, engaged in the eye of a plunger which works in a cylinder, H, carried by a bracket, I, clamped on the tube, E.



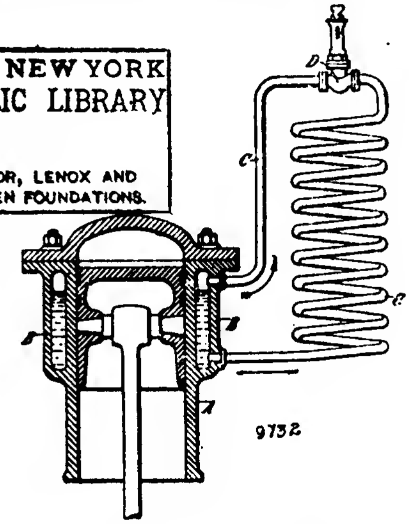
From a valve box, J, fluid under pressure can, when desired, be admitted to the cylinder, H, forcing its plunger with the stud, G, and the casing, D, backwards, thus pressing the rollers, B, against the tyre, A, so that they cause the road wheel to revolve. The two road wheels of a pair may be thus driven separately from two motors, one on each side of the carriage, or a single motor might obviously be arranged with suitable gearing to drive a pair of rollers such as B, B, on each side of the carriage, suitable means being provided for pressing them against the tyres, A, of the two road wheels.

When steam or compressed air is used as the working fluid of the motor-engine or engines, the same valve box, J, is conveniently used for the supply of the engine as well as for that of the pressure cylinder, H, and springs may be arranged to press the casing, D forwards, so that, when the supply to the engine is cut off by the valve in J, the rollers, B, are pressed by the springs out of contact with the tyre, A.

9,732. Explosion Motors. Count Albert de Dion and Georges Bouton, Puteaux (Seine), France. May 7th, 1896.

The invention has for its object to enable the cylinder and other water-jacketed parts of an explosion motor to be kept cool by means of a much smaller quantity of water than is generally required for this purpose.

A is the cylinder, and B is the water-jacket thereof, the upper portion of which may form a steam space. C is the condensing apparatus, which comprises a coil or a set of pipes in contact with



the atmosphere, the said pipes communicating at one end with the upper part or steam space of the jacket, and at the other end with the lower part or water space thereof. This coil extends above the level of the jacket, and is provided at its upper part with a safety-valve, D, of any suitable pattern, and, it may be, with a pressure gauge. When the valve, D, is shut, the coil and the jacket form a closed circuit extending from the upper part of said jacket to the lower part thereof.

By means of this arrangement the water becomes heated under pressure in the jacket when the motor is at work, and the steam produced is caused to condense in the said coil, and the water resulting from this condensation returns to the jacket, where it is again converted into steam.

The proper extent of cooling surface to be given to the coil, C, will depend on the difference between the temperature of the said steam and that of the air in contact with the coil. The greater this difference, the more rapidly will the exchange of heat take place, and, consequently, the smaller will be the surface required for condensation.

6,177. Mechanism for Driving Automotors, &c. Francis Herbert Wenham, The Beacon, near Woking, Surrey. March 19th, 1896.

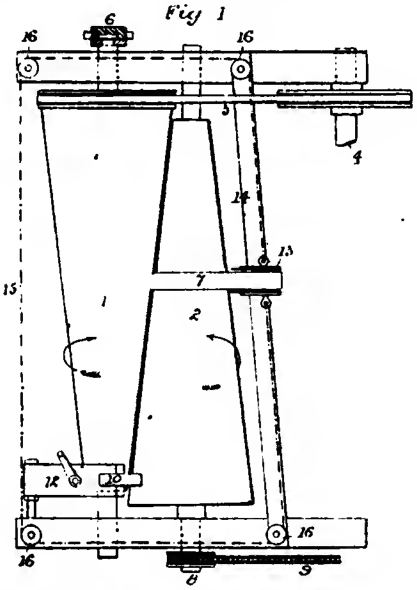
Two conical rollers, 1 and 2, are used, preferably of the same size and angle, rotating on axes, and with the large and small ends together. The first or driving cone, 1, is rotated by the engine, either directly or by a belt or chain, 3, from the main shaft, 4. Either the first or second cone is capable of being moved endways or to and fro in its bearings by a forked lever acting on the clutch like piece, 6, or by a screw or by other suitable means. Preferably surrounding the second cone, 2, is an endless or ring belt, 7, of leather, rubber, or other elastic or flexible material.

When one of the cones is forced forward by a parallel or endlong thrust from the clutch like piece, 6, it wedges the belt, 7, at any place at which it may at that time be between the two cones, 1 and 2, with any required grip causing the driven cone to rotate in a direction opposite to that of the driving cone. If the belt, 7, be gripped between the large end of the first or driving cone, 1, and the small end of the second cone, 2, the speed of the second cone is high, but if the belt, 7, be shifted towards the small end of the cone, 1, while the cones are rotating the speed is gradually reduced in accordance with the extent to which the said belt is shifted.

The motion of the second cone, 2, is conveyed to the running or road wheels, which may be done by securing to one projecting end or to both projecting ends of the said cone a pinion as shown at 8, over which passes an endless chain, 9, gearing with a wheel connected with the road wheel. When the first cone, 1, is drawn back the cones separate and the grip on the belt, 7, is released, and the rotation of the second cone, 2, ceases, and the carriage is stopped, although the motor and cone, 1, continue running.

For obtaining the reversal movement a spur wheel may be affixed to one end of each cone, and these may be geared together by dropping an intermediate or idle wheel between them, which causes the second cone to run the reverse way for obtaining the backward direction. Or preferably two rollers, 10, having frictional rubber tyres, are closed between the small end of the first or driving cone, 1, and the large end of the driven cone, 2, by a screw or lever arrangement, 12, applied when the cones are separated from the driving belt.

Fig 1



The belt, 7, is traversed along the cone, 2, for varying the speed by means of a forked shipper, 13, which slides on a guide bar, 14. The traverse may be effected by turning a screw of coarse pitch, but preferably as shown by a cord, 15, attached to the shipper, 13, running on pulleys, 16, any one of which may be turned by a handle convenient to the hand of the driver, thus carrying the shipper in one direction or the other to the position requisite for any required speed.

6,834. Horseless Carriages. Edmund Gascoine, Junior, College Road, Maidstone, Kent, and Charles Daniel Courtois, Chateau D'Ardon, Laon, France. March 28th, 1896.

This invention relates to improvements in horseless carriages of the kind in which petroleum or similar motors are employed for driving them, and has special reference to the means employed for cooling the water with which the working cylinder of the motor is jacketed.

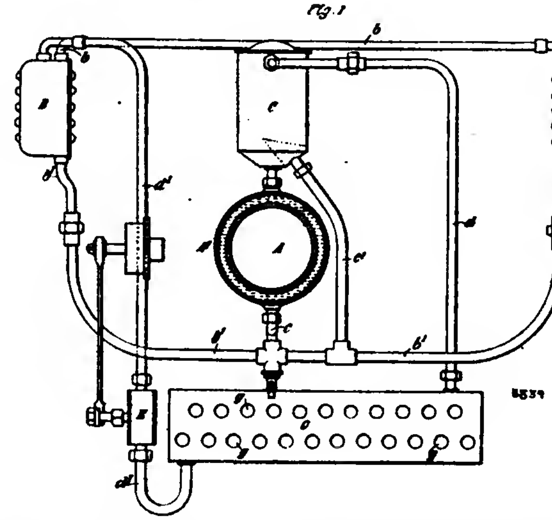
A is the working cylinder. B and B^1 are reservoirs for containing the cooling water. They communicate with each other at their upper parts by means of a horizontal pipe, *b*, and at their lower ends by means of a pipe, b^1, which passes underneath the working cylinder. A^1 is the jacket surrounding the working cylinder and communicating at its lower part with the pipe, b^1, by means of the pipe, *c*, and at the upper part with a chamber, C, situated above the level of the working cylinder. The chamber, C, also communicates directly with the lower part of the pipe, b^1, by means of an approximately vertical pipe, c^1, leading from the lower part of the said chamber.

G is the shallow box or chamber, preferably situated below the carriage near the front thereof. It is traversed by the horizontal tubes, *g*, which are open to the atmosphere at both ends, the said open ends being directed towards the front and rear of the carriage so that a current of air will readily flow through them when the carriage is in motion. The said box, G, communicates at one end with the upper part of the chamber, C, by means of the pipe *d*, and at the other end with the reservoir, B, by means of the pipe, d^1, leading from the lower part of the said box. E is a pump operated by the motor, and adapted to cause circulation of the water through the system.

The reservoirs, B and B^1, having been filled with water and the motor and pump set to work, the operation of the above system is as follows:—The water passes from the reservoir, B, through the pipe b^1 and the pipe *c* into the jacket, A^1. During its passage through the jacket, A^1, it is heated by the working cylinder, and the heated water, together with any steam that may be generated, pass together into the chamber, C, the water occupying the lower and the steam the upper portion thereof. The water will descend through the tube, c^1, into the pipe, b^1, and flow to the reservoir, B^1, whence it may pass again into the reservoir, B, through the pipe *b*.

The steam collected in the upper part of the chamber, C, is conducted through the pipe, *d*, to the box, G, wherein it is cooled and

Fig. 1



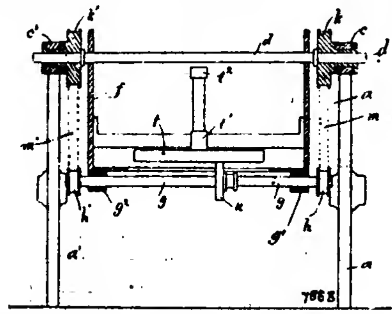
condensed, the water of condensation passing, by means of the circulating pump, through the pipe d^1, and being discharged into the reservoir, B, whence it descends through the pipe, b^1, and circulates again through the system.

By the circulation of the water and steam in the above manner and the passage of the air through the tubes, *g*, and over the outer surface of the box, G, a rapid exchange of caloric is ensured between the cooling water and the atmosphere.

7,668. Road Vehicles Propelled by Steam, Oil, Electric, or like Motor Mechanism. Frank Lister, Keighley, Yorkshire. April 11th, 1896.

The peripheries of the wheels, *a*, a^1, are prepared for the reception of friction driving wheels, *c*, c^1, which are mounted on a bearing shaft, *d*, in such positions as to enable the weight of the vehicle's body, *f*, to press their peripheries against those of the wheels, *a*, a^1, above referred to, so that the weight of said body (when loaded or otherwise) exercises a direct and beneficial influence over the driving power of the said wheels, *c*, c^1, while the wheel, *c*, on one side of the vehicle is driven entirely independently of the wheel, c^1, on the other side thereof.

The driving shaft, *g*, of the motor mechanism is arranged so that it may transmit its rotary motion to the friction driving wheels, *c*, c^1, through the medium of the pulleys, *h*, h^1 and *k*, k^1 (the former being secured to the shaft, *g*, while the latter is fixed to the wheels, *c*, c^1, respectively, and rotate freely upon—*i.e.*, without transmitting motion to—the shaft, *d*) through driving belts, *m*, m^1 (shown in broken lines), or in place of these belts, *m*, m^1, chains may be employed, or even, instead of either of these or the pulleys, *h*, h^1 and *k*, k^1, toothed gearing wheels may be used, the helt pulley, k, on one side of the vehicle being entirely independent of the pulley, k^1, on the other side, by which means the necessity of having the hearing axle, d, to rotate is entirely avolded, and by the levers and connecting rods or wire ropes being coupled so as to be operated by and whenever the steering mechanism is moved, the whole hody, f, may be raised on



one side or the other to carry with it its wheel, c or c^1, as the case may be, clear of its wheel, a or a^1, thus only one of such wheels, c or c^1, will be in effective operation, and so its wheel, a or a^1, will alone be moved; consequently the vehicle will be quickly and readily turned around or caused to travel at an acute angle.

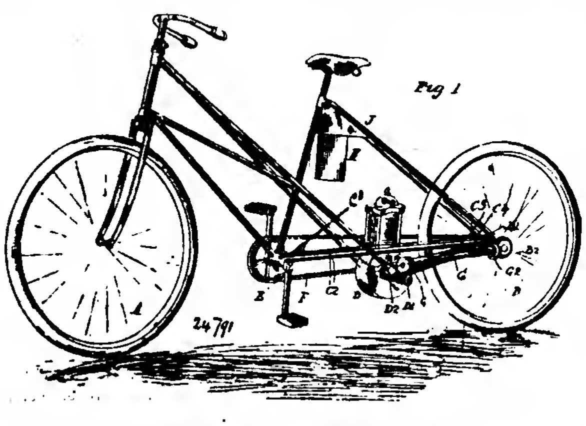
The driving wheel or disc, t, of the motor mechanism is arranged to rotate with its axis at right angles to the horizontal plane, while the shaft, g, to which its motion is transmitted through the friction pulley, u, extends horizoutally beneath it from one side of the vehicle to the other, by which means the said friction pulley, u, mounted on this shaft, g, and for contact with the disc, t, forms suhstantial support for relieving it of the friction that would otherwise be caused had said disc, t, to depend on its journal bearings, t^1, t^1, alone to counteract its weight or gravity.

Modifications are described and shown.

24,791. Motor Cycles. Henry John Lawson, of 40, Holborn Viaduct, London. November 5th, 1896.

Relates to motor cycles, its ohject being the construction of a motor hicycle with a high-speed motor.

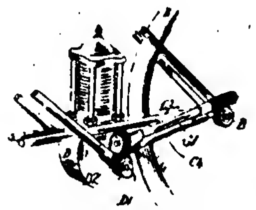
The leading and trailing-wheels, A and B, support a frame which has attached to it in rear of the bottom bracket, C^1, a motor, D, supported



by and between the two stays, C^2, and also by the stays C^3, C^4. D^1 is the main shaft of the motor, which is geared to the trailing-wheel, B, in the manner hereinafter described. E is the pedal shaft, geared hy a chain, F, to a chain-wheel, B^1, on the trailing-wheel, B, in order that when desired the power of the rider may be employed to aid the motor in propelling the cycle or to start the motor; an automatic clutch can form part of the gear between the pedal shaft, E, and the trailing-wheel, B, so that the latter may be allowed when driven by the motor to over-run the pedal shaft, but cannot conversely be over-run by it.

For the operative connection of the motor shaft, D^1, with the trailing-wheel, B, it is preferred to dispense with a chain and to employ worm or helical gearing. In the drawing the motor shaft, D^1, is provided with a worm, D^2, gearing into a worm-wheel, G, fixed on one end of an intermediate shaft, G^1, carried by the stay, C^4; the other end of this intermediate shaft has secured on it a bevel pinion, G^2, which operates the trailing-wheel, B, by acting on

Fig 2·



a bevel-wheel, B^2, fixed to the rear wheel huh. If desired, worm or helical gearing may be employed instead of the wheels, G^2, B^2, or helical gearing may be used in place of the worm, D^2, and worm-wheel, G.

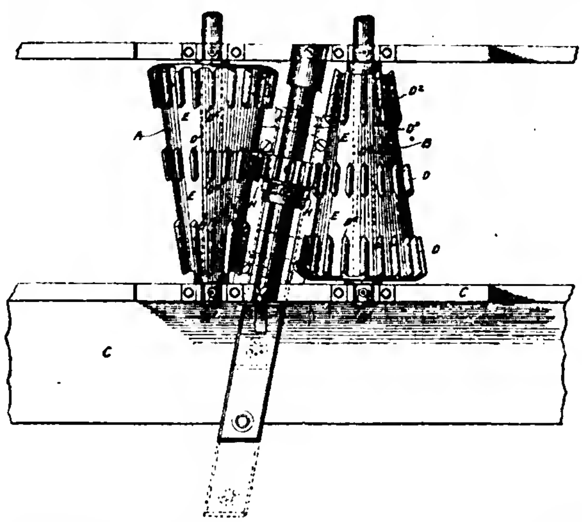
The battery, H, for the igniting spark and the carburetter, J, can be disposed upon any convenient part of the frame, the tubes heing arranged in any preferred manner.

12,360. Variable Gearing for Vehicles Driven by Motive Power. Frank Frederick Wellington, 100c, Queen Victoria Street, and Edwin Percival Allam, 14, Hatton Garden, London. June 5th, 1896.

This invention refers to improved means whereby the speed of motor-driven vehicles may be readily varied or regulated.

Two conical drums, A, B, are employed, one of which is the driver and the other the follower; these conical drums, A, B, are mounted on parallel shafts, A^1, B^1, carried in bearings on any suitable framework, C, and the drums are arranged so that the major diameter of one drum is opposite to the minor diameter of the other drum.

Upon these drums any number of series of teeth, D, D^1, D^2, are formed, at regular intervals apart, circumferentially around the drums, and these teeth extend lengthwise in the direction of the axes of the drums, A, B. Each tooth upon the drums is formed



with parallel sides, or nearly so, and with the ends of the teeth tapered or pointed as at D^x. The several series of teeth, D, D^1, D^2, around the drums are separated by spaces, as at E, E.

Between the two drums is a toothed pinion, G, so toothed as to be capable of engagement with either series of teeth on the drums, and free to revolve upon an axis parallel to the sides of the conical drums, A, B. Such pinion, G, is carried, say, upon a collar or sleeve, G^1, free to be slidden laterally by a forked slide, H, or by other convenient means. The width of the pinion, G, is less than the space or spaces, E, E, between the series of teeth, and, moreover, the ends of the pinion teeth are also tapered or pointed as are those upon the conical drums, A, B.

By thus constructing or forming the teeth upon the drums and upon the pinion, the latter can be slidden from engagement with one series of teeth and brought into engagement with another set, and the relative speed of one of the conical drums (such as the follower, B) thereby varied, the tapered end formation of the teeth permitting a smooth transference of the teeth of the pinion from one series of teeth to another upon the conical drums. The separation of the series of teeth, D, D^1, D^2, by the spaces, E, E, enables us to start or stop the motion of the follower, B, at any time by but a small motion of the pinion, G.

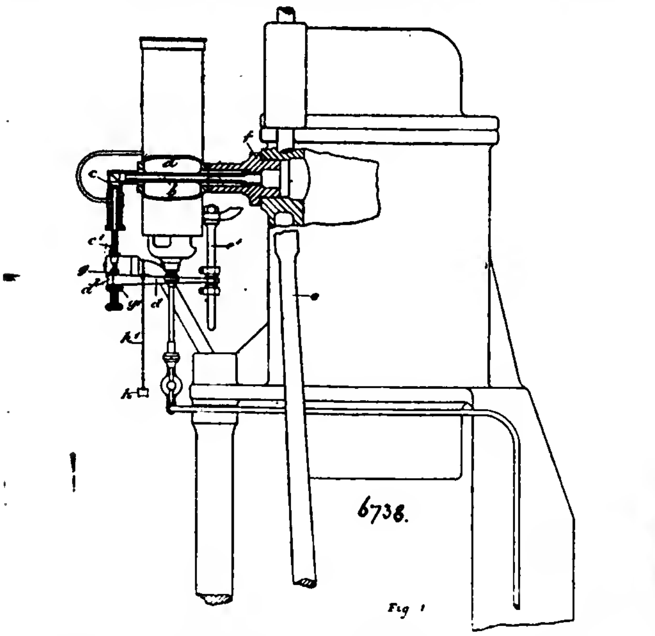
It is proposed in practice to provide an oil-containing bath or case for the gear to run in.

In such variable speed-gearing the tapered end formation of the teeth promotes a smooth and certain transference of the pinion from one set of teeth to another, while the teeth so formed present a sufficient length of bearing surface to render the construction applicable where the ability to withstand wear and tear is a consideration, as in motor-driven vehicles; while in this connection the spaces between the series of teeth, permitting of ready stopping and starting, is also of the utmost importance.

6,738. Igniting the Working Charge in Hydrocarburetted-air Engines. William Dent Priestman and Samuel Priestman, Holderness Foundry, and Harold Richardson, 51, Walmsley Street, Kingston-upon-Hull. March 27th, 1896.

This invention relates to motor-engines operated by the combustion of hydro-carbon vapour mixed with air; and consists in an improved method of and apparatus for igniting the working charge.

Across the chimney, *a*, of a heating lamp is arranged a tube, *b*, which is open at one end to the working cylinder and is provided at its opposite or outer end with an air admission valve, *c*. The movements of this valve are controlled by suitably timed mechanism,



regulated in such a manner that a small portion of the charge is allowed to escape while compression of the charge in the cylinder is taking place, or until the crank has arrived at or beyond the dead-centre. While the air-valve remains open, the charge is not ignited and pre-ignition is guarded against; but so soon as the valve closes, ignition and combustion ensue. The valves, *c*, are opened and closed by means of a lever, *d*, operated from a convenient moving part of the engine through the intervention of a connecting rod such as *e*, and arm, e^1. The open end of the tube, *b*, is inserted in a plug, *f*, which is screwed into the side of the cylinder; packing, consisting of layers of asbestos and iron, being employed to prevent the radiation of heat to the cylinder. In order to regulate the timing of the valve or valves, *c*, so as to render the ignition of the charge earlier or later, adjusting screws, *g*, are provided, and thumb-nuts, g^1, the former, *g*, of which screw through bosses, d^1, d^2, on the lever, *d*. By thus regulating the timing of the air-valve in starting, premature ignition of the charge and reversal of the engine are avoided. For the purpose of holding open the valve, *c*, of one of the igniters, in a double-cylinder engine, we provide a distance piece, or wedge; same being conveniently connected to the engine by means of a chain, h^1. At the time of starting the engine, this wedge is inserted between the lower extremity of the valve stem, c^1, of one of the air valves and the upper extremity of the adjusting screw, *g*, pertaining thereto; its function being to hold the valve open until the piston has effected a small portion of its stroke by reason of the compressed air which passes into the cylinder before the valve closes. The wedge becomes displaced almost immediately the piston moves, the valve closes and the charge is fired, whereby impulse is given to the piston.

11,491. Internal Combustion Engines. Major Henry Capel Lofft Holden, Royal Arsenal, Woolwich. May 27th, 1896.

This invention relates to improvements in the construction of internal combustion engines, the working piston or pistons of which are actuated by the explosion of a mixture of volatilised or gaseous hydro-carbons and air in suitable proportions.

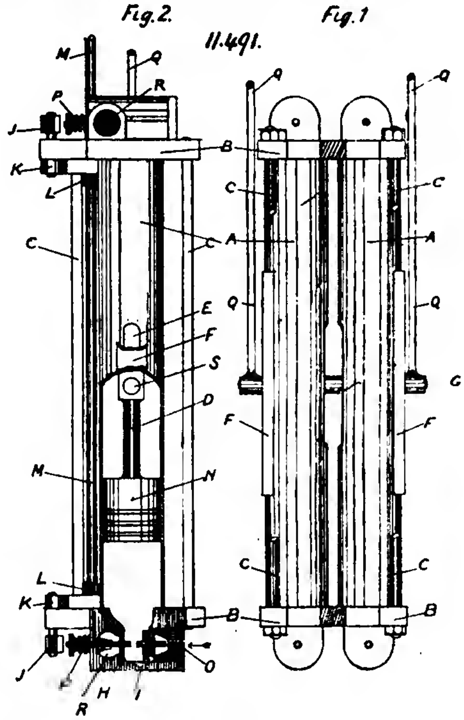


Fig. 1 is a plan of an engine.

Fig. 2 is a part elevation and part section of one of the cylinders.

The engine is constructed of two pieces of metal tube, A, A, preferably of steel.

Each end of the tubes, A, A, forms a working cylinder so that each tube comprises two working cylinders, and thus the two tubes, A, A, together comprise four working cylinders.

In each of the tubes, A, A, are two pistons, one at each end of each tube.

One of these pistons, N, is shown in the sectional view in Fig. 2.

The piston, N, is rigidly connected to another similar piston, similarly situated at the other end of the tube, by the piston rod, D, which rod has a hole, S, through the centre of its length at right angles to the axis; through this hole the crosshead bar, G, passes.

This crosshead bar, G, also passes through the piston rod connecting the two pistons in the other tube.

In order that the crosshead bar, G, may move backwards and forwards in the tubes, A, A, a slot, E, is cut in each side of each of the tubes, A, A, of the same width as the diameter of the crosshead bar, G.

To the outer ends of the crosshead bar, G, which ends project beyond the tubes, A, A, on either side, are attached by bearing sleeves the two connecting rods, Q, Q, which are attached to the crank or cranks of the main shaft of the engine in the usual manner and for the usual purpose of rotating it.

In order to exclude dust or foreign substances from the tubes, A, A, which form the working cylinders, segments of tube, F, may be arranged so as to cover the slots, E, E, and to work backwards and forwards with the crosshead bar, G, which passes through them.

The outer ends of the tubes, A, A, are closed by suitably shaped blocks of metal, B, B, in which are situated the inlet valves, I, and the exhaust valve, H.

The ends of the tubes, A, A, are bedded in the blocks, B, B, in such a manner as to obtain a suitable joint to withstand the pressure caused by the explosion and the aforesaid ends may be screwed or shrunk into recesses in the blocks, B, B, or may be, as shown in the figures, held in position by two or more tie rods, C, C, passing through holes in the blocks, B, B, and holding the whole system of tubes, A, A, and blocks, B, B, firmly together.

In Fig. 2 is seen a section through a part of the block, B, showing one of the four sets of exhaust and admission valves. The exhaust valve, H, is normally kept closed by the action of the spring, P, except at such times as the valve is forced downwards and off its seating by the pressure of the arm, J, which arm, J, is itself actuated in a manner to be hereinafter described.

By the opening of the valve, H, the waste gases after the explosion and working stroke are allowed to escape from the working cylinder into the passage, R, and thence to the external air.

The admission valve, I, is situated opposite the exhaust valve, H. It is held normally closed by the action of gravity or by means of a light spring as is the usual custom, or by the combined action of gravity and a spring.

The valve, I, is lifted by the partial vacuum produced by the movement of the piston, N, on its forward stroke and the vacuum so produced draws in the necessary explosive mixture from the source of supply through the passage, O, which is connected to the source of supply by means of pipes in the usual manner.

On the return of the piston, N, the valve, I, is closed and the explosive mixture compressed into the space in the tube, A, behind the piston, N, and between the piston, N, and the block, B. As the piston moves forward again the compressed mixture is fired by one or other of the well-known electrical or mechanical means in common use for this purpose, such as the electric spark, heated tube or wire.

The levers, J, J, are mounted on short shafts or arbors journalled in the blocks, B, B, and they carry also the pieces, K, K.

The pieces, K, K, embrace and are actuated by the cams or eccentrics, L, L, mounted on the shaft, M, in such a manner that when M is rotated the ends of the levers or arms, J, J, are raised and depressed, thereby actuating the exhaust valves, H, H.

The shaft, M, is journalled in the end blocks, B, B, and is carried beyond one of them in the direction of the crankshaft to which it is attached through the intermediary of gear wheels or equivalent devices in such a manner that its angular velocity is only one-half that of the crankshaft actuated by the connecting rods, Q, Q.

The rotation of the shaft, M, by the crankshaft of the engine at only one-half the angular velocity of the latter thus causes the exhaust valves, H, H, to be opened in the proper succession and at the right moment.

The engine works on the Otto or four cycle, which is well known, and since the four cylinders work in succession to one another then it follows that the crosshead bar, G, and through it the connecting rods, Q, Q, are continuously acted upon by a working stroke in either direction.

9,337. Valvular Arrangements for Petroleum and like Engines. Count Albert de Dion and Georges Bouton, Puteaux (Seine), France. May 2nd, 1896.

This invention relates to improvements in valve arrangements for petroleum and like engines, and has for its object to enable petroleum and other combustible to be withdrawn from a reservoir and fed into the engine cylinder in such a manner that both its quantity and its quality or composition remain uniform during the whole time that it is desired to keep the operation of the motor uniform without, however, employing any accessory parts or devices whose action is apt to prove unreliable.

The figure is a longitudinal section of a slide valve arrangement for charging the explosion chamber of a petroleum motor.

A is the slide valve and A^1 is the recess therein for carrying the successive charges of petroleum. B is the chest or casing in which the said valve works, and C is the valve rod or spindle which works in a stuffing box, D, in the ordinary manner, and has its inner end supported in a guide or socket, D^1.

Integrally with the valve casing are cast two cylindrical projections, E, F, each provided with an external screw thread. Through the projection, E, is formed a passage, E^1, communicating at one end with the petroleum reservoir (not shown in the drawing) and at the other end with a longitudinal groove, G, in the slide face of the valve casing, B.

The projection, F, is also provided with a passage, F^1, which forms at one end of the valve ports, and is enlarged at the other end, where it is provided with a valve seat, f, for a suction valve, $f^\times$, which is mounted on the rod, f^1, and held lightly up against its seat by means of a spring, f^2, acting against a collar, f^3, on the said rod. A cap or union, F^2, screwed on the projection, F, serves to keep the seat, f, in place, and is provided with a screw-threaded projection or nipple, F^3, having a passage, F^4, whereby communication is established between the suction valve, $f^\times$, and the explosion chamber of the motor.

Another screw-threaded projection is provided in which is a passage extending to the slide face, and forming a second admission port, $I^\times$, therein. This passage serves to admit the air necessary for the explosion, and communicates with an air inlet pipe traversing the explosion chamber, the supply of air for each explosion being thus heated during the interval between successive explosions.

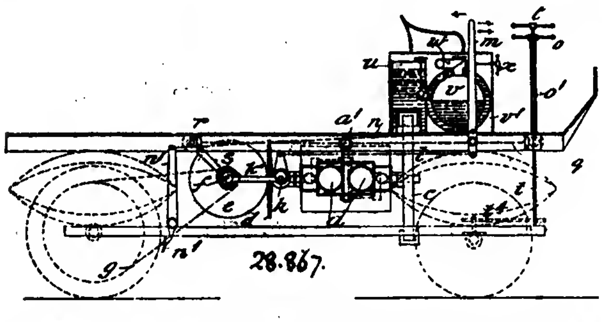
The passage, E^1, in the projection, E, is constantly in communication with the petroleum reservoir during the working of the engine, such communication being controlled by a suitable valve (not shown) at the will of the driver. By reason of the pressure within the reservoir, the petroleum passes through the passage, E^1, into the space around the valve, A, and also into the longitudinal groove, G.

28,867. Motor-van. Johann Geisenhof, Landsberg, Germany. December 16th, 1896.

The motor, a, is constructed as four-cylinder motor, and the cylinders are so arranged that each pair lies parallel to the other, and that both pairs stand opposite one another in such a manner that the four pistons operate upon a common crank shaft, which is provided on the front with a fly-wheel.

The transmission of force from the motor to the carriage wheels is effected through the disc, d, upon the shaft, and by the friction disc, e, touching it first, to the shaft, f, and from here, by means of chains and chain-wheels, g, to the carriage wheels. The disc, d, and friction disc, e, are so regulated and combined with the brake lever that the removing of the disc and the braking of the carriage wheels is effected by hand in one single operation. The disc, d, is movable, with its hub on the axle, and held from revolving thereon by a feather. In front of the disc, d, upon the non-rotating axle, h, lies a pressure-roller revolving thereon. This bipartite axle surrounds a hub of the disc, d, and is journalled at the ends by means of vertical carriers as well as horizontal arms, k, and serves for moving the disc, d, forwards and backwards. The rotation of the same by means of the shaft is therefore not disturbed by the axle, h, lying transversely to it. Its forward and backward movement is effected by means of the eccentrics surrounding the latter axle and the rod, l, connected thereto, which is fixed at the front to the brake lever, m. If the latter is pulled a little in the direction of the arrow, the rod, l, and the eccentrics are pulled or turned forwards, and the axle, h, with the rollers, is thereby pressed back so that it presses the disc, d, strongly on the friction disc, whereby the revolution is communicated to the same and thus to the wheels of the car; however, when the lever, *m*, is pressed forwards in the direction of the two arrows, the rod, *l*, and the eccentrics are moved back, and thereby the axle, *h*, is moved a little forwards, so that it pulls the disc, *d*, by means of the friction of its hub sleeve, from the friction disc and stops the transmission. This movement of the disc, *d*, is extremely small, and is sufficient to effect communication or interruption between *b* and *f*. On the brake-lever, *m*, above its turning point is fixed also the brake-rod, *n*, for the carriage brake, n^1, which thus, on the displacement of the lever, receives a movement which is opposite to that of the rod, *l*, and which while pressing disc, *d*, on roller, *e*, pulls the brake back, but on withdrawing the disc, *d*, from roller, *e*, it presses the brake on the carriage wheels. It is thns possiblo to give any degree of brake pressure and also to suddenly stop the carriage. One can, however, also change at pleasure the velocity of the motion, and this is effected by turning the wheel, o, correspondingly. The latter is fixed upon the tube, o^1, which at the underpart engages, by a bevelled gearing, with a shaft. From the latter, the motion is transferred to the shaft, *q*, and from the latter to the screw spindle, *r*. On the latter engages the arm, *s*, which forks the hub of the friction-roller, *e*, without hindering it in its rotation.

In the seat case lies the cooling water receiver, *u*, which at the under part is recessed semi-circularly, and under which is placed the fly-wheel, *c*, of the shaft, *b*, provided with paddles, so that the water is continuously cooled, and renewing on account of evaporisation is



not necessary for a long time. Next to this receiver is the receptacle, *v*, for benzine, petroleum, or the like materials developing explosive gases. It is surrounded with a jacket, v^1, and between the latter and reservoir, *u*, is a communication, so that the benzine receiver is surrounded by water from the cooler for the motor. This offers the advantage that the benzine or the like is previously warmed by the water always considerably warmed by continual cooling of the motor, and hereby a better and securer evaporisation is effected.

From the receiver, *v*, the tube, *w*, provided with a valve, leads to the motor, and by means of the handle, *x*, the valve can be regulated from outside at pleasure. The tube connection with the motor, the lighting which takes place in the chambers, *z*, and all the other organs necessary for a motor, which are already generally sufficiently known in the construction of motors, are not indicated in the drawing, and it may only be mentioned that in consequence of the above-described arrangements in this carriage, when the stoppage is only a short one, one can after having separated discs, *d* and *e*, let the motor continue to run free, or one can put it out of operation for completely stopping the working by closing the valve, *w*.

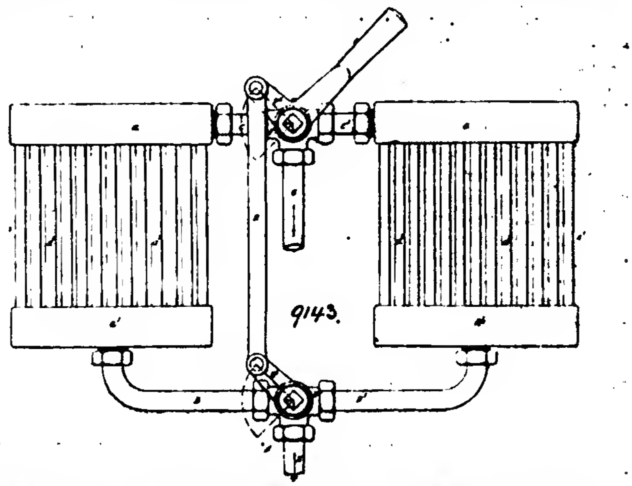
9,143. Motor-driven Vehicles. John Bradley Carse, 64 and 66, Wabash Avenue, Chicago, Illinois, United States of America. April 30th, 1896.

This invention relates to road vehicles driven by gas or oil or like internal combustion engines which require the working cylinder to be kept cool by water circulating in a jacket.

The drawing shows two reservoirs with their communication pipes constructed in accordance with this invention.

A, A^1, are the two reservoirs, B, B^1, are the outlet pipes leading therefrom, and C, C^1, are the inlet pipes. The pipes, B, B^1, are coupled by a three-way cock, D, to which is connected the pipe, E, leading to the cylinder jacket, and the pipes, C, C^1, are similarly coupled by a three-way cock, F, to which is connected the pipe, G, leading from the cylinder jacket. The plugs of the cocks, D, F, are furnished with short arms, D^1, F^1, which are connected together by a link, H, so that the cocks are opened and closed in unison. J is the handle for operating the cocks. Each of the reservoirs, A, A^1, may be conveniently made of upper and lower boxes, *a*, a^1, connected together by tubes, a^2, so as to expose a large surface to the cooling action of the atmosphere. The water entering the top box, *a*, passes down through the tubes, a^2, into the lower box, a^1, and in its passage is rapidly cooled.

The action is as follows:—By turning the handle, J, the reservoir, A, for example, may be placed in communication with the cylinder jacket, and the communication between the reservoir, A^1, and the cylinder jacket cut off, so that only the water in the reservoir, A, will be available for cooling purposes. When this water becomes unduly



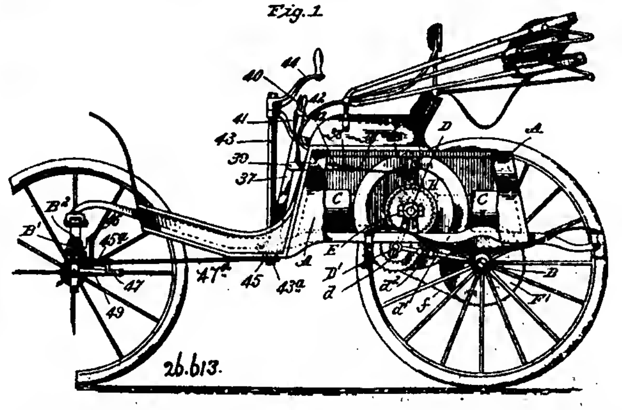
heated, the handle, J, is turned so as to reverse the connections, thereby placing the reservoir, A^1, in communication with the jacket, while communication between the reservoir, A, and the jacket is shut off. The water in the reservoir, A, is then cooled by the contact of the atmosphere with the tubes, a^2, so as to be ready for further use by the time the water in the reservoir, A^1, becomes too hot. The reservoirs are thus used alternately. If there are more than two reservoirs, they are used in turn.

26,615. Motor Vehicles. James Frank Duryea, 70, Montrose Street, Springfield, Massachusetts, United States of America. November 24th, 1896.

This invention relates to motor vehicles, and has for its object improvements in the driving mechanism.

The body, A, is supported on suitable springs on the axles, B and B^1. B is the driving axle, and B^1 the forward axle of the carriage.

Fig. 1



On each end of the forward axle is hinged, on a vertical bolt, a short stud for the reception of the hub of the wheel of said vehicle; said stud has a swinging movement in a horizontal plane, which movement is imparted thereto as follows:—

A short horizontal arm, 49, projects rearwardly from the said stud, which arm is by a rod connected to the forked lever, 47, which is secured to a sprocket-wheel, 45^a; said sprocket-wheel is rotatably supported on a yoke, 46, which is clamped to the forward axle, B^1.

A sprocket-chain, 47^a, engages said wheel, 45^a, and a similar sprocket-wheel, 45, on the lower end of the steering-post, 43^a, within the tubular support, 43. The upper end of said steering-post is provided with a crank-arm, 44, whereby it is rotated, and through the connections above described the forward wheels of the vehicle are turned on their pivots.

Suitably supported on the frame of the carriage, and at right angles to the axles thereof, is a suitable motor; said motor is preferably a gasolene motor, though any suitable motor may be used.

In the drawing said motor is represented by C, and shows two oppositely located cylinders connected directly to a crank on the end of the driving-shaft, D (see Fig. 1), which shaft is supported on suitable bearings, E, on the frame of the carriage, and is parallel with the driving-axle, B, thereof.

A counter-shaft, D^1, parallel with shaft D, is supported in bearings at the extremities of the arms, d, which arms depend from the main shaft, D, and have a swinging motion thereon.

A rod, d^1, having a loose connection with each end of the counter-shaft and the rear axle, is made in two parts, said two parts being united by a suitably threaded nut, d^2, by which the distance between said counter-shaft and said driving axle is regulated.

On one end of said counter-shaft a sprocket-wheel is secured, and on said driving axle another sprocket-wheel, F^1, is secured, a sprocket-chain, f, engaging both of said wheels.

The tension of said chain, f, is regulated by means of said nut, d^2, on the rods, d^1.

By means of suitable connections (described in the specification) between the driving-shaft, D, and its counter-shaft, D^1, varying speeds are imparted to said counter-shaft, and through said sprocket-wheels and chain to the driving axle, B.

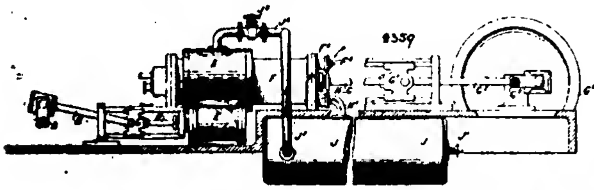
The means by which the said elbow-levers of the various clutch mechanisms are operated to drive the carriage forward or backward consist of a series of cams rotatably secured to the bar, L, on opposite sides thereof, one of said cams being provided for operation on the end of each of the said elbow-levers.

Each of said cams is provided with a spirally grooved hub, around which a chain, 34, is passed, which hubs are all in a line on one side of the bar, L, and said chain being supported on sheaves located on said bar, L, and on sheaves located on the frame of the carriage, whereby said chain is disposed in a horizontal quadrilateral form. The said chain, 34, is made endless, and has secured to any convenient part thereof a lever, 38, which by its opposite end has a pivotal engagement with the operating lever, 37, whereby, by the reciprocating movements of said operating lever, movement may be imparted to the said chain, 34, by which movement the cams may be rotated in either direction, because of the engagement of said chain, 34, with the spirally grooved hubs of said cams.

8,359. Motor-Power Apparatus for Propelling Vehicles and Boats. John Malcolm MacDonald, 2, Victoria Mansions, Westminster, London. April 21st, 1896.

A is the main driving shaft from which motion is transmitted to, say, the wheels of a vehicle, this shaft, A, forms the crank shaft of the compressed-air engines of which B B are the connecting rods, C C the crossheads, D D the piston rods, and E E the cylinders. Located

Fig. 1.



above the cylinders, E, E, is arranged the cylinder, F, of an explosive engine such as an oil-engine. The minor details of this engine are not specially illustrated as these do not differ from such engines as are ordinarily constructed and the cycle of operations are as is usual on the Otto engine. The piston rod, G, passes out of this cylinder through a packed gland, F^1, at the forward end of the cylinder which is provided with a cover, F 2, while the usual cycle of operations such as the indrawing of the explosive vapour, the compression, ignition, &c., take place at the rear of the piston. In its rearward motion the piston draws in atmospheric air into the forward end of the cylinder by means of an air inlet valve, F 3, on the cover, F 2, and the next forward motion of the piston forces the air therefrom by an outlet valve, H, and pipe, H^1, into a reservoir, J, which should be fitted with a suitable safety valve, such as J^1. From the reservoir, J, the air is conducted by a pipe, such as J 2, to a jacketted chamber, K, surrounding the cylinder, F, of the explosive engine, the pipe, J 2, being fitted with a stop-cock, J 3, and reducing or other valves as required (not shown in the drawing) are fitted in the air-conducting pipes if required or found necessary.

The piston rod, G, of the explosive engine is connected to a cross-head, G^1, having a connecting rod, G 2, operating a crank shaft, G 3, on which is or are mounted a fly wheel or wheels, G 4.

From the jacketted chamber, K, the compressed air is conducted to a valve chest of compressed-air engine cylinders, E, the valves of which are operated by eccentrics mounted upon the crank shaft, A. The motion of the crank or driving shaft, A, is communicated to the wheels of a vehicle or to the propeller or paddle shaft of a boat, in any usual or convenient manner.

The jacketted chamber, K, is preferably somewhat narrowed internally towards that part where the air passes out to the valve chest by plates for the purpose of bringing the air into more intimate contact with the walls of the hot cylinder, F.

5,682. Rotary Motors. William Phillips Thompson, 6, Lord Street, Liverpool; Wilhelm Eduard Marx, Halle, Germany. March 3rd, 1897.

A fixed flat disc, a, mounted on a suitable base, is provided with concentric rings, b and c, and with a concentric core, d. In the concentric interstices, e and f, thus formed there engage two concentric rings, g and h, of a revoluble flat disc, k, which is mounted eccen-

Fig. 1.

trically to the flat disc, a, and fixed on a motor shaft, i. This disc, k, is so eccentrically mounted relative to the flat disc, a, that the concentric rings, g and h, come in contact in one direction with the inner or outer surface of the concentric rings, b and c, and core, d, of the flat disc, a. In this manner there are formed between the rings crescent-shaped working chambers, e, e^1, f, f^1. Plates, m, are arranged radially movable side by side in the rings, g and h, the length of which plates is equal to the width of the concentric interstices situated between the rings, b and c, and the core, d. These plates which are movable in the rings have for their object to divide the crescent-shaped working chamber into two parts—one for the expansion, and the other for the discharge. The plates, m, act thus in the manner of a piston. As the rings of the two flat discs stand eccentrically to one another, the various working chambers alternate, and there is simultaneously an always varying endwise reciprocation of the two plates.

The mode of working is as follows :—

The high-pressure steam is conveyed in the direction of the arrow by means of a feed-pipe, y. It passes through the inflow passages into the working chamber, f, presses against the plates, m, and causes a rotation of the flat disc, k, and shaft, i, in the direction of the arrow, p. When the affected plates, m, come behind the discharge passage, 4, the expanded steam passes through the passages, 4 and 6, into the working chamber, f^1, where it acts in a similar manner. In the meantime, however, fresh steam flows into the working chamber, f. The further expanded steam in the working chamber, f^1, passes through passages, 7, 8, 9, into the working chamber, e, acts there by means of its expansion, passes through passages, 10, 11, and 12, into the working chamber, e^1, and after it has been expanded almost to atmospheric pressure escapes through a passage, x. The motor revolves, therefore, in the direction in which the steam enters. The motion of the motor is a constant and even one. The expanded steam engages on an always increasing radius, so that an equal pressure takes place on all parts.

6,067. Gas and Oil Engines or Motors, and Carriages Propelled Thereby. Frank Herbert Briggs, of 6, Park Crescent, Torquay, Devon. March 18th, 1896.

This invention has for its object improvements on the invention set forth in Application No. 16,079 of 1895.

Fig. 1 is a sectional view of the engine through the cylinders, and a sectional view at right angles to the above through the vaporising part, which is shown broken off from the other portion at the bottom.

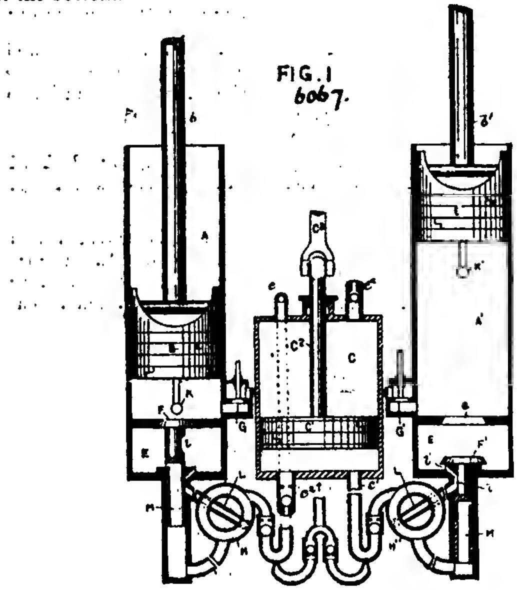


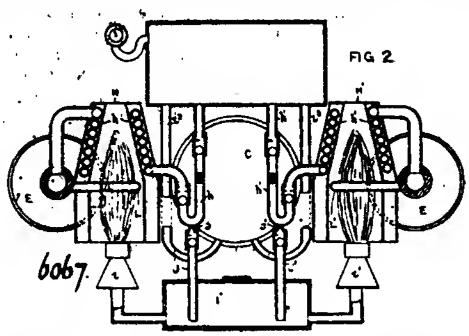
Fig. 2, a vertical section through the vaporiser and parts connected therewith.

Fig. 3, an elevation of the valve actuating gear and other parts showing one form of mechanism.

Fig. 5, a plan of the engine as applied to a road carriage.

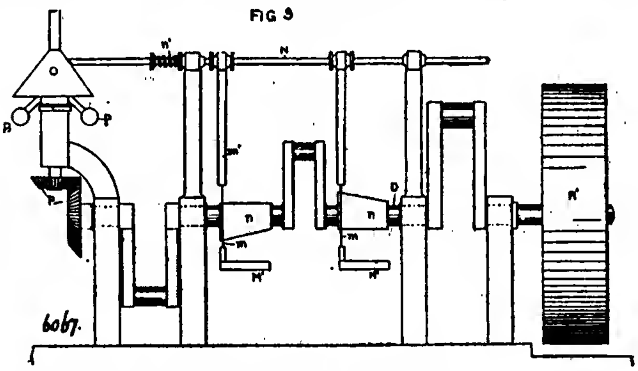
Fig. 11, a modification of the governor and valve actuating cams when these are placed on a counter shaft instead of the main shaft.

Fig. 13, sectional elevation of guiding handle and accompanying parts.



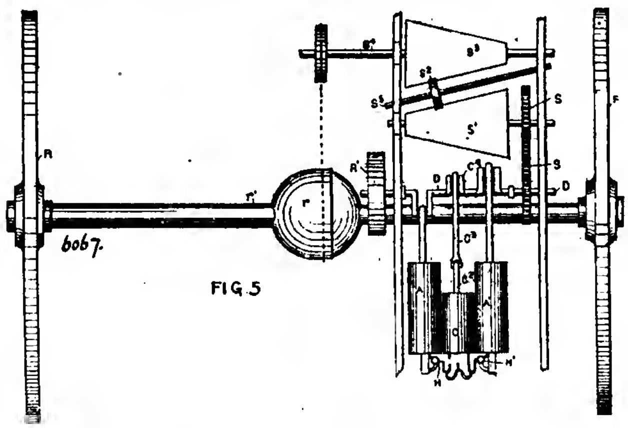
Referring first to Figs. 1, 2, 3, and 5, A, A¹, are two working cylinders, B and B¹ pistons of same with piston rods, *b*, *b*¹, pivotally connected to them as shown. C is a third cylinder enclosing a piston, C¹, and forming the pump. This is connected by a piston rod, C², and connecting rod, C³, with the central crank, C⁴, of crank shaft, D, Fig. 3. This cylinder, C, as shown in Fig. 1, hereinafter described, can be made single acting or double acting. It is used for supplying air and compressing the charge. E and E¹ are chambers immediately below or behind the cylinders, A, A¹, in which the ignition and explosion of the charge takes place. These communicate with the working cylinders, A and A¹, by means of orifices capable of being closed by the mushroom valves, F, F¹. G, G¹, are the exhaust valves, H and H¹ are annular conical vaporising chambers, Figs. 1 and 2, in which the oil and air circulate through tubes, *h* and *h*¹, the air being forced into tank, I, through pipe, *i*², by the pump, C, and under some circumstances hereafter set forth it is supplied by tank, I.

The tubes, *i*³, communicate with the opposite ends of the pump, C, so that compressed air is being forced through one of them all the time. In Fig. 1 the tank, I, is omitted, and the pipes, *i*², are broken away. The pipe, *i*², which supplies air and oil to the left-hand vaporiser, H, communicates with the outlet, *c*, of cylinder, C, while



the other pipe, *i*², which supplies air and oil to the vaporiser, H¹, communicates with outlet, *c*¹, at the opposite end of the cylinder, C. The cylinder, C, is provided with a valved air inlet, *c*², at each end.

The chambers, H, H¹, are heated by the flames of lamps, *i* and *i*¹, fed from tank, I¹, with oil. Oil from tank, I¹, passes through pipes, J and J¹, to the little nozzles, *j* and *j*¹, in bends in pipes, *h*, *h*¹, the air from pump, C, passing through the pipes, *h*, inducing the oil to issue in a spray form from nozzles, *j*, *j*¹, to be mixed with the air and carried to the vaporising chamber, H or H¹, where it is vaporised, and from thence it enters the bottom of chamber, E or E¹, as the case may be. Ball or other valves prevent action in a contrary direction, as shown in the drawings. K and K¹ are projecting pins or tappets on the pistons, B, B¹. L and L¹ are



ignition tubes projecting into the flame of lamps *i* and *i*¹, and communicating with the ignition chambers, E, E¹, respectively through ducts, *e*.

The mode of action of the parts is as follows:—

Assuming that the working piston, B¹, has just reached the end of its forward stroke, the exhaust valve, G¹, opens and allows the exhaust gases to escape. The pressure of the air from the pump, C, entering the tubular extension of the ignition chamber, E¹, at once forces the valve, F¹, on to its seat, *e*; the gas still exhausting, the piston, B¹, continues its inward or return stroke until it comes near the end. In the meantime the chamber, E¹, has been filled by the compressed air and gas vapour from the vaporising chamber, H¹, and has been shut off from cylinder A¹, by the valve, F¹. The tappet, K¹, now strikes the valve, F¹, and pushes it down to the position shown in the right-hand side of the drawing in cylinder A¹, and at the same moment connection is made with the ignition tube, L¹, by means of the notch or port, l, in the stem of valve, F^1, connecting the ignition chamber, E^1, with the small ignition duct, l^1. (The notch, l, is shown plainly in the left-hand side of Fig. 1 where the valve, F, is shown closing the chamber, E^1, from the ignition tube, L.) Ignition being caused, and at the same time or just previously to it the exhaust valve, G^1, being closed, an explosion takes place, and the piston, B^1, is caused to perform its working stroke, during which the operation above described will be repeated in connection with the other working cylinder, A, namely, the driving out of the residual products of the previous combustion, and the forming of a charge ready for firing when the piston reaches the end of its instroke. It

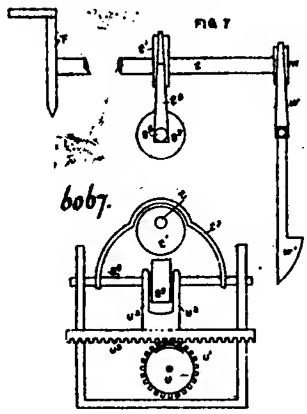
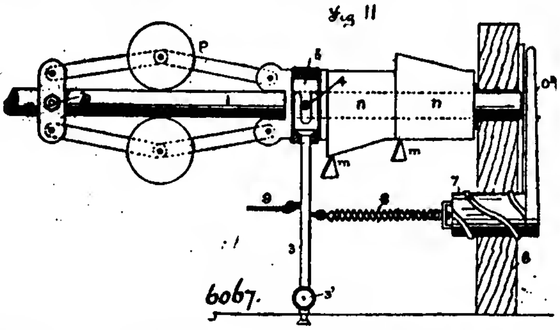


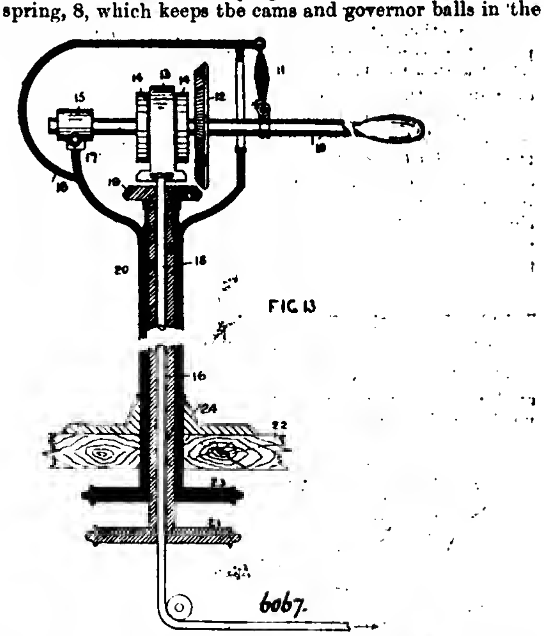
FIG. 9.

will thus be seen that as the pistons work alternately, there is always a compressed charge stored up ready for firing, and thus the engine can be automatically started without having to rotate the shaft by hand as in other arrangements. By the above arrangement two explosions are obtained at every revolution. When either of the pistons, B or B^1, alternately reach the end of their respective cylinders after performing their working stroke, the exhaust valves are again open, the valves, F or F^1, are closed on their seats by the pressure of the air from the pump, and the air enters freely through the hollow part, M, of the stem of the valves, F or F^1. The various valves set forth in the drawings in pipes, h, &c., allow the air and gas to go forward, but prevent their return. The firing device may, instead of the heated tube, L, already described, be any other



suitable device, such as the ordinary electric sparking apparatus. In some instances I may do without a vaporiser altogether, spraying the oil direct into the explosion chamber. The exhaust valves, G and G^1, are operated by the cam motion set forth in Fig. 3. In this M^1 is the valve lever; m, a knife edge or thin part of the connecting rod connecting the valve rod, m^1, with shaft, N; n, n are conical or partially graduated cams on the main shaft, D. By pressing the shaft, N, longitudinally in its bearings, the connecting rods, m^1, and knife edges, m, are brought on to a smaller portion of the cams, until when they get to their smallest diameter, there is no motion in the knife edges, consequently the valve is not actuated. Instead of the shaft, N, moving longitudinally, the connecting rods, m^1, or the cams, n, n, can be made to shift on the shaft; n^1 is a spring for bringing the shaft, N, back to normal position. For the purpose of stopping or starting the motor, a handle may be coupled to the shaft, N, or the cams, n, n, so that by pulling this handle and sliding the shaft, N, or cams, n, n, longitudinally, the knife edges, m, are brought to the smaller portion of the cone cams, n, thus stopping the engine. The shaft, N, is (or sliding cams or their equivalent are) linked to the governor and has any suitable device, such as slotted bearings for the connecting pin to allow for the small angular motion of the bell crank, a spring puts a resistance on the governor, and by regulating this resistance, any required resistance can be obtained, and thus the governor regulated to any required speed.

1, Fig. 11, is the counter shaft, which is revolved by a bevelled gear-wheel at its left-hand end gearing to another bevelled gear-wheel fixed on the axle. Its position is parallel to the cylinders, and at right angles with the main crank. Fixed to this shaft is a ball governor, P, by a set screw, p, the right-hand end of which is attached to two conical cams, n, n, these two cams, along with the right-hand end of the governor, are capable of being slid horizontally along the shaft, 1, but are prevented from revolving round the shaft, 1, by a key and keyway. 3 is a forked rod hinged at 3^1 to the base plate and its forks fitting round two studs, 4, which project from a loose collar, 5, which fits in a groove in the right-hand end of the governor, P. 6 is a standard from the base plate, with bearings for shaft 1, through the lower part of 6 is a hole tapped with a thread into which is screwed plug, 7, between this and lever, 8, is a strong spring, 8, which keeps the cams and governor balls in the



position shown in drawing, the end section of cam rods are shown at m and m, the valve connected with the left-hand cam being open, and that connected with the right-hand cam being closed. 0^3 is a pointer attached to the plug, 7, passing over a dial on which the number of miles or revolutions per hour is marked. The action of the governors on the cams is as follows:—The pointer, 0^3, being set at a given figure on the dial and clamped with any convenient locking device if desired, causes a given amount of tension to be put upon the spring, 8, and the forked arm, 3, so that the cams are held in the position shown until the speed of the engine revolving the governor balls increases to such an amount that the centrifugal force overcomes the spring, 8, and draws the cams, n, n, towards the left, thus regulating the opening at the valves, and in that way the speed of the engine. Should the speed of the engine be so great as to draw the narrow end of the cam on to the knife-edged valve rods, m, m, then the valves would not be open at all, and the engine would come to a stop. 9 is a swivel and rod connected with the steering gear, and is used when the steering handle falls to stop the engine instead of rising.

The steering, stopping, starting, and speed regulating gear is shown in Fig. 13. On the handle, 10, is first a spiral spring, 11, second a bevelled gear-wheel, 12, a loose collar, 13, running between two guide flanges, 14, and a bearing, 15, which is swivelled to the outer case, 16, by a bolt, 17, this is to allow of an up and down motion of the handle, 10. To the loose collar, 13, is swivelled a rod or wire rope, 18. 19 is a bevelled gear-wheel which is attached to a tube, 20, at the lower end of this tube is a sprocket-wheel, 21. The outer case, 16, descends beneath the carriage floor, 22, and ends in sprocket wheel, 23, it is kept in place and made to revolve in bearings, 24, which is screwed to floor, 22, of carriage.

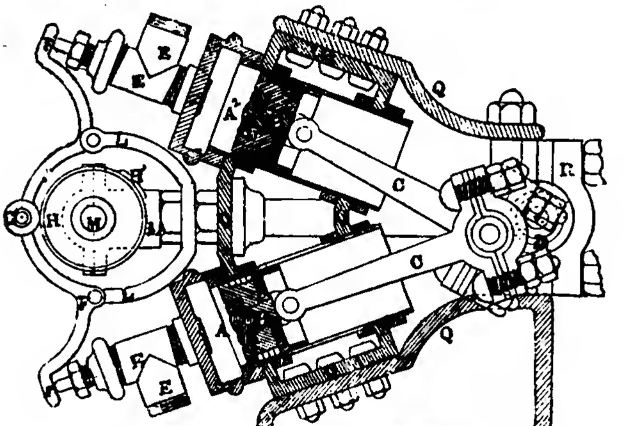
Referring to Fig. 5, R, R, are the carriage wheels, r, the differential gearing whereby each wheel is able to go at a different speed from the other, R^1, fly-wheel, S, S, gearing for driving cone, S^1, from the shaft, D. A friction-roller, S^2, drives the cone, S^3, by friction from S^1. The axis of the friction-roller, S^2, revolves in the adjustable bearings, and the said roller is pressed down against the surface of the cones, S^1 and S^3, by a spring. Shaft, S^4, is connected with the axle, r^1, of the vehicle by any suitable gearing, such as sprocket wheel and chain, as shown in drawing.

Referring now to Figs. 7 and 9, T is an end crank on shaft, t, t^1, is an eccentric on this shaft. By turning this shaft, therefore, the yoke, t^2, is raised. This yoke carries in bearings the shaft, S^5, on which the friction-roller, S^2, of Fig. 5, runs. By turning this crank, T, round therefore, the roller, S^2, can be raised out of gear with cones, S^3 and S^1, and thus the engine cut off from the driving-wheels, R, of the carriage. In order to increase or lessen the speed, the friction-roller, S^2, is drawn towards one or other end of the cones, S^3 and S^1. This is effected by a hand-wheel, not shown, on shaft, U, driving the gear-wheel, U^1, and rack, U^2. Projections, U^3, on this rack push the pulley, S^2, longitudinally on shaft, S^5.

The method of supporting the autocar on the engine, so as to prevent uncomfortable vibration, consists of two springs on each wheel with a bar between. On this bar the engine is supported, and on a spring the carriage body itself is suspended either directly or by a C-spring. The result of this arrangement is that the spring being interposed between the engine and the road, the shocks caused by the irregularities of the road are taken off the engine to a further considerable extent, and a spring being also interposed between the road and the carriage and also between the engine and the carriage, the shocks of the road are further deadened by this spring, and the vibration of the engine is also cut off to a considerable extent from the carriage occupants.

7,609. Explosion-Motor. Alphonse Edouard Tavernier, 23, Plato Road, Brixton, London, S.W. April 10th, 1896.

The object is to produce a gas or petroleum-engine, working by explosions in the best possible conditions, and to obtain in such machines the possibility of regulating at will the speed of rotation.



7609.

FIG. 1

The four cylinders, two of which, A, A^2, are shown, are fixed in a special box of sheet iron, Q.

In every cylinder is a piston, B. This piston is composed of three parts. One part receives the special segment of this piston, another keeps the said segment in place. The third part is the segment itself. This segment is composed of a steel wire of a square section, which is rolled so as to form a spiral spring. The three pieces are kept in place by a bolt and a nut.

Every piston has a connecting rod, C, the connecting rods of two opposite pistons acting on the same baring of one of the cranks of the crank shaft. To each cylinder is fixed two valve-boxes, E, E, one has for object the alimentation of the detonating mixture in the cylinder, the other valve-box is on the contrary for letting out the foul gases produced by the combustion of the detonating mixture in the same cylinder. The valves in the valve-boxes are worked by the levers, F. Each lever, F, has a friction roller, G, this roller turning on the drum, H. The drum, H, turns with the machine at a speed of the half of the speed of the crank shaft. On this drum, H, are disposed in the required positions cams, H^1. These cams acting on the friction rollers, G, bring, by the aid of the levers, F, the valves to open. Springs properly disposed keep the valves closed, and the levers, F, must overcome this resistance to open the valves.

The valve-boxes are of two different sorts. The valve-boxes serving for the alimentation are connected two by two by the tubes, these tubes being in communication, through an aperture covered by a wire gauze, with the interior of box, Q.

Each cylinder has fixed to it the two valve-boxes, E, E, and also a small detonator. The detonator is composed of a recipient in which are fixed two small insulating pieces in porcelain or steatite. These insulating pieces are traversed by a wire of platinum, and small nuts on these platinum wires form the electric terminus of the apparatus. The detonators are communicating with the interior of the cylinder on which they are placed, the upper part being shut by a screw.

In the middle of the drum, H, is a part in ebonite, and with the assistance of electrodes and contact pieces, this part forms the electric distributor to the detonators. By the help of a source of electricity and this distributor an electric spark is produced at the proper moment between the platinum wires of each of the detonators. The source of electricity employed may be a small magneto or dynamo put in motion by the machine itself, or an accumulator.

If the machine is burning petroleum or any other liquid hydrocarburet, this liquid is stored in a special apparatus. Methods of cooling the cylinders and changing the speed of the machine are described.

Printed Copies of the above Specifications Published may be obtained by forwarding 1s. for cost of each copy and postage to Messrs. Herbert Haddan and Co. Applications not yet Published.

THE AUTOMOTOR
AND
HORSELESS VEHICLE JOURNAL

A RECORD AND REVIEW OF APPLIED AUTOMATIC LOCOMOTION.

Circulates amongst Makers and Users of Motor-Cars, Cycles, etc., in the United Kingdom, the Colonies and the Continent.

VOL. I. No. 9. JUNE 16TH, 1897. PRICE SIXPENCE.

CONTENTS.

THE ENGINEER AUTOMOTOR COMPETITION.

IN response to the offer of the proprietors of *The Engineer* of prizes amounting to 1,100 guineas for the best self-propelled vehicles, the following firms announced their intention of competing, and paid the deposit money :—

CLASS A.

For the best mechanically-propelled vehicle constructed to carry, including the driver, four or more persons, the total weight, when fully loaded, not exceeding two tons, a prize of 350 guineas will be given.

The Electric Motive Power Company (Limited), 16, Elm Street, Gray's Inn Road.

The Electric Motive Power Company (Limited), 2nd carriage.

Middleton Crawford, 37, New Oxford Street, W.C.

The London and Glasgow Motor-Car Syndicate, 11, Queen Victoria Street, E.C.

New and Mayne (Limited), Palace Chambers, Bridge Street, Westminster.

Clement Richardson, 128, Stephen's Green, Dublin.

G. F. G. Des Vignes and Co. (Limited), Orleans Works, Teddington.

John I. Thornycroft, Eyot Villa, Chiswick Mall, Chiswick.

The Dorset Iron Foundry Company (Limited), West Quay Road, Poole.

E. J. Pennington, Bramlea, Hersham Road, Walton-on-Thames.

W. J. Perrett, The Laurels, Romford.

W. H. Barker, 37, Haverstock Hill, N.W.

William Baines, 5 and 6, Great Winchester Street, London, E.C.

John Fielding, Upton Saint Leonards, Gloucester.

The McDonald Patent Battery Syndicate, 4, North Saint David Street, Edinburgh.

The Clarkson and Capel Steam Car Syndicate (Limited), Deverell Street, Great Dover Street, S.E.

J. Irving Courtenay, 4, Great Winchester Street, E.C.

Douglas Neale, 21, Rutland Square, Edinburgh.

Roots and Venables, 100, Westminster Bridge Road, S.E.

Higgins, Bessemer, Nicholson, and Co., 127, Brixton Hill, S.W.

The Romiley Engineering Company, Hatherlow Wharf, Romiley.

Henry Sharp, 43, Broadway, Deptford.

Brindley, Naylor, and Wilson, 5, Waterloo Road, North, Wolverhampton.

Ridley James Urquhart, 6, Clayton Square, Liverpool.

Stevenson and Shovelton, 23, School Lane, Liverpool.

H. K. Hales, cycle agent, Burslem.

Walter Jno. Hubert Jones (J. Truman and Co.), Gloucester Works, Smithfield Passage, Birmingham.

The London Motor-Car Works Company (Limited), Albert Mills, Beavor Lane, Hammersmith.

CLASS B.

For the best mechanically-propelled vehicle constructed to carry either one or two or three persons, the total weight, when fully loaded, not exceeding one ton, a prize of 250 guineas will be given.

The Electric Motive Power Company (Limited), 16, Elm Street, Gray's Inn Road, W.C.

James Morton Hall, 102, Dale Street, Lancaster.

J. Holt Thomas, West View, Hopwood Lane, Halifax.

New and Mayne (Limited), Palace Chambers, Bridge Street, Westminster.

Atkinson and Philipson, Northumberland Carriage Factory, Newcastle-on-Tyne.
E. J. Pennington, Bramlea, Hersham Road, Walton-on-Thames.
W. J. Perrett, The Laurels, Romford.
Greengrass and Docking, 62, Dingwall Road, Croydon.
William Baines, 5 and 6, Great Winchester Street, E.C.
The Electric Construction Company (Limited), Bushbury, Wolverhampton.
G. Stanton, 335, Strand, W.C.
The McDonald Patent Battery Syndicate, 4, North Saint David Street, Edinburgh.
The Clarkson and Capel Steam Car Syndicate (Limited), Deverell Street, Great Dover Street, S.E.
Douglas Neale, 21, Rutland Square, Edinburgh.
The Steam Carriage and Wagon Company (Limited), Homefield, Chiswick.
The Dorset Iron Foundry Company (Limited), West Quay Road, Poole.
The Lancashire Steam Motor Company, Leyland.
The Prince Motor Syndicate (Limited), 147, Leadenhall Street, E.C.
The Clarkson and Capel Steam Car Syndicate (Limited), Deverell Street, Great Dover Street, S.E.
Douglas Neale, 21, Rutland Square, Edinburgh.
The Liquid Fuel Engineering Company, East Cowes, Isle of Wight, and 20, Abchurch Lane, E.C.
The Romiley Engineering Company, Hatherlow Wharf, Romiley.
Merryweather & Sons (Limited), Greenwich Road, Greenwich.

Fig. 1a.

Roots and Venables, 100, Westminster Bridge Road, S.E.
Eccles and Sugden, 75, Queen Victoria Street, E.C.
William Henry Dugard, Vulcan Mills, Bridge Street West, Birmingham.
The Yeovil Motor-Car and Cycle Company (Limited), Yeovil.
J. F. Stilwell, Royal Pier Hotel, Weston-super-Mare.

Class C.

For the best mechanically-propelled vehicle constructed to carry, in addition to the driver, not more than one ton of goods or parcels, the total weight, when fully loaded, not exceeding two tons, a prize of 250 guineas will be given.

Herbert John Dowsing, 24, Budge Row, Cannon Street, E.C.
New and Mayne (Limited), Palace Chambers, Bridge Street, Westminster.
Enock Bros., Coombe, Dartmouth, Devon.
Clement Richardson, 128, Stephen's Green, Dublin.
J. F. Stilwell, Royal Pier Hotel, Weston-super-Mare.
Stevenson and Shovelton, 23, School Lane, Liverpool.

Class D.

For the best mechanically-propelled vehicle constructed to carry, in addition to the driver, five hundredweight of goods or parcels, the weight, when fully loaded, not exceeding one ton, a prize of 150 guineas will be given.

The Clarkson and Capel Steam Car Syndicate (Limited), Deverell Street, Great Dover Street, S.E.
Roots and Venables, 100, Westminster Bridge Road, S.W.

Supplemental Class.

For the vehicle, whether passengers or goods, propelled solely by a motor actuated by the vapour of oil or spirit, having a lower specific gravity than 0·8, or a flashing point lower than

73° Fah., Abel's test, and constructed to satisfy the requirements of any Act of Parliament, and the rules to be made thereunder for the time being respectively in force, which, in the opinion of the judges, best satisfies the purpose for which it is built, a prize of 100 guineas will be given.

Herbert John Dowsing, 24, Budge Row, Cannon Street, E.C.
Herbert John Dowsing, 24, Budge Row, Cannon Street, E.C. (2nd).
M. Tod and Son, Devon Engine Works, Dunfermline.
Alfred Cornell, Tonbridge, Kent.
William Baines, 5 and 6, Great Winchester Street, E.C.
T. Coulthard and Co., Cooper Road, Preston.
J. F. Stilwell, Royal Pier Hotel, Weston-super-Mare.
H. K. Hales, cycle agent, Burslem.

The necessary power is obtained through a two-crank compound tandem horizontal steam-engine, A, having two high-pressure cylinders, placed on two low-pressure cylinders of large area. The whole of the engine working parts have very large bearing surfaces, and are thoroughly well lubricated by running in oil contained in the case. In order to prevent as little water as possible finding its way into the steam cylinders, the valves are placed below the centre line of the engines and so allowing of proper drainage. Owing to the high revolution of the engines it is necessary to gear it down by toothed wheels (no chain gear being used) contained in the case, *a*, which transmits the power to the driving shaft, *b*. On each side of this shaft are steel pinions gearing into a large internal gear, *d*, which is attached to the spokes on each of the rear wheels. This gear-

FIG. 1.—"LIFU" STEAM VAN (Plan).

Of the above firms seven only appeared at the Crystal Palace with automotors, viz., the Liquid Fuel Company of Cowes (1); Messrs. Roots and Venables (2); the Electric Construction Company of Wolverhampton (1); the Yeovil Motor-Car Company (1); the Electric Motive Power Company (1); Mr. Holroyd-Smith (1); and Mr. Cornell (Arnold Carriage, Benz System) (1).

Taking these exhibits in order, the motor van of the Liquid Fuel Company was unquestionably, from the utilitarian point of view, a wonderfully perfect machine, and deservedly gained special commendation from the judges. We illustrate it in the figures on pp. 344–349:—Fig. 1A is a side view; Fig. 1 is a plan; Fig. 2 a longitudinal sectional elevation; and Fig. 3 a rear transverse section. As will be seen, the van is of the ordinary four-wheel type, having doors at the rear. The body of the van is about 10 feet by 4 feet 3 inches by 5 feet, and is carried by springs in the ordinary way.

wheel, *d*, is encased in a patent dust-proof case, through which it is impossible for any dust or grit to find its way. The engines when running at 600 revs. are capable of indicating about 12 horse-power, and weigh, with feed-pumps, about 155 lbs. The carriage wheels make one revolution to 8½ revs. of the engine. When necessary, as when climbing a hill, steam can be admitted direct into the low-pressure cylinders by the valve, A 2; on ordinary occasions the engines are worked compound. The exhaust from the steam-engines passes into the exhaust box, C, then into the funnel, B, where the steam is consumed by the gases from the furnace as they escape up the funnel. The boiler feed pumps, J, draw their water from the water tank, W. The main boiler feed pumps are placed beneath the front seat, and are run off the main engines by means of a shaft and gearing by which the speed of the pumps is reduced.

A separate steam pump is also placed beneath the seat, to be worked only when the engines are not running. The boiler, B (which is separately illustrated in Figs. 3A and 3B), is placed immediately behind the front seat, and is of ample size, to allow of easy steaming. The boiler is of the water tubular type, and the steam pressure carried is 250 lbs per square inch. Its chief peculiarity is a patent detachable tube joint, by means of which all the small generating tubes are connected to the upper steam drum and the lower water drums. Any tube can be taken apart for inspection and replaced within a few minutes. The steam drum is of Elmore copper, and the small generating tubes of solid drawn copper. Ordinary petro-Company's patent liquid fuel burners, *j*.

In this carriage the fuel (petroleum) is carried in a strong copper tank placed under the floor beneath the front seat. The oil is forced into the burner by means of an air pressure in the tank not exceeding 10 lbs. per square inch. A few strokes of the hand air-pressure pump, H, placed alongside of the driver on his right is sufficient to maintain the necessary pressure. The fire is regulated by the oil valve, P, and is also automatically controlled by a small automatic valve, which is opened or closed by the steam pressure according to the rise or fall of the pressure in the boiler. Should the pressure in the boiler rise then the valve shuts off the supply of oil to the burner or *vice versâ*. The

Fig. 2.—"Lifu" Steam Van (Longitudinal Sectional Elevation).

We illustrate this burner in Figs. 4 and 5, the former being a plan of the generator and the latter a section; it will be seen that the oil is forced through a series of passages in a chamber, which is heated by the flame from below. In this way the oil is gasified and passing down through the vertical tube reaches the conical burner, from whence it issues as a powerful and intense flame of great volume. The amount of oil-gas emitted, and consequently the volume of the flame, being automatically regulated by the needle valve in the cone which is actuated by the steam pressure.

This burner is extensively used in oil launches and yachts, and seems to us well suited for steam barges on canals.

whole of the arrangements are quite under the control of the driver, who sits on the front seat with the steering handle, D, in his left hand, which is connected to the two front wheels. The front wheels are placed on pivot axles which are connected together by a rod crossing and joining the two levers on the pivots which is again joined by a universal joint beneath the carriage to the steering handle, D. On the driver's left is the steam valve, A 1, giving steam to the high-pressure cylinders, and the valve, A 2, giving steam to the low-pressure cylinders. E is the reversing lever, and G is the hand brake, while the foot brake is shown at F. It will be seen that all operations are immediately under the control of the driver.

The Bushbury electric dog-cart (Fig. 6, p. 319), manufactured by the Electric Construction Company, Wolverhampton, from the design of Mr. A. Blackburn, M.I.C.E., is one of the neatest, best-appointed vehicles for private use that we have seen for some time. As will be gathered, it presents an exceedingly elegant appearance, and it is difficult at first sight to see how it is propelled, nothing savouring of mechanism being visible save a casing under the body of the car. This vehicle is designed to carry two persons seated side by side. The motive power is derived from accumulators, which, under ordinary conditions, hold sufficient charge to carry it from 20 to 25 miles at an average speed of 9 to 10 miles an hour. The total weight, including accumulators, is about 14 cwt.

The accumulators, which are of the Faure-King type, number 40 in all, and are carried in four boxes, each containing 10 cells. They are manufactured by the E.P.S. Company. The total weight being about 5 cwt.: the total capacity is 40 ampère hours at a discharge rate of 5 ampères, or about 28 ampère hours at a discharge rate of 15 ampères. The cells can be charged in about seven hours from a 100 volt circuit. Terminals are provided for enabling this to be done without shifting the cells. These cells supply current to a double pole series wound motor, which has a drum wound armature with Eickemeyer coils. The current delivered by the cells is 10 ampères at 80 volts, and at 700 revs. the commercial efficiency or the ratio between the current supplied and the work performed is about 80 per cent. The motor is suspended beneath the footboard by a flexible attachment to the footboard, and the motion of the armature spindle is transmitted to the sprocket driving wheels by means of a Renold pitched chain. The driving wheels are carried on an axle which is in two parts, united by a differential bevel gearing. The sprocket wheel is 20·5 inches diameter, the driving wheels 39 inches diameter, and the steering wheel 45 inches diameter. All these wheels, excepting, of course, the sprocket, are solid rubber tyred and fitted with ball bearings. The gauge is 4 feet 6 inches and the length of wheel base 5 feet 6 inches.

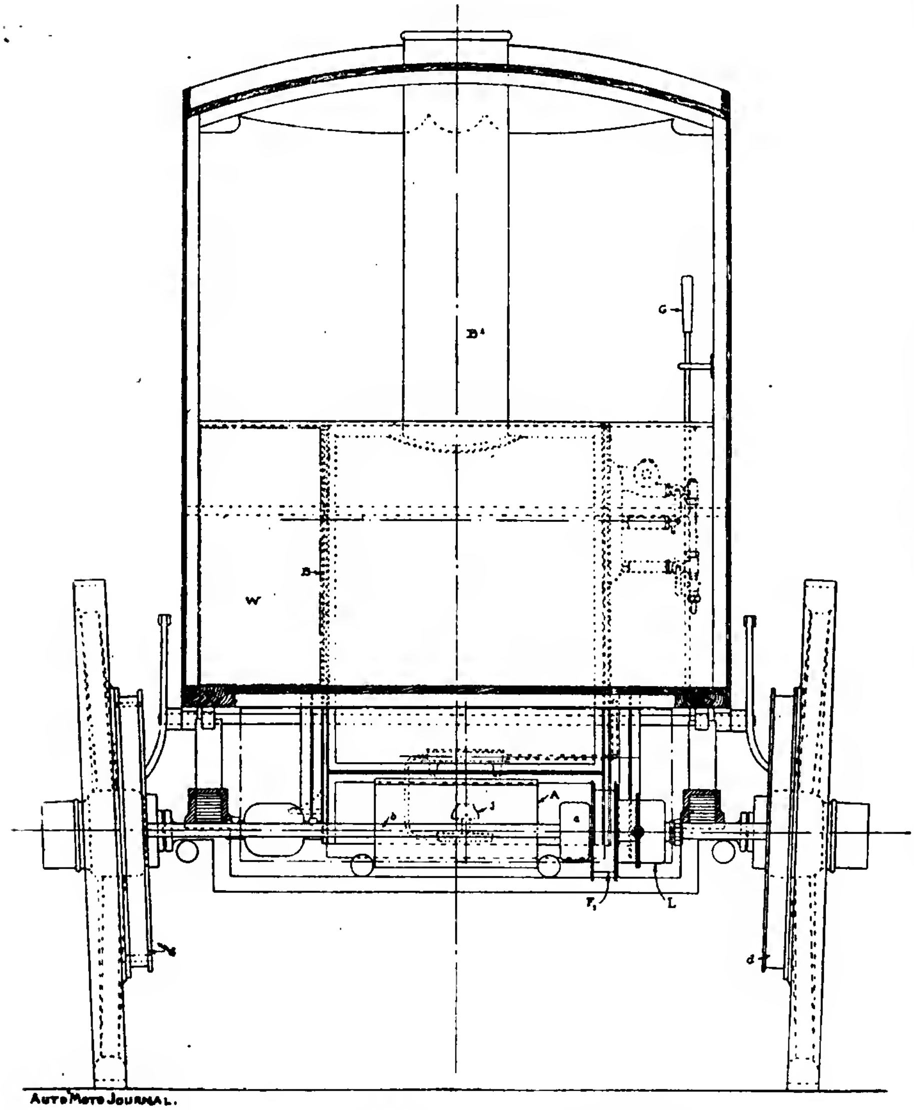


Fig. 3.—"Lifu" Steam Van (Rear Transverse Section).

The front wheel is steered by means of ordinary reins, and when the wheel is locked, owing to the peculiar method of attachment, it is thrown out of perpendicular, thus greatly adding to the stability when turning.

The switch gear is placed under the driver's seat, and consists of a reversing and controlling switch, the former actuated by a vertical lever on the right hand, and the latter by means of a sliding contact seat, having four positions, viz.:—(1) off; (2) two parallels of 20 cells in series in circuit with the motor; (3) 40 cells in series in circuit with the motor; (4) 40 cells in series in circuit with the motor, but with a resistance in parallel with the magnets.

Thus three speeds are provided, practically corresponding to the paces of a horse, viz., walking, slow trot, and fast trot. An electric brake enables the speed to be checked when descending gradients, and in addition there is a hand brake actuated by the foot, capable of bringing the car to a stand within a distance of a few feet.

It will thus be seen that the cart will do about as much work in the day as one horse for every day in the year, but by having a spare set of accumulators it will do as much as two horses.

A person using a car of this description, and living within a few miles of an electric supply station, could easily at small cost, say not more than 3*d.* per unit, arrange for charging his accumulators, which could be sent and returned by rail. Most electric lighting companies using continuous current would gladly entertain any chance of increasing their day load. We have no doubt that the Bushbury Car will be largely patronised by medical men and country residents of limited means, for whom it seems very suitable.

Messrs. Roots and Venables, of Westminster Bridge Road, London, entered two vehicles, the one a four-seated Petro dog-cart, and the other a Petro tricycle. The general appearance of these is shown in Figs. 7 to 12 (pp. 350-354).

Dealing with the dog-cart first (Fig. 7), Fig. 8 is an elevation and Fig. 9 a plan. The great merit of the motor designed by and brought to a considerable degree of perfection by this firm is that ordinary petroleum, which can be purchased anywhere, is used as the source of power. The motor is a twin-cylinder one, giving off 3·2 brake horse-power at 510 revs. The cranks are placed opposite each other, thus ensuring good balance. They are enclosed in a chamber partly filled with lubricant, and there is thus no risk of heated or warm bearings from mud and dust attaching to the working parts. A silent-running chain connects the crank-shaft to a countershaft, on which are keyed the friction clutches. These clutches drive either of two chain wheels, which are connected by chains and chain wheels directly to the axle. The method of governing is that of operating the exhaust valve and the oil feeder simultaneously and by the same mechanism, by which means a clean exhaust is obtained; and the construction of parts surrounding the vaporiser and igniter relatively to one another ensures complete combustion. The method of governing was only arrived at after many years of experiment. The automatic burner for

Fig. 3a.—Back View, showing "Water Back."

heating the ignition tube enables the motor to run continuously as long as it is supplied with oil, without any attention whatever.

There is an automatic feed delivery for each working stroke, and the function of the governor is to cut out feeds of oil according to the load. The cooling water for the cylinders is forced through the jackets, it then traverses the whole of the upper tubes of the frame and then by half the lower tube to the water tank, thence by the other side of the lower tube of the frame back to the pump. This enables a much less quantity of water to be carried, the tubes owing to this surface forming a very efficient cooler.

There is only one countershaft, which not only drives the axle directly, but also operates the valves and carries the governor. It has been found by experiment that it is preferable to have the driving countershaft directly over the axle rather than placed horizontally with it, and to have an intermediate stiff spring, because in meeting with a large obstacle, such as a brick, the driving wheel, if the car is going at a slow speed with but little momentum, is suddenly checked, and the chain may snap or shear a tooth off the wheel; in this car the chain slackens to reduce the jar, slack in the chain is easily taken up, and the chain can always be kept tight, it also runs more smoothly, and the power is conveyed through the clutches more evenly and steadily.

The steering of the car can be done at full or slow speeds with the finger and thumb, and is always positive.

No gear wheels are used anywhere in the motor, all driving being done by chains in order to reduce noise.

Fig 3b.—Front View, showing Furnace.

One valuable advantage possessed by this motor is that it can be quickly started from "all cold."

The mechanism of this firm's Petrocycle (Figs. 10, 11, 12), is similar to the foregoing, the motor in this case being however but of 1½ brake horse-power. There are, however, important differences in the arrangement for cooling the water. The water tank is placed on one side of the frame to balance the fly-wheel on the other. The cooling water is conveyed from the tank through the tubular frame of the car, and passes through a coil of pipe surrounding the fly-wheel, and is thus cooled by the air given off at the periphery by rotation. The ignition tube is first heated by a separate lamp, which is removed or extinguished as soon as the engine is started. The tube is afterwards kept hot by means of an automatic burner.

The special features claimed for this motor are:—The tubular frame for conveying and cooling the jacket water, and the coil round the fly-wheel for cooling the latter; the automatic burner; the method of making the same governor govern both the oil feed and the exhaust valve; the disuse of gear-wheels, all the driving being by chain and chain-wheels; the construction of the ignition tube relatively to the port and combustion space, thereby enabling complete combustion to be obtained.

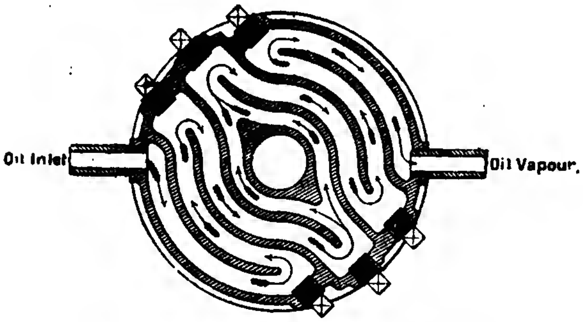


FIG. 4.—PLAN OF "LIFU" GENERATOR.

The Yeovil Motor Company's car (Fig. 13, p. 355) is a neat and compact dog-cart, suitable for two persons, and with room for a portmanteau.

It is driven by a two-cylinder Petter patent petroleum-engine, working on the Otto cycle and using ordinary petroleum. The cylinders are arranged side by side, and fire alternately. The explosions are effected by means of two ignition tubes, the foot lever is held down, and the back of the belt pressed on to a pulley fixed on the intermediate shaft. A brake is held on the fly-wheel by a spring to control the engine when the

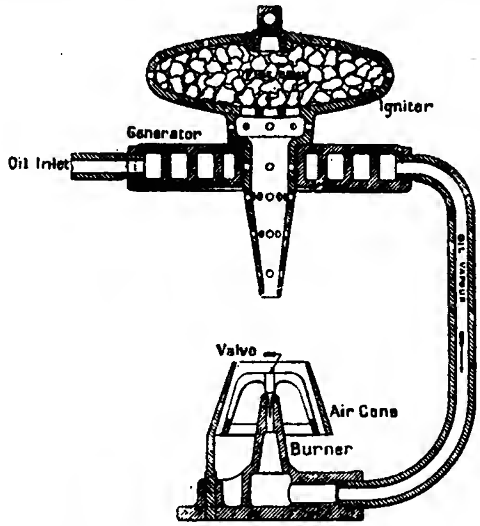


FIG. 5.—SECTION OF "LIFU" BURNER.

carriage is at rest. When the carriage is in motion this brake is held off by a hand lever. Two pairs of ordinary carriage

FIG. 6.—BUSHBURY ELECTRIC DOG-CART.

heated by a single blow lamp. The air inlet valves of the motor are operated by the suction of the piston, the exhaust valves by means of levers driven by chain gearing from the crank shaft. The motion is taken from the crank shaft to an intermediate shaft by means of sprocket wheels and chains, reducing the speed in the ratio of 2·8 to 1. A friction disc on the intermediate shaft is made to grip the chain wheel by lateral pressure applied to the end of the shaft by a hand lever. The intermediate shaft drives on to the rear axle by either one of two chains, the one gearing in a ratio of 12 to 32 and the other of 6 to 36, providing fast and slow speeds of 10 and 4 miles respectively. A square clutch on the intermediate shaft between these two chains throws either one of them into action. The rear axle drives one only of the rear wheels of the carriage. The reversing motion is taken from the crank shaft by a belt. This belt drives a loose pulley carried on a foot lever. When reversing, the friction clutch for forward driving is released

brakes are applied to the rear wheels, and the reversing motions provide a strong additional brake in case of emergency.

The Holroyd-Smith benzoline motor phaeton (Fig. 14, p. 355) is an ingeniously constructed machine possessing many elements of originality. As befits a pioneer in electric tramway traction worm-gearing is employed. Why, it is not very apparent; the absence of drawings makes it somewhat difficult to describe this motor at length, but we may say the engine is a twin cylinder, one giving off about 2½ to 3 brake horse-power, and it is placed longitudinally, the motion of the shaft is transmitted by toothed gearing and a worm to the driving axle. To each cylinder is fitted a silencer consisting of a cylinder fitted with baffles. Another feature is the coil water cooler. The method of carrying the car on a double framing and the wheels on ordinary springs combined with spiral springs working in a kind of horn plate no doubt has advantages, but we failed to appreciate them. The fuel capacity of this motor is, we understand, about five gallons, sufficing for a run of 60 miles at a speed of about 10–11 miles per hour on the level. The total weight being about ·75 ton.

The next motor (Fig. 15, p. 356) is entered by Mr. Cornell. Owing to our inability to obtain drawings or even much information concerning it we must be content with the briefest description. We understand that light oil is employed in an ordinary Otto cycle engine having electric spark ignition. Neither this motor nor its performances call for any special notice.

Another motor-car was entered, viz., a handsome Victoria, by the Electric Motive Power Co., but was withdrawn from the competition. We give a general view in Fig. 16 (p. 357), and Figs. 17, 18, 19 (pp. 358–360) are respectively a plan, transverse section, and elevation, showing details of the motor and gearing.

of some half-a-dozen vehicles instead of 70, as was anticipated some months ago. During last month the manufacturers with one accord began to make excuses, and the plea generally put forth was inability to complete their machines in time, so that there must be at least 50 motors of different design scattered about in the "shops," and no doubt we shall hear of them in the coming bye-and-bye.

Speaking generally, all the vehicles showed merit and advances on former performances. Although the judges have not deemed it necessary to carry out the programme yet the performances are distinctly encouraging, and those who competed have no reason to feel unduly depressed at their non-success in capturing any part of the *kudos* (not to mention the more material money) that was offered by *The Engineer*. One word in conclusion. Much, and we think undue, importance was attached to the

FIG. 7.—ROOTS AND VENABLES' PETRO DOG-CART.

The power for propelling the carriage is obtained from 32 Epstein (120 ampère hour) cells. A two brake horse-power series motor is geared to the driving wheels through double reduction spur gear, flexible couplings allowing for the play of the springs on the carriage. The resistance switch is worked by a to-and-fro movement of the steering handle. The steering wheels are centrally pivoted so as to enable them to be turned with the minimum of effort. The brake is an ordinary foot brake.

As regards the trials in the Crystal Palace these duly came off in the presence of the judges on May 27 and 28, and on the latter date were summarily terminated by the posting up of the following official pronouncement:—"The judges have decided that they cannot award a prize to any of the cars exhibited. It will, therefore, not be necessary for the trial run to Birmingham to take place. Although the judges cannot see their way to award any prizes, the steam car of the Liquid Fuel Engineering Company, and the Bushbury electric car of the Electric Construction Company are highly commended."

Thus then the competition resolved itself into an inspection question of offensive smell emitted by the motors, and during the trials the smell of partially consumed petroleum was very pronounced, especially at starting and stopping. Whether these fumes are more objectionable or offensive than the fœcal emanations of a horse is, of course, a matter of taste. We prefer the petroleum, because we *do* know what that is; but no one, not even a sanitary expert, can say what *may be* in the latter. At the worst, the petroleum involves a deposit of pure carbon in the air passages; the other means the absorption of millions of microbes, which may be anything from anthrax to glanders, in any case they are cadaverous, and set up ptomaines in the system. At present there is apparently a prejudice in favour of the retention of horse manure, and we are not disposed to quarrel with those who prefer to put their trust in chariots and horses rather than in automotors. Thus *The Engineer* competition.

Fig. 8.—Roots and Venables' Petro Dog-Cart (Elevation).

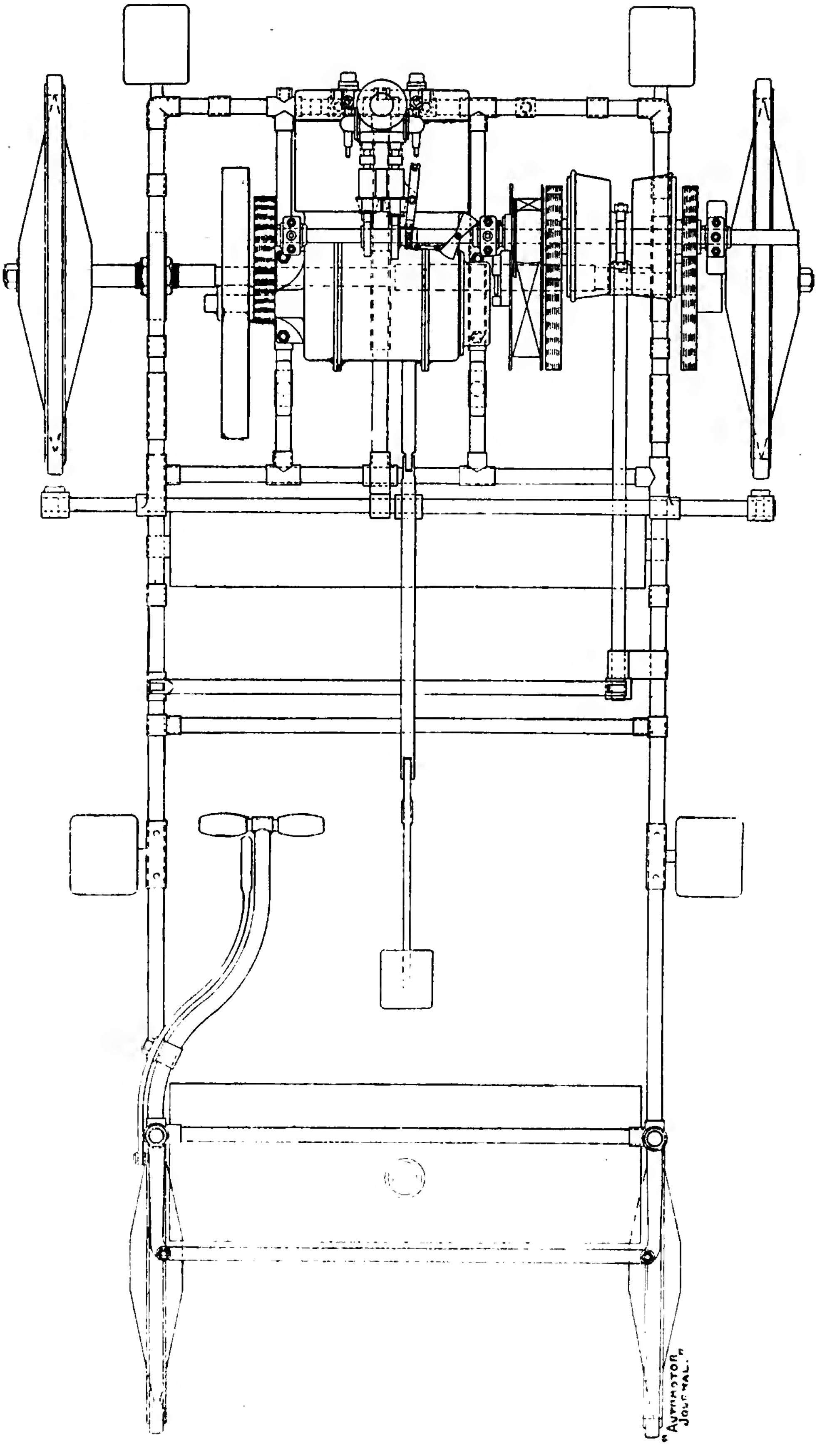


FIG. 9.—ROOTS AND VENABLES' PETRO DOG-CART (Plan).

THE PRESS ON THE MOTOR-CAR COMPETITION.

THE failure of *The Engineer* Motor-Car Competition has naturally been much commented on in the Press, and confidence in the future of the horseless vehicle is, as a consequence, much shaken. It has been very generally assumed by writers in the non-technical Press that no reliable automotors are at present manufactured in this country. We are told with wearisome iteration that the industry is (of course) "in its infancy." The air of profound wisdom with which this bald platitude is trotted out by scribes in the daily Press is not a little ludicrous. On inaccurate premises and with that general all-round knowledge of nothing in particular which distinguishes the ordinary non-technical journalist, conclusions are formed and opinions uttered which are repeated *ad lib.* by that shining light the "Man in the Street"; and in all societies one hears the before-mentioned "wheeze" delivered as though it were some Delphic Oracle. With the daily Press—always so woefully at fault where mechanical matters are concerned—we need not concern ourselves any more than to deplore the inaccurate and misleading opinions which have been expressed as a result of *The Engineer* competition fiasco. The technical Press, we regret to observe, is apparently also disposed to draw erroneous conclusions, and it would seem that the automotor is regarded much in the light of the *mauvais sujet* of the highly respectable and extremely well-connected engineering family, and is, one would think, doomed to bring the grey hairs of its sponsors with sorrow to the grave.

The Engineer is naturally grieved at the failure of its well-intentioned efforts to make the automotor a respectable member of society. Says our contemporary :—"The motor-car has yet to be made. It may be that it has not as yet been invented. This we say with a full appreciation of what has been done in France. It must not be forgotten that what will satisfy our French neighbours will not at all satisfy public opinion in this country, which is much more exacting. And then after all comes the question—are motor-cars wanted? Will there ever be so full a demand for them that money can be legitimately made out of their manufacture? There are not lacking those who assure us that the motor-car has been slain by the tramcar and the bicycle. Time alone can settle the question. The world may rest assured that if a motor-car is really needed it will in time be produced."

How truly moral! In an earlier part of the same article it complacently washes its hands of the business thus :—"One result of our essay has been satisfactory. It has cleared the air. It has placed the world in possession of facts concerning the motor-car industry in this country. There is at present no such industry. There is no such thing as a thoroughly satisfactory self-propelled vehicle. If a motor-car of the kind existed it would have been submitted for competition."

Engineering quite endorses all this and goes a little bit better. It casts aside the severe air of the technical critic and becomes positively facetious :—"It must be always remembered that a locomotive with steering gear added is not a motor-car, even if petroleum take the place of coal and also of water."

FIG. 10.—ROOTS AND VENABLES' PETROCYCLE.

Perhaps our contemporary will kindly explain what *is* a motor-car? *Engineering* then continues :—"The motor-car of the future must be able to compete with the horse, not only in his capacity for speed but also in economy of keep and attendance. For years the problem has been studied in relation to tramways, and, speaking generally, it has ended in failure. A tramcar generating its own motive power without nuisance either to passengers or public, and running economically in comparison with horse-traction, yet remains to be produced. The motor tramcar is, however, an easy problem compared with the motor-carriage or omnibus, and it will be a very considerable time before it attains the dignity of constituting an industry. As an instrument of sport, affording plentiful chances of sudden death from collision, upset, and explosion, the spirit-car will satisfy the aspirations of any reasonable man, but it is just these capabilities which put it out of court as a commercial vehicle."

It is not often that our two elderly contemporaries agree, but

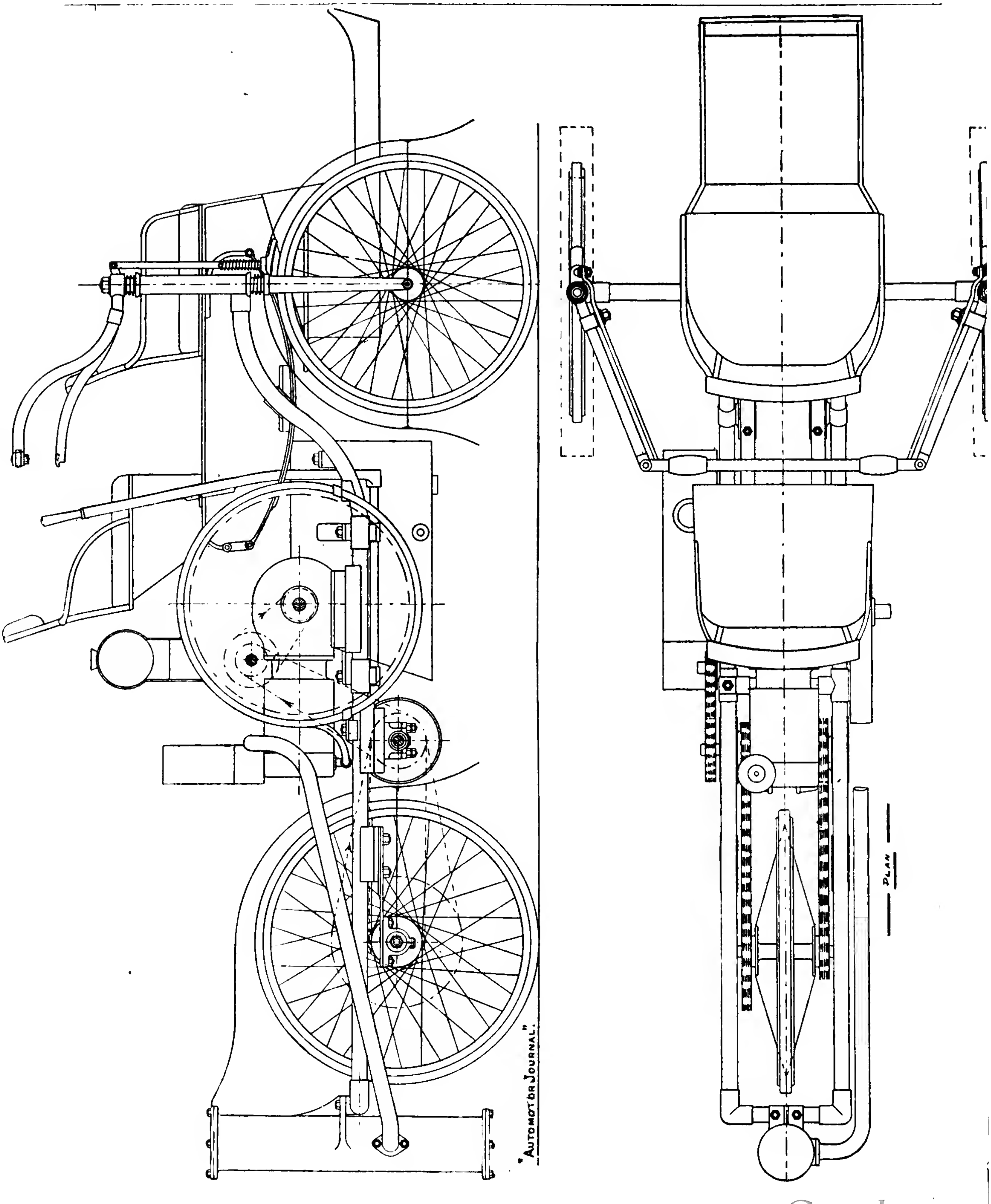

"Automotor Journal."
Plan

FIG. 13.—THE YEOVIL MOTOR COMPANY'S DOG-CART.

FIG. 14.—THE HOLROYD-SMITH BENZOLINE MOTOR PHAETON.

when they do their unanimity is wonderful. Despairing of a friendly and sympathetic word we turn to the *Electrical Review*, only to find that it too has not a good word for the automotor. The *Review* naturally may reach the same conclusion as any other paper, but it must get there quite "on its own," or it would not be the *Review*. Says it :—"Our contemporary (not us but *The Engineer*) has made in the aforesaid ponderous leader a few good points. First, that it is obvious that the motor-car industry of this country is practically non-existent. No one will gainsay this so long as they admit that vehicles using petroleum spirit were properly excluded. The exclusion of this class from the competition practically assured the *status quo* of the 1,100 guineas. At the present time the spirit engine is the only motor that has effected much. True it smells, it can only creep up hills, it vibrates, it is noisy, and so on, but it is a success, and it was ruled out, and being so negatives the claim made by *The Engineer* that the best England can do at present was to be seen at the trial." And again :—"At the same time, while not agreeing with *The Engineer's* methods or mode of reasoning, we may agree that the motor-car is yet to be made. Not merely as a machine is it far from perfect, but as a carriage it is equally imperfect. Tied down to the exterior appearance of the horse-drawn vehicle, and apparently, also afflicted with the fear of the older locomotive men that drove them to adopt low centres of gravity, the motor-car men of to-day put their passengers as near the road as possible. Why cannot they place them well above the ground with a clear view over the hedge rather than into the ditch, and thereby find machinery room below him, so escaping at once from the thraldom of the old design, and the necessity of cramping their machinery into the narrowest possible space."

With very much of this we cordially agree, and makers of automotors would certainly do well to depart from the traditions of elderly carriage makers, and endeavour to imitate a Post Office van as little as possible. It is evident that the automotor car is not liked by our contemporaries. It has been weighed in the Press balance, and has been found wanting in some respects, and hence it is consigned by the technical Pecksniffs to everlasting damnation. Fortunately the automotor has its admirers, and is not quite such an outcast as our contemporaries seem to think, and is, in fact, being quietly perfected and improved. We should, however, like to see an automotor designed by our contemporaries. Since no automotor at present meets with their critical approval, why not give the world the benefit of such superior knowledge?

It was certainly rather rough for *The Engineer* to declare that they did not believe that any motor-car industry properly so called is carried on at Coventry for other than Company-promoting purposes. Mr. H. Sturmey, the Acting Chairman of the Daimler Motor Company, promptly requested the retractation of this (if false) very damaging statement; *The Engineer* refuses to do anything of the kind, and no doubt more will be said about the matter in a very different place. Mr. Harrington Moore, of the Motor-Car Club, likewise feels grieved at the utterances of *The Engineer*, and writes our contemporary to pass no rude remarks about the Daimler Motor and the Coventry industry. In this case, too, *The Engineer* is not disposed to accommodate Mr. Moore. Really, it would seem that this unfortunate Competition is producing very untoward results.

FIG. 15.—CORNELL OIL CARRIAGE (BENZ SYSTEM).

The Bollée Motette.—Some satisfactory running has been done lately by the Hon. C. S. Rolls on a Bollée tandem tricycle, including two runs from Coventry to Cambridge, a distance (by the route taken) of about 90 miles, which were accomplished without any serious trouble with the mechanism. The machine is a racer, fitted with a cylinder of extra large diameter for high powers, and seems to have given considerable satisfaction.

Indiarubber—Erratum.—By a clerical error the price of indiarubber per ton was stated by us in our article dealing with this in our May number as £16 10*s*. It is palpable that this should have been £216 10*s*.

SOME DISADVANTAGES OF THE HORSE.

We are all familiar with the usual plea urged in defence of betting and horse racing, viz., that it encourages the breed of horses. And to this noble end thousands of people devote their time and money, from office boys who steel petty cash and postage stamps, to the mechanic who "'as 'is little bit on"; and from prosperous business men and shopkeepers to noble members of the Beerage and the Peerage, who sit upon magistrates' benches and dispense good advice to delinquents upon the evils attending betting, &c. We are not, however, concerned with the ethics of those who, in various ways, are interested in horses, but we wish to point out that from a purely business point of view the horse is, notwithstanding all that its admirers may say to the contrary, about the most expensive means of locomotion that can be devised. It has been truly remarked that the great advantage of the horse is that it gives employment to such a large number of trades. It does indeed. In the good old days—we don't know precisely when these were—but it does not matter, there was usually work for all that wanted it. Nowadays the inevitable and proper tendency is to lessen the amount of toil and save the expenditure of energy—which means money—in every possible way. The extinction, or rather the

Fig. 16.—Electric Motive Power Company's Victoria.

disuse of the horse for any but purely luxurious purposes is a scientific certainty; just as the disuse of sails for marine propulsion is. Sailmaking is practically an extinct art in this country, and is confined to the yachting port; so it will be with the horse, that noble but nervous animal will be used for hunting, racing, and circus riding, and such like luxurious purposes. Our present object is, however, to point out a few reasons why it can hardly be deemed sound economy to purchase a horse for business purposes. Leaving aside the first cost, there is the food, which must be regular in supply, sufficient, and of good quality; the stable must be a building which conforms to sanitary laws, which means it must be well drained and ventilated, well supplied with water—in short, in all but a fireplace and bedding it must be as well built as the master's house. All this involves money, and the services of a groom. We then have to consider that a horse is just like a woman — never continuously well; this means the "Vet." and his fees, or it may mean, in addition, the loss of the beast. Much more might be said on this head. Another trade is the harness-maker, which again involves the leather-maker, or tanner; then we have the farrier who supplies the shoes, without which the horse, in all developed countries, would be of little use. If, as recently, the farriers go out on strike the locomotion that depends upon horses becomes paralysed. The horse is indeed the hub or centre of a wheel of employment; if one spoke is damaged the whole thing upsets. Of course the master or owner pays for everything; every business man knows that the less the number of subsidiary trades he employs the greater are his chances of success. Thus the great objects of the employers in such trades as shipbuilding, engineering, iron and steel making, mining, &c., is to reduce as much as possible their dependence upon other trades, and to make their own industry simple and self-contained. Similarly the horse, inasmuch as it involves the employment of so many other trades, is bound to be replaced by the motor-car. Even in their present state of development it is much cheaper to maintain a motor-car for light business purposes than a light horse-drawn van. The former requires no stable—a tarpaulin thrown over it gives ample protection against the weather; it will run at a cost of less than 2*d.* per horse-power hour, this including fuel and wages.

FIG. 17.—ELECTRIC MOTIVE POWER COMPANY'S VICTORIA (Plan of Motor).

Apart from the disadvantages inherent in the employment of animals for power purposes we have to consider the objections to the use of horses in crowded cities. In our leading article we have referred to the disgusting and offensive fœcal emanations of the horse. In streets this nuisance is much more serious, and it requires a large army of sweepers to prevent our cities from becoming immense cesspools. It is only by the most vigorous sanitary precautions in such towns as London, Liverpool, Manchester, &c., that outbreaks of fever and other diseases are avoided. For humane reasons too the use of the horse in towns is to be in every way deprecated. The slippery condition of our streets in wet or damp weather involves the sacrifice of thousands

FIG. 18.—ELECTRIC MOTIVE POWER COMPANY'S VICTORIA (Transverse Section, looking from Rear).

of horses, and this alone constitutes an expense which might well be avoided. In the City it is a common sight to see the traffic stopped because half a dozen horses have fallen. We have ourselves seen no less than five horses down in Cheapside at one time, of which three were dead or dying from fractured pelvis. Only last week a most painful sight to thousands of people was witnessed in Kensington High Road. Three horses had fallen; they had evidently split their pelvis and were dying an agonising death—plunging and kicking in a way most distressing to behold. These horses were not "old crocks," such as one sees falling down from sheer exhaustion, but were fine animals owned by firms of the highest repute, one being owned by Messrs. Gilbey, who have done so much for the horse. We estimated that these three horses represented at least £200. Indeed we can't go to the City in wet weather without meeting convincing proof of the unsuitability of horse for traction purposes.

THE CREWE AUTOMOTOR TRIALS.

[BY OUR SPECIAL COMMISSIONER.]

As soon as the development of automotors began to make decided progress, about two years ago, the Royal Agricultural Society of England saw the possibilities these motors possessed as forming a cheap means of conveying produce and what not to market, and they therefore decided to offer prizes for vehicles specially designed for traction purposes. The trials of the cars entered for competition were arranged to take place at Crewe on June 10th, and thither our Special Commissioner duly journeyed on the day previous.

On Arriving

at the Station Hotel, from the yard of which the run was to start, hopes of good things were raised by the fact that the house was full, a number of gentlemen interested in or connected with automotors staying there, while Mr. Clarke, the Secretary of the Royal, had booked rooms for a party of seven, including

The Judges,

who were three in number, and included Sir William Anderson, K.C.B., F.R.S., of Erith, Kent; Bryan Donkin, Esq., of London; and F. W. Webb, Esq., C.E., of Crewe.

Although there was, therefore, a goodly smattering of people interested in the trials, it was not very encouraging to learn that so far none of the vehicles had put in an appearance, and in fact it was no easy matter to gather any information from the "inhabitants," who, strange to say, seem to take but little interest in the matter. A little persistence, however, proved

Fig. 19.—Electric Motive Power Company's Victoria (Elevation through Motor).

Towing an Electric Motor-Car.—A somewhat novel sight was witnessed in London recently when the Hon. C. S. Rolls, with his Peugeot phaeton, towed an electric four-seated car weighing nearly a ton, which had exhausted its current, from Chelsea to Mansion House, City, without a hitch, maintaining on the level a speed but very little below the normal speed of the former vehicle. This performance does great credit to the Peugeot car considering the weight of the towed vehicle.

successful in so far as to learn that it was intended to make a run of 50 miles out and 50 miles back in the direction of Derby, and that the judges and other spectators were to follow the vehicles in wagonettes. The advisability of this step will be apparent when it is remembered that the vehicles in the chief class were not intended for passengers, and therefore offered no accommodation; while, on the other hand, it would hardly have been fair to burden them with additional weight in excess of the load enjoined by the rules of the competition. Such, in brief, was the position up to evening, when neither the prospect nor the weather was very propitious. Later on the first arrival put in an appearance in the form of the motor-wagon of the

LANCASHIRE STEAM MOTOR COMPANY,

Leyland, Lancashire, which was entered in the 1st class, viz., substitutes for light spring carts, the prizes offered being £100 and £50. There were no entries for the 2nd class, of heavier vehicles. In an interview with the firm's courteous Mr. Spurrier I was able to learn the following particulars concerning their motor, which had come a journey of close on 50 miles to be ready for the start at 9 o'clock next morning. The van is four-wheeled, with steel tyres, and the body is of greater capacity than was to be expected. It is roofed with sheet metal, and so constructed that all the rain falling on it is collected and passed to the water-tank. The condenser is situated on the roof, consisting of a number of brass tubes indented on the Rowe system. Liquid fuel is used for steam raising, the boiler and the firing arrangements being special patents which are the property of the firm. The boiler and engine are placed in the front of the van, the former being a vertical multitubular boiler, the 84 tubes being of copper, and the shell steel. The engine is a vertical compound, of the marine type. The tubes and copper firebox present a total heating surface of 50 square feet. The connection with the engine is made by a steam dome, which thoroughly dries the steam and prevents priming.

The crank shaft revolves in one direction only, and is connected with a second motion shaft with clutch gearing, which gives three changes of speed, and also reverses. From the second motion shaft the power is conveyed to a third shaft, on which the driving-chain pinions are fixed, and the compensating gear. Powerful pitch chains convey the power to the road or driving wheels. The boiler, engine, and gearing are so disposed that the weight on the steering wheels are kept constant, and as the clutch levers, &c., are all in front one man can easily attend to the car. Steam can be raised in a few minutes, and any ordinary petroleum lamp oil can be used. The partition which separates the boiler and engine from the car does not restrict the rear view of the driver. The oil and water are carried in a cylinder under the van. The cost of running has been found, from a number of experiments, to be about one penny per hour. The weight of the car and driving plant is 26 cwt. The speed ranges from three miles per hour uphill to six on the level, averaging, as a rule, five miles an hour.

THE ROUTE

as officially announced, was as follows:—Start from station opposite Crewe Arms Hotel, past Wheelock to Sandbach. Bear to the left from Market Place at Sandbach, along Congleton Road, bear to the right at the fork a mile out, opposite a house with pink may and rhododendrons in the garden. On arriving at Congleton turn to left at Lion and Swan, then to right, and again to the left where four roads meet, taking the Buxton Road hill, passing Buglowton. At the Yew Tree Farm keep to the left until the Macclesfield-Leek Road is reached, then turn to right, and after passing Rushton bear to the right where the signpost points to Leek and avoid the old road. Pass Hanging Gate publichouse, and straight on to Leek. Pass Leek Church and turn to the right down Market Place. At the bottom turn to left and bear to the right along Ashbourne Road, passing New Carlton. In middle of Ashbourne turn to the right where four roads meet. Take the one to Derby, bearing slightly to the left until the five-milestone from Derby is reached. Turn round and return by the same route to Crewe.

The following morning it was found that no other car had arrived for the competition so that only one out of the three entries put in an appearance. A Daimler car, however, had arrived from Coventry with a party to witness the run.

By nine o'clock steam was up and things shaping well for a start, but it was 10.25 before the judges had made their inspection and weighed up the load, which in this case was 12 cwt. It then transpired that the trial run had been shortened to Leek. By 10.30 we were off, the party including, among others, others, Mr. Shrapnell Smith (Secretary, Self-Propelled Traffic Association, Liverpool); Mr. Coulthard and Mr. Tomlinson (of Preston); Mr. Samuelson (Banbury), Mr. Courtnay (Engineer to the Royal Agricultural Society), while a number of others followed on bicycles. About three miles out some trouble was experienced by side slipping which rather upset the steering, these three miles having been accomplished in 30 minutes. At Wheelock Canal Bridge there was a remarkably sharp hill culminating in the high crest of the bridge itself. On sighting it there was a flutter in the judge's wagonette and many thought the rise would prove too severe a test. It was pleasing, therefore, to see that the hill and bridge were taken very nicely with only a reasonable slackening of the speed, and apparently with far less effort than by the horses and cyclists. The six miles to Sandbach were made in the hour. Practically speaking all there was to see had been seen, and certainly the van appeared at its best when hill climbing.

An hour and a half were lost owing to slight accident with the steering gear, so that the trial was eventually restricted to the journey to Congleton and back, the *average* speed attained having been 6½ miles per hour, which shows that the Company had not exaggerated their claims in the first instance.

In making a mental survey of the whole we feel that before criticising in any way it is only fair to explain that the van was largely an experiment. The general system was a step in the right direction, and power had not been sacrificed for speed, as the hill tests proved. The steering gear seemed the most unsatisfactory part, as it could hardly be said by an impartial critic that the van was always under perfect control. It is, however, an open question whether this was so much due to the steering gear as to the side slip of the steering wheels. Although it is known that the wear and tear on rubber tyres on the *driving* wheels with heavy vehicles is excessive considering their cost, still we venture to suggest that the addition of rubber tyres to the two steering wheels would do much to overcome this difficulty of side slipping. In the matter of emitting smoke or visible vapour it is at present almost impossible to attain perfection, and although on the whole the van was satisfactory in this respect, there is still room for improvement, before the regulations of the Board of Trade can be said to be fully complied with. As a whole, however, the firm are to be congratulated on having produced a van which, as an experiment, is a success and gives good hope for the future.

Lastly, we would venture to suggest that if the automotor industry is to be fostered it will be well for those getting up competitions to bear in mind that people interested in these trials like to know a little about the probable arrangements, and that courtesy costs nothing. If those who take an interest are to be always treated as in the case of the Crewe trials, there is every prospect of their ardour flagging away to nothing.• This may not greatly concern the organisers, but it is not fair to the competitors, who would thus lose half the benefits that should accrue from their competition. In the present case as only one van ran it could scarcely be considered a competition, and so the judges decided that no prize should be given.

LAW REPORTS.

Reid v. Hooley and Rucker.—The Appeal of the Defendants dismissed.

The action commenced against Mr. Hooley and Mr. Rucker by Mr. Reid for damages consequent on his having subscribed for 125 shares in the Grappler Pneumatic Tyre and Cycle Company (Limited), as to which he alleged conspiracy between the defendants, on June 2nd came before the Master of the Rolls and Lords Justices A. L. Smith and Chitty, the defendants appealing from the decision of Justices Grantham and Wright, sitting as a Divisional Court, and refusing to strike out the plaintiff's statement of claim as not showing reasonable ground of action.

Mr. Bigham, Q.C., and Mr. W. Graham were counsel for the appellants; and Mr. Carson, Q.C., appeared for the respondent plaintiff.

Mr. Graham, in stating the case for the appellants, pointed out that the plaintiff's statement of claim alleged a conspiracy by the defendants to spread a rumour that they had purchased the Grappler Pneumatic Tyre and Cycle Company, in consequence of which the £1 shares of that concern, which at one time were as low as from 1*s.* 9*d.* to 4*s.* each, went up to £4 each. By causing this rumour to be spread, the statement of claim went on to say, the defendants had sought to benefit themselves and to cheat and defraud the public by their purchase of shares. For the purposes of carrying out this conspiracy the defendants (the claim went on) purchased shares in the Company, and caused it to be publicly known that they were negotiating for the purchase of the undertaking, and ultimately, by an agreement dated May 12th, 1896, they purchased the undertaking for £385,000, a provision being contained in the agreement enabling the defendants to cancel the agreement and to refuse to complete it on paying £25,000. The statement went on to say that the price thus agreed to be paid was absurdly exaggerated and had no reference to the real value of the Grappler Company, nor had the defendants any intention of carrying out the purchase or of paying more than the £25,000. In further pursuance of the said conspiracy, it was likewise charged, the defendants caused a letter to be written by their solicitors to the *Irish Times* stating that the negotiations for the purchase were then completed.

Lord Justice Smith remarked that what was said was the defendants told a lie, and that they never intended to act upon the agreement.

Mr. Graham said the statement went on to say that, it having become publicly known, as defendants designed it should be, that this Company had been bought, so absolving the concerns it had been thought desirable to amalgamate, the price of the shares of the Grappler Company rose to £4 or thereabouts, the defendants never completed the purchase, but sold the shares they had acquired at a profit far in excess of the £25,000 they had agreed to pay as a forfeit; and plaintiff claimed that he had suffered damage, consequent on the publication of the alleged purchase by the defendants, through the purchase of 125 shares.

The Master of the Rolls: Suppose they prove all this?

Mr. Graham said his clients were not to be responsible to everyone who chose to believe what he read in a newspaper, and on it to go and gamble in shares on the Stock Exchange. The fact was that plaintiff, having found out by inquiries one half of the agreement, and not having discovered the other half, now wanted to base an action upon it.

Lord Justice Smith: You only told him one-half.

Mr. Graham: We told him nothing.

Lord Justice Smith: Oh, yes, you did.

Mr. Graham: Well, all we said was that we had entered into an agreement, as we had. We said nothing about terms; but plaintiff found out things through friends of his connected with the Company. If things leaked out, the defendants were not liable to people who chose to act upon such information.

Lord Justice Smith: Why did you instruct the solicitors to write that letter to the *Irish Times*?

Mr. Graham said because it had been represented, in connection with a £5,000,000 scheme then being talked about, that the defendants had not obtained the whole monopoly so long as this Company was outside, and it was written to show the defendants had concluded an agreement acquiring this particular property.

Without calling on Mr. Carson for the plaintiff in support of the judgment below, affirming his right to proceed, the Master of the Rolls said they had heard a wondrously innocent and plausible comment on this innocent transaction, but he was too old to adopt it. Because, after all that Mr. Bigham had stated, it came to this:—I cannot deny that this statement of claim suggests an ill-looking fraud, but it is not clear enough—it is not sufficiently specific. All this Court had to do was to take the statement of claim, and see whether it disclosed a cause of action. It said that the defendants invented transactions with the aim of running up the shares, and then they intended to sell to people who could be induced by these representations to buy; that they never intended to pay £385,000, but they did intend to pay and actually had paid £25,000, and had put into their pockets the difference they had received over this amount on the figure to which the shares went up. Was it not obvious that their intention in suggesting the £385,000 was that they might cheat the public? It was all very well to look and talk so innocently about a transaction of that kind. They had to look out for dupes, and the statement of claim said that they had an eye not only on the public generally, but on this particular plaintiff, and that it should come to his notice. And why? That he might give an advanced price, and then they would pay themselves the £25,000, and, pocketing the difference, leave the plaintiff with a dead loss. That was what was stated, and whether or not it was true and formed a false or fraudulent statement was the point to be decided on the trial of the case. It seemed to him there was no colour or ground for striking out the statement of claim, and that the appeal ought to be dismissed and the way left open for the trial.

Lord Justice Smith said he was of the same opinion. Whether the allegations could be proved or not was not the question for this Court, and he was not saying whether it was true or not; but he had no doubt there was no foundation for saying that the statement did not disclose reasonable cause of action.

Lord Justice Chitty said he agreed. He, too, thought the appeal failed, and that the statement sufficiently disclosed reasonable cause for bringing the action.

The British Motor Syndicate.—Lanchester and Others v. Richter and Another.

In the Queen's Bench Division of the High Court of Justice on June 1st, Mr. Justice Wright tried the above case. In his opening Mr. Walter, who appeared for the plaintiffs, said:—The action is brought for infringement of letters patent No. 5,479 of the year 1890. It relates to motors and gas-engines and to the apparatus for starting same. As your lordship knows, these motors have a cylinder somewhat similar to the cylinder of an ordinary steam-engine. In an ordinary gas-engine there is a cylinder with a piston, and in lieu of the piston being brought forward by the pressure of steam generated from water, as in an ordinary boiler, the motor is worked by the explosion of an explosive mixture of oil—petrol—and air; it may be not only gas and air, but also petroleum vapour and air, and any other explosive mixture of air and some body that will burn. Great difficulty has been experienced in starting these motors, especially where the engines are of any considerable size, and your lordship sees the reason of it is this, that when the engine comes to rest there remains in the cylinder of the engine either a mixture of the burnt gases from the last explosion, or more generally of air, and with an engine with a fly-wheel weighing some tons or several hundredweight, great difficulty has been experienced in starting the engine on account of the fly-wheel having to be turned round by hand or by an auxiliary starting engine in order that a proper explosive mixture may be introduced into the cylinder. This is a device for obviating those difficulties, and it shortly consists of this: Mr. Lanchester discovered that by boring a hole into the cylinder and inserting therein a very simple piece of apparatus which I will shortly describe to your lordship, and passing gas into the air contained in the cylinder, the gas and air as they mix in the cylinder would pass out from the opening which he provided, which was furnished on the outside of the flame. As the gas and air pass through, when the proper mixture of gas and air had been attained within the cylinder, the flame which passed out through the opening, and which was lit by the jet outside, indicated the proper and precise moment when the explosive mixture was within. The gas, of course, was passed with a certain pressure into the cylinder and was passing out with a certain pressure. All that was necessary was to provide really a tap in the apparatus to close the gas admission, and the result of doing that was this: It enabled the rate of flame transmission, the combustion of the gas—which was going on outside—to pass back through the mixture of gas and air into the cylinder, and there meeting the flame it exploded instantly, and forced the piston forward so that it rose, and there was no necessity at all to turn the fly-wheel. That really is the apparatus, and it is of a very simple kind. The defendants had done absolutely the same. I will ask Mr. Dugald Clerk to explain that there are practically no differences at all. In both cases there is the hole in the cylinder, in both cases the gas is allowed to go into the cylinder and work the apparatus by passing out, forming the explosive mixture, and when the explosive mixture has obtained the proper proportion the thing is forced back. The thing enables the use of two things; it enables the operator when he has a proper explosive mixture to start an engine of any size, and it has immense value. Messrs. Crossley, amongst others, are licensees, and they put a very large number of these on to their engines. It is of great importance to my clients; I shall have to call Mr. Lanchester, who will speak to having seen exactly the same thing manufactured by the defendant as his.

Mr. Dugald Clerk was then called and deposed:—I find here a self-starting arrangement in which gas is injected into air already present in a cylinder. That gas mixes with the air in the cylinder, and that mixture flows out at a jet shown in the drawing marked 5. The nozzle is screwed into the cylinder with a clear passage from the outer gas flame. For the purpose of igniting the mixture that flows from the cylinder by the nozzle 5 in the space 2, there is a little check valve which is shown separately at Fig. 4. That check valve has a groove at the bottom surface which leaves a clear way by No. 25 between the nozzle 5 and the cylinder. When the mixture flows through that valve it is a weak mixture; first, air only appears, because the gas shown in the cylinder at 10, Fig. 6, displaces air first and then mixes with the air to form the explosive mixture. As that explosive mixture is formed, more and more gas goes out from the nozzle 5, and ultimately an explosive mixture passes through that nozzle. Now, if you allow too much gas to enter the cylinder in Fig. 6 then you get a mixture, by what we call over-dosing, which is not explosive at all. One of the objects of the inventor is to find the exact point where you get the proper mixture. Whenever you touch the flame 5, turning the proper way, you turn off the tap 11, and in turning that tap off you diminish the rate of flow of the gas from nozzle 5. Now, the reason why the flame does not go through the nozzle 5 while the gas is flaming into the cylinder is this: that though flame propagates itself from an explosive mixture at a certain velocity, if you cause the mixture to flow too freely, then the flame, of course, produces a flame, and does not go back. If you check that velocity the flame goes back into the cylinders. Mr. Lanchester has taken advantage of that to check his velocity by taking off the tap. The moment he does that he causes an explosion, and the little valve, Fig. 4, is then thrown up by the explosion.

After further evidence his Lordship found for the plaintiffs, and granted a certificate of validity, made an order for injunction, for an inquiry as to damages, for delivery up of the infringing article, and for costs of the action and for destruction of all infringing apparatuses.

Furiously Driving a Motor-Car.—At the Kenilworth Divisional Sessions, on May 26th, Alphonse Deniot was charged with furiously driving a motor-car in Leek Wootton, Kenilworth, and other places, under three summonses. The Bench dismissed the second case, but convicted in the first and third. The defendant was fined £5 in each case, and the costs of six witnesses and solicitors' fees, the total amount of the fines and expenses being £16 4*s.* 6*d.*

Alleged Furious Driving.—Mr. John Stirling, of Hamilton, Scotland, was summoned at Leeds, under the Locomotives and Highways Act, for having unlawfully driven a motor-car along Victoria Road, Headingley, at a furious pace. A police-constable, named Sunley, said that on the evening of May 10th he saw the defendant and three other men in a motor-car going down the road in question at a speed of about 14 miles an hour. For the defence it was contended that the car could not be driven more than 12 miles an hour, and that on the occasion in question there was no danger to the public, owing to the width and quietness of the road. The case was dismissed, but the magistrates suggested that motor-car drivers ought to regulate their speed to suit the locality.

Obstruction.—Mr. Edward Mines was summoned for leaving a motor-car in the street at Liverpool, and thus causing an obstruction. The police officer stated that the car was left standing in Lord Street on the afternoon of the 13th ult., while defendant was inside a shop. It was there about 40 minutes, and attracted a large crowd. Defendant's excuse was that he had gone to get his lunch. A fine of 5*s.* and costs was imposed, the Bench remarking that people had no right to go shopping on motor-cars!

What is a Proper Warning?—At Brighton, on the 25th ult., Mr. Chas. F. Monk was summoned for not giving proper warnings of the approach of his car. The defendant had run against an elderly flower-seller named John Welch, breaking five of his ribs and lacerating his head and hand. The patient had been in the infirmary for a fortnight, and would have to stay there another month. The defence was that the accident was unavoidable, as Welch turned in the road just as the car reached him. The magistrates held that the car had been negligently driven, and inflicted the maximum penalty of £5 and costs. It was agreed that the car was going at 10 miles an hour, and the Justices declared that that speed was excessive in a town, whatever might be the case on a country road.

The American Electric Motor-Car Race.—Mr. A. Shippey thus describes the performances of the Riker car at the recent trials at Providence, R. I.:—In the first heat the Riker car, with only 40 storage cells, did the five miles in 15 minutes and 1 second. In the second heat with the same cells the car did the space in 13 minutes and 6 seconds, and in the third heat the five miles were done in 11 minutes and 28 seconds. He is informed that the Morris-Salom people in the first heat used 49 cells to drive their motor, or a pressure of about 18 per cent. over and above the actual voltage of the motor used by them, which battery power was increased to 55 cells in the second heat, being an increased pressure of E.M.F. of about 30 per cent., and still the Riker car came in with flying colours. The third and final heat was not fairly run, because it is said that the Morris-Salom people increased their battery power to 60 cells, being a pressure of about 40 per cent. over the actual voltage of the motor used by them. Mr. Shippey says his firms are having constructed at one of the largest carriage builders in London a specimen parcels van, an electric phaeton, and an improved electric cab employing 1½-2 and 3 kilowatt Riker motors, which vehicles will be driven by the new Woodward multipolar traction cell, but for the present he will leave the merits of both systems for other experts to report upon, which they will be invited to do after the vehicles are finished and ready for working on the thoroughfares of the metropolis.

NOTICES.

Contributions and articles likely to prove of interest to our readers will receive due attention, but in all cases the name and address of the writer must be given, not necessarily for publication.

All matter intended for publication should reach us not later than the 10th of each month. Stamped envelope must be sent if the manuscript is required to be returned. The Journal is published the middle of each month.

All Advertisements should be sent to the Advertising Department, F. King and Co., Limited, 62, *St. Martin's Lane, London, W.C., where Advertising Rates may be had on application.*

The Annual Subscription is 7s., including prepaid postage to any part of the world. Single copy 7d., post free.

Cheques and Post Office Orders should be made payable to F. King and Co., Limited, *and crossed London and County Bank; otherwise no responsibility will be accepted.*

SPECIAL NOTICE.

The Automotor and Horseless Vehicle Journal *can be obtained from all* Messrs. W. H. Smith and Son's *bookstalls, and the following Agents:—*

London: Pottle and Sons, 14 and 15, Royal Exchange, E.C.
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Manchester: John Heywood, Deansgate.
Newcastle-on-Tyne: C. C. Ross, 35, Side.
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When any difficulty is experienced in procuring the Journal from local newsvendors, intending subscribers can obtain each issue direct from the Publishing Office, by forwarding remittance of 7s. for 12 months' subscription, post free (or at the rate of 7d. per copy).

The Automotor and Horseless Vehicle Journal.

A RECORD AND REVIEW OF APPLIED AUTOMATIC LOCOMOTION.

JUNE 16th, 1897.

ANSWERS TO CORRESPONDENTS.

H. B. N. and Co. (Brixton).—Much depends upon the purpose for which the petroleum burner is required. We should recommend a Rusden and Eeles burner for large furnaces. Wurstemberger and Co., München, make a good burner, as do Moeller and Coudrup, of 78, Fore Street, London.

Vox (Chelmsford).—We know nothing of the firms in question and could hardly advise on the matter. On page 34 of the "Automotor Diary" for 1897 we give a list of reliable firms and consulting engineers engaged in the motor industry.

A. W. B. (Knighton).—We do not supply newspapers, but the address of *La Locomotion Automobile* is 7, Faubourg Montmatre, Paris.

E. H. (Stony Stratford).—The address of the Motor-Car Club is 40, Holborn Viaduct, E.C. (C. H. Moore, Esq., Secretary), and the Self-Propelled Traffic Association is 30, Moorgate Street, E.C. (Secretary, Andrew W. Barr, Esq.).

GIÖVIK STÖBERI (Norway).—(1) You should communicate with any of the following firms :—New and Mayne, Palace Chambers, Westminster ; Daimler Motor Company, 219, Shaftesbury Avenue, W.C. ; E. J. Pennington, Motor Mills, Coventry ; Great Horseless Carriage Company, Coventry ; C. Oppermann, 2, Wynyatt Street, Clerkenwell, E.C. ; Anglo-French Motor Carriage Company, Digbeth, Birmingham ; &c., &c. (2) Desired form for signature has been duly forwarded you.

S. STREET (Northampton), W. H. PICKARD (Walton), J. POTTER (Dublin).—The address of M. Serpollet is 13, Boulevard Malesherbes, Paris, and for England all information can be obtained from G. Hopkins, Esq., 30, Parliament Street, London, S.W.

MORGAN AND CO. (Tamworth).—The address of Atkinson and Philipson is 27, Pilgrim Street, Newcastle-on-Tyne, and that of Thornycroft and Co. (the Steam Carriage and Wagon Company), Homefield, Chiswick.

W. A. M. (Stantonbury).—We can only suggest your writing direct. We are glad to know that you are satisfied that you have obtained a successful motor, and should you prove it by practical tests, you would have no difficulty in getting a first-class firm to take up its manufacture.

W. J. P. R. (Falmouth).—(1) The addresses you require are :— M. Serpollet, 13, Boulevard Malesherbes, Paris ; The Woleseley S. S. Machine Company, Alma Street, Birmingham ; and E. J. Pennington, Motor Mills, Coventry. (2) Your regular stockbroker can procure you what you want, in all cases at a very considerable discount. The published quotations are to a large extent nominal.

E. W. (Brighton).—We think it will be some little time before Serpollet steam carriages will be made in England, although a special Company has been formed, we believe, for the sole purpose of utilising the system on tramways. No doubt carriages will follow. The French factory, we understand, is so full of orders that you would experience difficulty even in getting one direct from France.

THE MOTOR-CAR COMPETITION.

BY the time these lines are in print everyone concerned will be fully aware that the competition promoted by our contemporary, *The Engineer*, has proved abortive ; there has been no competition. Nearly two years ago, or, to be exact, on July 5th, 1895, our contemporary offered prizes to the amount of 1,100 guineas for the best self-propelled road vehicles which fulfilled certain conditions. These conditions were drawn up by three engineers of the highest professional standing. In deference to the wishes of manufacturers and engineers the trials were postponed from the date of trial originally fixed till the early days of the present month, when five automotors out of seventy-two entries put in an appearance, and on examination by the judges none were found to come up to the standard of excellence laid down by them. The projected trials were, therefore, abandoned, and it has gone forth to the world that British engineers cannot yet solve the problem of horseless traction. We, no less than our contemporary, regret the result, and no amount of special pleading on our part, even supposing we were disposed to indulge in it, can alter the facts of the case. We would, however, ask the unbiassed reader to carefully bear in mind what these facts are.

On referring to the conditions of the competition published in our supplemental number on 28th ult. it will be seen that the points of excellence to which the judges would give particular attention to included—

(*a*) Distance run without taking or receiving supplies of fuel, oil, gas, electrical or chemical materials or electrical current, or of any agent employed for actuating the motor. Freedom from stoppages for repairs, adjustment, or for oiling, or any other purpose or cause.

(*b*) Suitability of design and excellence of workmanship, not only of the actuating machinery but of the carriage.

(*c*) Safety.

(*d*) Simplicity, durability, accessibility, and facilities for repairs, absence of offensive smells, and of excessive vibration.

(*e*) Time occupied in getting to work and ease of starting.

(*f*) Speed—up to 10 miles per hour—and hill climbing.

(*g*) Completeness of control by, and certainty and decision of, steering and steering gear, and efficiency and durability of brakes and brake gear.

(*h*) Weight of carriage and motor machinery and appliances.

(*i*) First cost and — to a limited extent — the cost of working.

(*j*) General efficiency.

How long, may we ask, did it take to bring the railway locomotive to attain anything like the above degree of excellence? And even in the latest types of locomotives is there much evidence of "simplicity" in, say, a "Webb" compound, fitted with Joy's or Walchaert's gear? Is a locomotive free from "offensive smells"? Or even go further, does the fœcal matter of horses constitute a particularly grateful and sweet-smelling savour that a motor should be damned because at times it may emit the fumes of unburnt petroleum? Is a locomotive, too, so free from vibration? Is it perfectly "safe"? Does it not at times "jump the track," and do not sparks from it set fire to hayricks? While, is not the shriek of its whistle in towns one of its most objectionable features? Does it not, too, require a most expensive roadway, and is it not a most wasteful and uneconomical heat-engine? Do we, therefore, ostracise the steam locomotive? Not a bit.; because it is a general, if imperfect, public convenience. Similarly, we cannot reprobate the motor-car because it does not at present possess those points of excellence which are only partially attained in the steam locomotive. In both, the question is not—Is this a perfect machine? but, Shall I, as a trader, obtain any advantage in using either in preference to horse-drawn vehicles? If public opinion is so tolerant of the frailties of the steam locomotive, surely we ought to regard with a benevolent and forgiving spirit the lapses from the path of strict mechanical rectitude (as expounded by our contemporary's judges) of the younger and, therefore, immature motor-car in the sure hope that with greater experience existing imperfections will be remedied, and any tendency that may be evinced by the motor-car to prance wildly and unrestrainedly about the country, a danger and a nuisance to the public, will be eradicated under the chastening influence of the law. Naturally enough the collapse of *The Engineer* competition has been received with a chorus of cacaphonous concatenation by the Press of "We told you so," "There is no practical road locomotive," "The horse is still the best motor," and so forth and so on. It is, of course, useless to tell those who thus jump at conclusions that there has been no competition ; but to argue, as does *The Engineer*, that because there has been no competition, *therefore*, there is no motor industry in this country, is not only illogical but utterly at variance with the truth. We could mention at least a score of firms of repute engaged in the design and manufacture of motor-cars intended not so much for pleasure purposes as for the requirements of trade. At least three firms have evolved motor-carriages for commercial uses which, in spite of their not complying with all the conditions of *The Engineer's* competition, are yet in every way practical machines. We refer to the carriages of Messrs. Thornycroft, of Chiswick, and those of the Liquid Fuel Company, of Cowes, and of Messrs. Atkinson and Philipson, of Newcastle. So far as our observation goes, we should say that the principal and only serious objection to each is that a skilled driver is necessary; or perhaps we should say that some intelligence and knowledge of machinery is requisite on the part of the driver. We believe this remark applies to the handling of automotors of every description, including locomotives. No doubt this was felt to be a sound argument against the use of the early locomotives, just as the probability of "coos" getting on the track was an absolutely convincing clincher urged against their use. The public, however, required locomotives, and was content to take the risk of the stranded "coos." Similarly, if it wants automotors—and it does want them badly—it will not mind a few imperfections, and there will be no lack of competent drivers.

Our contemporary also asserts that "there is no such thing as a thoroughly satisfactory self-propelled vehicle." As we have before intimated that there is no such thing as a thoroughly satisfactory railway locomotive, we need not further labour the point. We might, however, say that there is no thoroughly satisfactory battleship or lifeboat; it all depends upon the point of view. Ruskin, we think it was, called the locomotive a "devil," or something equally expressive. This, no doubt, is very shocking to the feelings, say, of Mr. Aspinall or Sir F. Bramwell, who regard that motor as the triumph of mechanical engineering. Be this as it may, we—all of us—may rest assured that the demand for cheap internal transport must be met, and the automotor van is the only possible solution for crowded cities. In its present state it may not be "thoroughly satisfactory." What is? It can be improved. In the meantime we must take it as it is, so long as it enables us to effect a saving in the cost of transport. It has taken over half a century to produce a fairly satisfactory locomotive; but to evolve an almost perfect dynamo did not require fifteen years. With so much cultivated intelligence at work on the automotor, as we know is the case, we may reasonably expect that within a very few years the drastic conditions of *The Engineer* competition will be more than satisfied.

We sympathise with our esteemed contemporary over the failure of its well-intentioned plans, but considering the very short time that has elapsed since the legal restrictions affecting the industry have been withdrawn it would seem hardly reasonable to expect all at once the evolution of the "thoroughly satisfactory" automotor. We would say to our contemporary: Make your conditions a little less rigid and try again in a year's time.

We would specially direct the attention of our engineering readers to the advertisement which appears in the present number, in which £100 is offered for working drawings of a steam tractor. Without, of course, divulging the name of the firm advertising, we may say it is one of high standing, and the designer who succeeds in gaining this prize will also probably establish a valuable connection.

FIRE-ENGINES.

One of the features of the Jubilee proceedings will be a Review of the Fire Brigades by the Queen at Windsor. One hundred Brigades will attend, and the total force will be 1,000 men, 66 engines, and 127 horses. As a review or exhibition of an inefficient, uneconomical, and very costly method of road traction it will be no doubt interesting. As showing how lamentably slow we are to adopt better methods, it may be mentioned that when the Queen was about a quarter of a century younger the fire engines of that time differed but little, if at all, from the present accepted type, and they were then as now drawn to the scene of their employment by horses with the usual accompaniment (as now) of vociferous and raucous cries rendered necessary by the noise made by the sledge-hammer action of the horses' feet. When this review takes place we are afraid that Her Majesty will be horribly bored by the ancient spectacle. While on this subject we would ask, How is it that the London County Council, as the principal fire extinguishing body in the country, still adheres to horse traction? Is it in accordance with modern ideas of Municipal Progress that an inefficient and costly system should be maintained when a better one is at hand? Or is it that the technical talent employed by the L.C.C. is not so conversant with what is being accomplished in the matter of road traction as is desirable? Accepting as we do the *dicta* of such distinguished authorities as Sir David Salomons and Mr. Worby Beaumont, we cannot understand how it is that at the close of the nineteenth century a light steam pumping plant has to be dragged about by horses, and this by a municipal body which is supposed to be "smart" and "up to date." As our remarks will no doubt be read by many members of the L.C.C. we will amplify them in order to show what might be effected. In each fire station we would place a "thermal storage" plant; this would merely be a moderately large low-pressure boiler, that would suffice for all purposes of lighting, heating, and cooking for the station and the staff. The fire-engines would consist of a water-tube boiler of the Yarrow or Thornycroft type, supplying steam to a suitably designed engine, which could act either for locomotion or pumping. Under idle conditions the boiler would remain empty; on a "call" being received, hot water would be injected into it and the fires started: the fuel being of course petroleum. In a few minutes, or at any rate in not more time than is at present taken to "start the wagon," there would be steam sufficient to propel the engine at a speed of not less than 10 miles per hour. The engines would of course be fitted so as to work either as simple expansive engines or compound. As the steam pressure increased so would the speed, and on arrival at the scene of the fire we should have a pump ready for work actuated by a motor necessarily about twice as powerful as the present ones. As regards weight this should be certainly less by 25 per cent. than the most modern fire-engine (weight of horses included in the latter). The first cost would be greater by perhaps the same amount, but the annual cost of maintenance would be ridiculously small. Of course in this, as in all similar problems, Kelvin's "Law of Economy" applies, and our proposition is a matter of unquestionable demonstration. Those then that will take part in the Jubilee Fire Brigade Review may reflect that they are by no means exhibiting an "up to date" show. For our part we would just as soon see an exhibition of four-wheeled cabs, and should derive about as much instruction from the one as from the other. Notwithstanding the absence of anything like scientific progress on the part of the Fire Brigade of the L.C.C., which is all the more to be regretted as it deters other municipal bodies from advancing with the times, it is satisfactory to know that in the United States horse haulage for fire-engines is being abandoned in favour of self-propelled vehicles. Since the foregoing was written we have had the advantage of a conversation with a leading manufacturer of fire-engines who assures us that he has had several inquiries from municipal bodies for automotor fire-engines, fire-escapes, &c. Some experiments are also being carried on at Croydon under the local authorities with motors, &c., for this purpose. So after all some progress is being made in replacing the noisy, excitable, nervous, sledge-hammer horses by other and more efficient means of locomotion.

THE DAGNALL MOTOR.

This motor, which we illustrate below, is of considerable interest, the designer, Mr. Dagnall, departing from ordinary practice in several important points of detail.

He considers the use of *variable* speed gear a mistake, and in place provides a motor which will run at a variable speed, and develop, under all conditions of running, sufficient power for the work.

His calculations of the power required are not based on the horse-power developed by the engine, which on consideration will be seen to be inaccurate, but on the tractive force necessary to propel the carriage, which he finds to be one-third of the weight of the car (720 lbs. per ton) under the worst working condition.

His engine is therefore constructed to develop great power on emergency, while it may be regulated to produce any power from zero to the maximum without the use of the ordinary hit-and-miss governor device. The motor derives its power from ordinary lamp oil, and runs at the moderate speed of 300 revs. per minute.

No flame burners for heating or igniting are used, as he considers a lamp burning on the carriage far more objectionable and dangerous than even motors using light oils.

We hope to illustrate the motor fully at an early date.

The Dagnall Motor.

We regret to announce the death of Mr. Joseph Ruston, head of the well known Lincoln engineering firm of Ruston, Proctor, and Co. He represented Lincoln in Parliament as a Liberal in 1884 and 1885, but split from the party on Home Rule and retired. His decorations were the Cross of the Legion of Honour and the Order of Osmanieh.

BUSINESS NOTES.

The London Motor Van and Wagon Company have opened a showroom at 86, Chiswell Street, E.C., and are ready to take orders for immediate delivery.

Barges Propelled by Electric Motors.—The Clayton Foundry Company have received the order from Messrs. Lever Brothers, of Port Sunlight, to supply two motors of the enclosed type, of 40 horse-power each, to be driven from accumulators, for a cross-river barge.

An interesting example of the enterprise of Manchester business men was, according to the *Manchester Courier*, given last week in that city, when Mr. J. Burgess, the proprietor of Sutton and Co., the well-known carriers, launched a motor van on the city. The van is a light one, and was run as an experiment, with a view to its general adoption. It is constructed to carry half a ton. It proceeded through the principal streets of the city, thick with traffic, at a comfortable pace; and in the hands of Mr. G. Foster Pedley, of the Daimler Motor Company, proved of easy guidance through the congestion as any horse, while more obedient to the touch, and not at all restive. After going through the town, it set off, through the country, to Cheadle Hulme. It took the country roads at a more rapid pace, getting up to 12 miles an hour, and running quite as easily, though iron-tyred, as the average four-wheel cab. The motion was easy, the speed good, and the steering perfect. Mr. Burgess occupied a seat in the car, and tested its utility for parcel delivery purposes. All experiments, such as sudden stoppages, were highly satisfactory. If when in regular use the van proves as successful it will undoubtedly revolutionise the parcel delivery business. It is a Daimler car, and has been built at Coventry. It travelled by road from Coventry—a distance of 109 miles—in 13 hours, exclusive of stoppages for refreshments. The van is driven by a four brake horse-power Daimler motor. A supply of oil sufficient for a run of 60 miles is carried. Messrs. Sutton intend to make a general use of motor power for the locomotion of their vans, which will mean the retirement of 230 horses in Manchester alone.

LONDON can hardly be regarded as behind Manchester in using motor-vans practically. Messrs. Carter, Paterson, and Co. have now for some little time been using several light express parcel vans for town delivery. They look exceedingly neat and business-like as they glide along amongst the general traffic, and as far as we can see, horses absolutely ignore their presence. One thing we can personally vouch for, whether it be chance or otherwise, since this firm has been using these motor vans they have secured several regular and important deliveries which hitherto have been in the hands of other carriers.

MOTOR-CAR DESIGNS.

THE Worshipful Company of Coach Makers and Coach-Harness Makers' regular Exhibition of Prize Drawings is now on view at their Hall, in Noble Street, near the General Post Office; the principal prize offered, we are pleased to see, being in Competition No. 4, for designs of a self-propelled Light Motor Pleasure Carriage, to convey two or four persons—side elevation —half-front—and half-back—on two or more sheets of paper, of a uniform size, 2 feet 6 inches by 2 feet—scale 2 inches to the foot—details of mechanism 6 inches to the foot. The copyright of any new design gaining a prize remaining the property of the winner of such prize.

1st Prize.—The Company's Silver Medal and £20, given by the Worshipful Company.

2nd Prize.—The Company's Bronze Medal and £10, given by the Worshipful Master (Col. John Wm. Lee).

Although it is very satisfactory to note that these competitions are only open to British subjects, it is very disappointing to find the drawings sent in are not of sufficiently novel a character to justify the judges (composed of the Master, Wardens, and the members of the Company's Standing Committee), in awarding a prize to either of the two competitors. Messrs. Joseph and William Graham (aged 17 and 20), of Gateshead, send in a smart-looking four-wheeled electric dog-cart, which is provided with special facilities for steering and turning. In the elegant design for a vehicle of the wagonette type by Mr. Matthew W. Henderson (aged 21), also of Gateshead, all suggestion of the motive power to be used is absent, which is a drawback, as the very essence of a design should be to provide for the special machinery, &c., with which it is intended to propel the vehicle. This competition, however, is a move in the right direction, and no doubt next year, with the same inducements held out by the Company, there will be a much greater number of entries, including, we hope, some drawings of sufficient merit to carry off both prizes offered. It is curious to note both the present competitors hail from the same town, and are associated in business with Messrs. Atkinson and Philipson, the well known carriage builders of Newcastle-on-Tyne.

THE BAZIN ROLLER BOAT.

IN an article in our last number dealing with this vessel, we expressed grave doubts as to its fulfilling the expectations of its designer. Since then the trials have taken place, and the result is as we anticipated. Instead of the 30 knots, but 12 were obtained.

NOTES OF THE MONTH.

"VAGABOND," the well-known north-country journalist, is hardly, to judge from his writings, the kind of person to indulge in very optimistic views or one likely to pour himself out in fulsome panygeric on any new thing. He has, however, recently devoted his attention to the very excellent automotor carriage designed and built by Messrs. Atkinson and Philipson, of Newcastle-on-Tyne, and has recorded his experiences in the *Newcastle Daily Chronicle* of the 24th ult. We are glad to learn from such a distinguished layman that the automotor in question meets with his warm approval. "Vagabond" displays quite a critical appreciation of the whole problem of horseless traction, and does not attempt to minimise the disadvantages or to unduly appreciate the merits of the subject. If all or most critics would display the same judicious attitude as "Vagabond," manufacturers of automotors would have little cause for complaint. We should say that the motor-car upon which "Vagabond" made a pleasant run was intended to compete in *The Engineer* competition, but after completion it was found slightly in excess as regards weight. It has, however, been most thoroughly tested on the steep gradients of Newcastle and its vicinity, about the worst district for either horse or horseless traction that we know of, bar parts of Wales and Scotland; and has given every satisfaction to the inhabitants of a town all of whom are, not even excepting the ladies and children, expert critics in machinery, and if a motor-car will suit Newcastle it will suit any town. We congratulate Messrs. Atkinson and Philipson, and also their engineers, Messrs. T. Toward and Co., on their success, and we hope to have the duty of recording many similar successes.

LAST month we drew attention to a proposed race that was being inaugurated by the *Irish Field*. We have not heard anything further of the matter, and it would be interesting to know whether the projected race is to be abandoned. Really, we think, after *The Engineer* fiasco, that competitions which *do not* turn out to be competitions in any sense of the word are useless, and only serve to hinder the development of the use of motor-cars.

AUTOMOTOR-cars, if not vehicles plying for hire, are now allowed to enter the Royal Parks just as other private carriages are.

THE automotor has penetrated to Arran, N.B.

IN the prospectus of Messrs. Thomas Tilling (Limited), of South London, it is stated that "the directors do not at present contemplate the adoption of motor-cars for any portion of their business, but power has been taken in the memorandum of association which will enable them to introduce any present or future automatic inventions when, if ever, they may become of practicable utility." Messrs. Tilling have a stud of 3,386 horses.

A FEATURE of the Petersfield election was the employment of automotors in the shape of traction engines for the conveyance of the "free and independent" electors to the poll. An automotor is at all times an instructive object, and its presence in a country village has a distinct educational value; we are, however, not aware that it has ever before been used for the propagation of great political truths or falsehoods as the case may be. It would be interesting to know the opinions of leading politicians as to the moral influence of an automotor in swaying an election.

ONE of the most interesting processes carried out in Nature's laboratory is the manufacture of petroleum. How this is accomplished is as yet unknown to us. Mendeleef, the great

Russian chemist, thinks petroleum of mineral origin through the chemical interaction of steam upon metallic carbides, assumed to exist at great depths. Engler has recently demonstrated experimentally the artificial production of hydrocarbons of the paraffin series in the destructive distillatiou of animal fats under pressure. This interesting fact greatly strengthened the view of many chemists, that natural stores of petroleum had their origin in the decomposition of animal remains under peculiar heat and pressure conditions. Sadtler now supplements the work of Engler by demonstrating that petroleum hydrocarbons are produced in the destructive distillation, under pressure, of linseed oil, a product of vegetable origin. The results obtained by Sadtler, therefore, would permit the conclusion that native petroleum was derived from the decomposition of vegetable remains, and reopens the whole question.

AN air pump worked by the motor is being introduced for the purpose of inflating the tyres of motor-car vehicles. We also hear that carbonic acid gas is to be tried for this purpose. The former seems to us to be the preferable method, as in the latter it would be necessary to carry about a tube of the compressed gas—not a desirable thing to entrust to the average driver to handle, because of the great weight of the flask and the risk of fracture uuder pressure.

OXILIN is the name of a new substitute for indiarubber. It is said to be impervious to mineral oils and a temperature of 400° F., while its cost is low.

USERS of motor-cars will be interested in learning that, as the result of numerous tests, the best paint is graphite paint. Professor Spennrath, director of the Technical School of Aix-la-Chapelle, lately won the 2,000 dollars prize offered by the Society for the Advancement of the Industrial Arts for the best essay on protective paints. The prize was not won simply by theoretical demonstrations, although the professor furnished scientific reasons also, but by most carefully conducted practical experiments with various pigments and oils, extending over several years' time. The results demonstrated that a properly-made paint of graphite and boiled linseed oil is the most suitable for protecting structural ironwork, roofs, &c., exposed to the destructive agencies of heat, cold, storms, &c.

A MR. GUATTARI proposes to increase the efficiency of steam boilers by adding to the water a liquid composed of carbonic acid gas and ethene chloride, better known as "Dutch liquid." The carbonic acid gas is generated in the ordinary way in a suitable closed receiver, which is provided with a stoppered mouth by which the Dutch liquid is introduced. The proportions which are found suitable are :—Water, 28 litres; whiting, 7 kilogrammes; acid, 2 litres; ethene chloride, 140 grammes. The resulting compound gas passes off through a pipe (provided with a check valve) and is injected into a saturator filled with water. The water saturated with two or three times its own volume of the compound gas is forced by a feed pump into a steam boiler. Here it is evaporated and does work in a steam engine, from the exhaust of which it passes into a surface condenser, wherein condensation takes place without separation of gas. The condensed solution is then forced back by an air pump into a receiver at atmospheric pressure, from whence it is pumped again into the saturator. We should like to see this process in operation or to hear of reliable tests having been made of it.

"ANTI-TRAM," writing to the *Morning Post*, strongly advocates the employment of motor-carriages. He says:—It is to be hoped that the accession of the motor-carriage may in some ways reduce the frightful plague of tramways, which, having bought their way into all Continental towns, are rapidly making the roads impassable for other vehicles. How far one form of traffic has a right to monopolise three-quarters of the road to the utter detriment of thousands of other vehicles of every description is a question too long to discuss. They have bought their way, and money is a vehicle that runs smoothly. They have taken possession of the roads, which ought to be free to everyone, under pretence that it is for the good of the public. It may be good for the company; it is certainly no good for carts, cabs, fiacres and carriages, &c. The sooner the motor-cars come into force and open the roads again to the public the better. All success, say I, to the motor-car. I have personally no objection to trams in their own place, but I do contend that they have no right to place rails on the crown of the causeway. In their own place, with roads adapted for them, they may be useful enough.

A LOCOMOTIVE of a novel description has recently been constructed at the Baldwin Locomotive Works, for the New City branch of the New Jersey and New York Division of the Erie Railroad, running from Nannet to New City, a distance of about four miles. The Erie Company runs a few trains between the terminal points every day, but the passenger and freight traffic is very light, and the company felt the requirement for a motor-car which will do the work that is now being done by a locomotive, a baggage and smoking-car combined, and a passenger car, which, altogether, require the services of five men. The motor has been built according to the plans of the Kinetic Power Company, and weighs 13 tons. The length over all is 26 feet. It resembles in appearance an ordinary street-car, and has a seating capacity of 20. The driving wheels are 31 inches in diameter. A preliminary test showed that in running a distance of 20 miles but 30 gallons of water were used. According to the *Railroad Gazette* the water is carried in a tank beneath the car body, but enough space is left in this tank for the accumulation of a small amount of steam. Before leaving the car-house the water in the tanks is heated until the pressure of the steam is about 200 lbs., but the steam is used in the working cylinders at a much lower pressure. In order to keep up pressure a fire in a small fire-box is kept burning in one end of the car in order to generate a constant supply of steam, keeping the pressure in the tank from 150 lbs. to 200 lbs. per square inch.

AT the recent Royal Society soirée, Sir A. Noble, K.C.B., showed an apparatus for ascertaining the duration of an explosion, pressure developed, and rate of cooling of products of combustion. The apparatus in which the explosion takes place was not shown, as it is too weighty. It is a cylinder into which the explosive is inserted and closed up. The chamber, however, is not entirely filled. Into its mouth is screwed a powerful pressure-gauge, comprising a piston and coiled spring. Connected with this piston is a lever which moves a pencil over a "card" on a large rotating drum. By aid of a chronometer and another pencil seconds are marked on the paper, and by this means there is prepared a diagram in which the two elements are time and pressure. To check this diagram a second is made on a smoked cylinder. In this the line is not continuous, but a succession of dashes are made by the pressure-gauge lever moving over electric contacts, and so setting a series of electro-magnets into intermittent operation. To minimise the effects of inertia, the pressure-gauge can be set not to move until eight or nine tons has been attained. A number of curves were shown during the evening. In these the pressure required a perceptible fraction of a second (cordite being the explosive) to reach the maximum, and several seconds to fall to about one ton, when it remained stationary.

THE well-known Paris correspondent of the *Daily Telegraph* writes to his paper on the prospects of motor-cabs in Paris. He says:—"Although the public does not seem to take very kindly to the idea of starting motor-cabs, the manager of the Company which is assuming the initiative in the matter is extremely sanguine as to the result of the bold experiment. In all likelihood, electricity will ultimately be adopted exclusively by the Company in preference to petroleum, but each is to have a fair trial. As for the objection that the present drivers will be unable to hold their own under the new system, the manager makes light of it, and says that in the course of three or four days the men will be quite in their element with the motor-cabs, models of which, by the way, were to be seen at the Cycle Exhibition held at the Palais de l'Indnstrie some time ago. There is one decided advantage in the contemplated change, and that is that the pleasure of a lounge in the streets of the gay capital will not be marred by the spectacle of the brutal treatment to which cab-horses are so frequently subjected."

FOR crass ignorance of law and a bucolic attachment both to the "whisky of their forefathers" and old-world ideas and prejudices, commend us to the provincial magistracy. Puffed up with the importance of affixing the shibboleth "J.P." to their names, they as a rule administer after a fashion the common law of the land. For "drunks and disorderlies" and slight "assaults" these magistrates, usually an illiterate class of persons, may fulfil their part with more or less—usually less—ability. *Truth* has for many years found the provincial magistrates an unfailing source of interesting copy. Their ways, their sentences, and their prejudices really form a complete branch of human science. It seems that it will also be our duty to discuss the Great Unpaid, because the prejudice and absolute illegality that many of them exhibit in their dealings with motor-cars is fast becoming a public scandal, and unless these ignorant J.P.'s manifest a little less prejudice and a good deal more justice we shall have to bring the matter before the notice of the Lord Chancellor. Even J.P.'s can be removed, and, as Koko says, "I have known it done." A gross instance of the prejudice with which many of these J.P.'s regard the automotor has lately occurred in Liverpool (see our Legal column), where a magistrate told a defendant that he had no business to go shopping in a motor-car. It makes one positively boil to read such an insolent observation, and we trust that the defendant will use every means to obtain an apology. The case ought to be brought to the notice of the House of Commons, the Lord Chancellor, and the Home Secretary.

COMPRESSED air is to be tried on the Manhattan elevated line, the Hardie system being adopted. In general appearance the machine much resembles the ordinary steam locomotive. The space usually occupied by the boiler, however, is taken up by the storage tanks for the air and by the reheater. On this locomotive the air is stored in 36 tubes of Mannesmann rolled steel; they are 9 inches in diameter and of varying lengths, from 13½ to 21 feet. The charging pressure is 2,000 lbs. per square inch. The air is led from these tanks through the reheater, in which water is stored at an initial temperature of 350° F., and after passing through three reducing valves is admitted to the cylinders at a pressure of 150 lbs. The working cylinders are 13½ × 20 inches. The American Air Power Company, which controls the Hardie patents, has erected a compressing plant for charging. The locomotive has been delivered, and is now undergoing its trials. We shall probably refer to them in our next issue.

Automotors for Small Boat Propulsion.—In our present number we give excerpts of some interesting and instructive papers that have recently been contributed to the Institution of Civil Engineers and the Institution of Naval Architects. The standing of these bodies is guarantee enough of the excellence and soundness of the views expressed. We would particularly direct the attention of canal-boat owners to the advantages of the steam turbine. We can speak of this motor from personal experience, having worked one of the earliest ones.

REVIEWS OF BOOKS.

"Manuel Pratique du Conducteur dAutomobiles." Par PIERRE GUÉDON, Ingénieur, Chef de Dépôt principal de la Traction mécanique à la Compagnie Générale des Omnibus de Paris, et YVES GUÉDON, Ingénieur civil. Préface de M. EMILE GAUTIER, Directeur de la *Science Française*. (J. Fritsch, 30, Rue du Dragon, Paris.) Price 5 francs.

WE have in this work an excellent treatise on automotors by two writers who are in every way well qualified for their task. In the first part, which treats of steam motion, all the best types are fully illustrated and described in some detail. The authors are apparently not very conversant with motors of types other than those usually met with on the Continent. Thus in the present section the Dion et Bouton, the Serpollet, the Weidnecht, the Bollée, Le Beant, and Scottie systems are dealt with, but nothing is said about the varions British types of steam automotors. Surely such distinguished engineers as the writers of this work must be conversant with our water-tube boiler practice? After describing each motor, the authors devote considerable space to a discussion of the tractive data, and much useful information is given under this head. This is followed by a discussion of the advantages of the compound engine and the method of calculating power; our authors state that the greatest *practical* effort of a machine such as a steam-motor is only 63 per cent. of the theoretical. We should suppose that this is rather too high an estimate. The second part contains an equally well-written account of gas-engines, and singularly enough the patents owned by the London Gas Traction Company come in for a good deal of description. The authors, after discussing the *pros* and *cons*, conclude that gas traction is very suitable under certain conditions. No other system than that of the Gas Traction Company is described. In the third part petroleum motors are exhaustively dealt with, and our authors evidently think that there is a future for petroleum. All the well-known French oil motors are described, but nothing is said about the British oil-engine. We do not think that our French friends will deny that Priestman, Tangye, and others, have done a good deal to improve the oil-motor. We see no reference either to the Capitaine motor. A very short chapter suffices for electric motors, but only one or two types are described, and we fear the authors are hardly aware of recent advances in the direction of reducing the weight of cells and improving them generally. The electric motor described can hardly be said to represent the best practice. This chapter is succeeded by a very useful one on motor-car accessories; in this one learns French practice as regards constructive details of wheels, tyres, &c. There is a good account of petroleum, and how to test it, and the book concludes with a list of the duties levied on automotors by the various Continental States. Altogether, the work is well written, and is indeed a high-class one in every respect. We have perused it with pleasure and can recommend it; the illustrations are good, but might be better, and we should have preferred them on a larger scale.

"Aggenda du Chauffeur." Édité par *La France Automobile*.

THIS is a handy little pocket-book, arranged as a kind of "log," in which to record motor-car performances. We think something similar might be produced for use on this side of the Channel.

An Essay on Motor-Cars.—A schoolmaster, having set his class the task of writing an essay on motor-cars, found one scholar (the son of a horse-trainer) had excelled for brevity. It ran as follows:—"Motor-cars is beastly things, and stinks." He said he had not written more, as his father told him the less he knew about them the better.

President	Sir DAVID SALOMONS, Bart.
Secretary	ANDREW W. BARR, Esq.
President of the Liverpool Centre	The EARL OF DERBY, G.C.B.
Hon. Local Secretary	E. SHRAPNELL SMITH, Esq.
Semi-Official Journal of the Association	THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

Motor Vehicle Exhibition and Competitive Trials.

IT will be remembered (*vide* report in THE AUTOMOTOR for May) that last month the Liverpool Branch of the Self-Propelled Traffic Association announced their intention to organise an Exhibition of Motor Vehicles, to be held some time in the spring of 1898, by which time there is reasonable ground to expect that makers of both light and heavy types will be in a position to take part.

We now have pleasure in announcing that the preliminary arrangements in connection with the above will be ready for publication by the end of June. Persons desiring to be provided with copies of same are requested to apply to Mr. Shrapnell Smith.

The Objects of the Self-Propelled Traffic Association.

IN a letter to the *Manchester Guardian*, Mr. Shrapnell Smith, the Hon. Local Sec. of this Association, says:—"Sir,—I must take exception to the statement to the effect that this Association proposed to run vehicles in opposition to the Ship Canal. This branch of the Association has been organised for the 'scientific investigation of self-propelled vehicular and locomotive road traffic,' and has no intention of entering as a body upon any commercial undertaking whatever."

Royal Agricultural Society's Trials.

MR. SHRAPNELL SMITH had arranged for the vice-presidents and members of the Liverpool and District Centre to visit Crewe on the occasion of these trials, but on reaching the Station Hotel on Wednesday afternoon, the 9th instant, he learnt from Mr. Frankish (Chairman of the Implement Committee) that only one car was likely to take part in the run.

Under the circumstances, it was thought advisable to cancel all arrangements, which was accomplished by the despatch of a batch of telegrams to the members who had signified their intention of following the trials on the Thursday. On the latter occasion Mr. Shrapnell Smith represented the Association. Naturally, much disappointment has been felt and expressed in Liverpool and Manchester that these trials have not served to produce a vehicle suitable for heavy traffic, but, at the same time, it is known that the problem is engaging the attention of many engineers, and it is hoped that before long something tangible will be evolved.

THE DANGERS OF HORSE TRACTION.

FEW situations are more dangerous than that of being in a vehicle drawn by restive horses. In spite of his docility and other good qualities the horse is yet one of the most nervous of animals, and when excited by fear, or in any

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and another, it is feared, will have to be killed. As the season advances such accidents will become numerous—at least judging from the experience of former years; with motor-cars they would be impossible. In this respect—not to mention others—the motor is unquestionably the safer mode of travelling.

THE POPE MANUFACTURING COMPANY'S ELECTRIC PHAETON.

WE have received from the Pope Manufacturing Company, of Hartford, Conn., U.S.A., a description of their Electric Phaeton, which, we understand, has already become very popular in the States. Unfortunately, the motor-car industry in America, as with us, has had to suffer from the injudicious booming of crude and unsuitable types of motor-cars, and hence it is only by combining the best design and workmanship, together with handled with ease and safety by anyone who is not altogether devoid of common-sense. The battery can be readily charged from any 110-volt circuit. The total weight of the car complete is 1,900 lbs., and one charge suffices to traverse a distance of from 30 to 35 miles, at speeds of from 10 to 12 miles per hour. The cost of this motor-car complete is, we understand, 3,000 dollars. It is interesting to note, and it may be taken as a guarantee of excellence, that this car was designed by and under the superintendence of Mr. H. P. Maxim, the son of the well-known ordnance engineer who resides on this side.

DOIGS OF PUBLIC COMPANIES.

Standard Weldless Tube.

The statutory meeting of the Standard Weldless Tube and Cycle Components (Limited) was held on May 17th.

The Chairman (Colonel Lewis Vivian Lloyd) gave an outline of the work which had been done since the registration of the Company. He stated that since the issue of the prospectus Chillingworth's patents had been all assigned to the Company, to the satisfaction of the patent agents and the solicitors of the Company. The business of the Standard Tube Company, carried on by Mr. J. W. Fitter, had been taken over by the Company, and more land had been acquired on the other side of the canal at a small rental. The existing works were in full operation, and they had a considerable number of customers, among which might be mentioned the Birmingham Small Arms Company, Messrs. W. Heath and Company, and Messrs. W. Bown (Limited). With reference to Chillingworth's foreign patents, the Company had been approached by certain persons who were desirous of purchasing these, and negotiations were pending in respect of the American, French, and Belgium patents at very satisfactory prices. The board had secured from Mr. Chillingworth a very valuable patent for the manufacture of the hubs, which was not set forth in the prospectus as part of the purchase.

The "Clyde" Cycle and Motor-Car Company (Limited).

The first general statutory meeting of the above Company was held at the Bell Hotel, Leicester, on June 2nd, Mr. J. F. L. Rolleston, J.P., Chairman, presiding, who explained that the meeting was held in conformity with the Act of Parliament. The Company had every prospect of paying substantial dividends. The works were in full operation, and overtime had been resorted to for months to enable them to cope with the orders on hand. Shares had only been issued for an amount of capital which could be usefully employed.

Leather-Shod Wheel Company.

The statutory general meeting of the Leather-Shod Wheel Company (Limited) was held on May 28th, under the presidency of Mr. C. N. Baker, who said:—This is a meeting called for the purpose of complying with the Act of Parliament, and hardly sufficient time has elapsed to let you know much about the prospects of the Company. All I can tell you is that we have taken a factory at Bow. We have got the engines there, but the necessary machinery for manufacturing the leather-shod tyre is being made abroad, and we hope to receive it and get it in its place in the factory in the course of next month. Meanwhile, I may tell you that in order to keep the factory at work and make some profit we took an order for some 200 cycles, which we are manufacturing there. But, of course, this will not interfere with our other business. I hope that at the end of our first year we shall be able to show you that we can make a profit; at all events, I have every hope that the tyre itself will turn out a great success. Personally, I should very much like to see all our omnibuses and cabs fitted with noiseless leather tyres, which are more durable than indiarubber. I certainly am of opinion that the tyre will meet a great want, and be a great success. We have received a great many sample orders from various railway companies, carriers, and various firms, and as soon as we get the necessary machinery to manufacture them these will be supplied. The machinery that we require no English firm would make, and therefore we had to get it abroad.

Mr. Thurston inquired the amount of capital taken up by the public, and whether it was sufficient for their requirements.

The Chairman. I think it is injudicious to mention the figures, but I may say that we have plenty of working capital The amount subscribed was over £110,000.

Perfecta Seamless Tube.

The first annual meeting of the Perfecta Seamless Steel Tube Company (Limited) was held at the Queen's Hotel, Birmingham, on June 3rd, Mr. G. J. Brodie presiding. The Chairman said the vendor, when the business was taken over, guaranteed that £40,000 should be made in two years, and as a fact they had made more than that on the first year's trading. The prospects for the current year's trade were exceedingly good, and the works were going night and day; and, although they had laid down large additional plant, they were unable to overtake the orders. They had supplied the Admiralty with the tubes for 60 ships now in commission without a single complaint. They were also well in with the War Office and foreign Governments, and strong enough not to fear any competition. The report was adopted.

Peerless Metal and Martino (Limited).

Under the above title a Company has been incorporated with a share capital of £150,000 divided into 60,000 5½ per cent. cumulative preference shares and 90,000 ordinary shares of £1 each.

In addition to the fixed cumulative preference dividend of 5½ per cent., the holders of preference shares will be entitled to one-third of the profits of the Company in excess of sufficient to pay dividends at 10 per cent. per annum on the ordinary shares. They will also be entitled to a preference to capital, and the articles of association provide that no debentures or debenture stock can be created by the Company without the sanction of a resolution of the preference shareholders at a meeting especially summoned and held for the purpose.

The present issue is 60,000 5½ per cent. cumulative preference shares and 40,000 ordinary shares of £1 each.

The prospectus states that the Company has been formed to take over from the Peerless Metal Company (Limited) the old-established nickel and white-metal business for many years carried on by Mr. F. R. Martino, at Princip Street and Lower Loveday Street, Birmingham, which has recently been acquired by them; the valuable British patent under which the now well-known metal "Peerless" is manufactured; the business carried on by the "Peerless" Metal Company at 38, Parliament Street, S.W., and West Ferry Road, Millwall, E.; the valuable freehold property, comprising six acres, situate at Hollywood, and the large range of manufacturing premises erected thereon; the residences adjoining; the leasehold manufacturing premises at Millwall, covering an area of about 38,000 square feet; and also trade marks and trade secrets, formerly the property of Mr. F. R. Martino, whose business was established in the year 1876. Mr. Martino occupies a leading position in the white metal trade, and having agreed to act as director of the Company for a period of five years, it will acquire the benefit of his experience and knowledge. The profits over a long range of years of this business are certified at £3,000 per annum, and, added to this, the total profit for distribution is estimated to amount to £27,600 without taking into consideration any extra profit to be made by the rolling, tube, and drawing mills. Some of the advantages claimed for the "Peerless" metal are its cheapness, its splendid appearance, which is equal to silver, its great strength, durability, and ductability, its purity and uniformity of colour throughout, the latter being unaffected by the atmosphere or sea water, and, finally, the facility with which it adapts itself to being rolled and drawn into tubes, wire, &c. Considering the enormous opening for a first-class metal of this description for every type of fitting and component parts of vehicles, cycles, ships, railway carriages, &c., without mentioning the thousand and one small articles to which it is applicable, the calculations as to prospective profits of the directors do not seem excessive. As we have previously stated, the strength of this special metal is very remarkable, Messrs. David Kirkaldy and Sons having reported that a sheet 30 by 20 by 12 inches, I.W.G., stands a stress of 139,228 lbs. to the square inch, with an extension of 35·1 per cent. in 10 inches.

The purchase price for the business and assets of Mr. F. R. Martino, the freehold and leasehold premises before referred to, the patents, trade marks, and goodwill, has been fixed by the vendors, who are the only promoters, at £130,000, payable as to £80,000 in cash, and as to £50,000 by the allotment of fully paid ordinary shares of that amount.

The list of applications will be opened on Wednesday, June 16th, 1897, and closed on or before Friday, June 18th, 1897, at 4 p.m. for town, and on or before Saturday, June 19th, for the country and abroad.

The information which we published in our last issue regarding the decision of the French law courts against the Welch-Dunlop pneumatic tyre patents has, we notice, already begun to bear fruit, as shareholders appear to be getting very restless and anxious about the value of their property which was so glowingly set forth in the prospectus issued some time back. Some rather pertinent questions are being raised by various correspondents, and "Astley" in writing upon the subject says:—"I imagine most shareholders in the Dunlop Pneumatic Tyre Company (France) (Limited), like myself, think it high time the directors called a meeting and explained how the Company now stands as to the validity of its patents, position, and prospects in face of the recent decision in the French courts. It would also be interesting to know what the 'experts'' opinions are now worth, also the contingent claims upon 'firms who have infringed'; also if the vendors or promoters are likely to come forward and show their generosity out of their immense profits. The prospectus drew attention to the fact that profits were taken over from October, 1895, and gave one to understand they were very substantial profits—yet, in spite of this, although 20 months ago, there is no mention of even a small interim dividend. The sooner the shareholders know exactly how matters stand the better." Which appears to be reasonable. In France they do many things better than in England, and although we are sorry for the unfortunate shareholders, in this case we are inclined to think the decision of the French courts upon the "novelty" of the patents is not a very unreasonable one.

Mr. H. Swingler, of Edgehill, Derby, another correspondent, goes one step further, as he, having been in correspondence with the secretary of the Company, is anxious to act with other shareholders in insisting upon the directors calling a meeting so that they may know the position of affairs. With this object in view he is prepared to co-operate with others, as well as to subscribe towards expenses. Possibly those who were originally responsible for the issue will be able to afford some information at any meeting which may be held, and some valuable points no doubt might be gained by communicating with Mr. A. M. Broadley, at the Midland Grand Hotel, St. Pancras, who, we believe, has a good deal of inner knowledge upon most points involved at the time of the flotation of this and some kindred companies.

The Dutch-Roumanian Petroleum Company at Amsterdam has been over-subscribed 115½ times.

Messrs. M. Samuel and Co. are converting that portion of their business relating to petroleum and its storage and transport into a private limited liability company, under the name of the Shell Transport and Trading Company (Limited), with a paid-up capital in ordinary shares of £1,800,000. No shares will be offered to the public.

New Issues.

For the Month ending June 14th.

Brampton Brothers (Limited).—Share capital £200,000, divided into 15,000 six per cent. cumulative preference shares of £5 each, and 125,000 £1 ordinary shares. Formed to acquire and carry on the business of Brampton Brothers, manufacturers of cycle and motor-car chains, saddles, chain wheels, and other cycle and motor-car accessories, &c. The Company acquire the freehold and leasehold works at Oliver Street, and the freehold works at Chester Street, Birmingham. The prospectus states that the firm employ about 1,000 hands, and that recent additions to the Chester Street works will accommodate 500 more. The net profits from August 1st, 1895, to July 31st, 1896, have amounted to £27,120, and those from August 1st to April 15th last to £28,910, or at the rate of £32,798 per annum. Purchase price £181,500, payable £125,000 by the allotment of all the ordinary shares, and the balance in cash, leaving £18,500 for working capital.

The James Cycle Company (Limited).—Share capital £50,000, in £1 shares. Formed to acquire the business of Mr. Henry William James (trading as Harry James), of the James Cycle Works, Sampson Road North, Birmingham, manufacturers of the cycles known as the James Cycles, also the leasehold manufactories and premises at Birmingham and depôt at Liverpool, the goodwill, machinery, plant, stock-in-trade, and other assets. Purchase price £40,000, payable £16,666 in fully paid-up shares, and the balance of £23,334 in cash.

Brown Brothers (Limited).—Formed to acquire as a going concern the business of Messrs. Brown Brothers, general hardware, cycle parts, accessories, and fittings, lamp, tool, and machinery warehousemen, of Great Eastern Street, London, together with their branch at 24, Passage de l'Opera, Paris, and the business carried on by them at 44, St. Mary Axe, London, under the style of H. A. Knox and Co., and all the assets of their business. Share capital £250,000, divided into 20,000 preference shares of £5 each and 150,000 ordinary shares of £1 each. Purchase price £250,000, payable as to £150,000 in ordinary shares (the whole issue) and the balance in cash.

The New MacGregor Cycle and Engineering Company (Limited).—Share capital £60,000, divided into 25,000 cumulative seven per cent. preference shares, 25,000 ordinary shares, and 10,000 deferred shares of £1 each. Formed for the purpose of purchasing the MacGregor Cycle Company (Limited), now carried on at Nottingham, including freehold factory, lately erected by the vendor company at Apsley Lane, Nottingham, and surplus land, and also all the plant, machinery, and assets of the vendor company. Purchase price £45,000, payable as to £10,000 in deferred shares, and as to £35,000 at the option of the new Company, either in cash or ordinary or preference shares.

Blackpool and Fleetwood Tramroad Company.—Share capital £120,000, in £10 shares. Formed for the purpose of working, by electricity on the overhead system, a tramway from Talbot Road Station, Blackpool, to the borough boundary, and constructing, working, and maintaining a tramroad from the borough boundary to Fleetwood, and a tramway in Fleetwood—altogether over eight miles in length, held by the Company in perpetuity, except the portion in Fleetwood, which may be purchased at the expiration of 30 years, and the line in the borough of Blackpool, which will be held on 21 years' lease from the Corporation. Estimated annual profit, £14,400. Authorised borrowing powers, £40,000.

South Wales Motor-Car and Cycle Company (Limited).—Share capital £5,000, divided into 1,000 shares of £5 each. Formed in December last for the purpose of experimenting with motor vehicles and of acquiring the business of Mr. Josh. Williams. At that time £2,000 of the capital was issued. Since then two depôts have been opened—one at the Docks, and the other in High Street, Cardiff—and this issue is the remaining £3,000 capital, with the object of further extending the business. The Company has secured the sole agencies in the district for the Steam Carriage and Wagon Company (Limited), the New Beeston cycles and motors, &c.

New Companies Registered.

[Under this heading we give a full list of new Companies registered which take power to make, deal, or become interested in any manner in automotor vehicles. We shall be pleased to reply with detailed particulars to inquiries through the "Answers to Correspondents" column. All communications should be addressed to the Editor. The only stipulation which we make is that where the inquiry involves a search of the records at Somerset House—as in the case of information on the subject of the holdings of shareholders—a postal order must be enclosed to cover the Government stamp of one shilling which is charged before a search is allowed to be made.]

	Capital.
Accumulator Syndicate, Ld.	£30,000
Ames Brake Syndicate, Ld. (Guildhall, Northampton)	1,700
Bailey Bros., Ld. (53, Tenby St. North, Birmingham)	8,000
Birmingham Carriage Lamp Co., Ld. (City Lamp Works, Birmingham)	15,000
Blackpool Motor-Car Co., Ld. (Commercial Buildings, Leeds)	10,000
Brampton Brothers, Ld. (Oliver St. Wks., B'ham.)	200,000
Frank Peach & Co., Ld. (48, Holborn Viaduct, E.C.)	50,000
Hewett's Chain-Gearing Syndicate, Ld. (6, Jeffrey's Square, E.C.)	15,000
Hitching's, Ld.	50,000
Hull & Barton Cycle Manufactrg. Co., Ld. (Butt's Rd., Barton-upon-Humber, Lincolnshire)	10,000
Ideal Cycle Syndicate, Ld. (3 & 4, Crooked Lane, E.C.)	10,000
James Cycle Co., Ld. (26, Waterloo St., B'ham.)	50,000
Kear-Appleton Cycle & Engineering Co., Ld. (Redcross St., Bristol)	50,000
Masonoid Silver Syndicate, Ld.	3,000
Messrs. Cross & Mathews, Ld.	60,000
Mulliner (London) Ld. (28, Brook St., W.)	10,000
National Motor-Carriage Syndicate, Ld. (37, Walbrook, E.C.)	30,000
New Macgregor Cycle & Engineering Co., Ld. (Nottingham)	60,000
Peerless Accumulator Syndicate, Ld.	15,000
Perry & Co., Ld. (36, Lancaster St., Birmingham)	800,000
Progress Cycle Co., Ld. (Foleshill, Coventry)	50,000
Robert Bunting & Sons, Ld. (19, St. James' St., Sheffield)	85,000
Thornton Motor Co., Ld. (Worsley St., Hulme, Manchester)	1,000
White, Jacoby, & Co., Ld. (54, Bayham Place, Camden Town, N.W.)	4,000
Yorkshire Motor-Car Co., Ld. (Bradford & Harrogate)	2,500

CONTINENTAL NOTES.

THE "Société Francaise d'Automobiles pour Construire des Voitures sans Chevaux" has recently been formed with a capital of 600,000 francs. M. Gaillardet is director and chief engineer.

L'Autocar advertises for a motor-car which shall carry 1,500 kilos. at a speed of 15 kilometres for 15 hours per day, or, in other words, a motor-car is required that shall have a speed of 9·3 miles and shall carry $1\frac{1}{2}$ tons for 15 hours per day.

IT is said that owing to the death of M. Levassor the business of the Société Panhard-Levassor will be carried on by the former gentleman as sole proprietor, or a public company might be formed. The firm is very busy with orders for its type of motor-car. We are glad to hear it.

"LA SOCIÉTÉ D'ENCOURAGEMENT POUR L'INDUSTRIE NATIONALE," whose address is 44, Rue de Rennes, Paris, offers a prize of 2,000 francs for the invention of a new means for the safe employment of heavy petroleum. ·800 specific gravity safety in the use of petroleum is one of the principal objects to be attained.

A WRITER in our contemporary, *La Locomotion Automobile*, exhibits his Anglophil propensities by signing himself "O'Tom Obile." We had some difficulty at first in recalling to mind such a distinguished family name, but at last we grasped it. Not bad, is it? Next please.

A PUBLIC service of automotors is to be inaugurated from Antwerp to Brussels on lines similar to that which govern light railways in Belgium.

THE Committee of the Automobile Club of Paris has voted a medal to M. Georges Broca, director of the Paris Tramways, in recognition of the great services he has rendered to the cause of automobilism in substituting mechanical traction in place of horse traction. How different with us. Our tramway and 'bus company directors in London are marking time and are waiting, to use their own language, for the production of a "really satisfactory" motor. Everything comes to him who knows how to wait—even (as *The Engineer* would say) a "really satisfactory motor."

THE Vicomte de Champfleur has had a Panhard and Levassor motor-car for three years, and in which he and his wife have travelled more than 3,000 leagues.

IT is proposed to introduce automotor fire-engines for use in Paris. We should think so, too, after the late terrible accident, which, like our London warehouse fires, demonstrated the inutility of steam squirts drawn by horses.

A MAJORITY of Paris cyclists have adopted Saint Cloud as their patron saint in preference to Saint Germain.

THE General Council of La Charente has authorised the establishment of several services of motor-cars to facilitate communication between the various towns.

THE "Concours d'Art Industriel" has not succeeded in effecting any decided improvement in motor-cars. The Competition is, indeed, a failure so far as bringing forth any really practical types of motor-cars is concerned, and hence the three medals were not awarded. Five competitors received money prizes and mention. Really, the Concours had the effect of producing some of the most fearful and wonderful looking things on wheels it is possible to imagine, and even those machines which obtained reward and mentiou are beautiful examples of what to avoid in motor-car work.

La Locomotion Automobile illustrates, rather unkindly we think, these prize winners. M. Pierre Selmersheim obtained a special mention and 500 francs for a motor-car, which, no doubt, is efficient in affording protection to the driver and passengers, but which at the same time resembles a huge cocked hat on wheels with numerous windows—a more atrociously ugly thing it is difficult to conceive.

Four other motor-cars obtained mention and money prizes of 150 francs. That of M. Vireux resembles a four-wheeler with a clothes basket in front and a "boot" behind; that of M. Courtois is also like a four-wheeled cab with a kind of elevated coffin attached to the rear, in the upper part of which the driver sits and looks over the roof. M. Frich's car is something like a phaeton in a very early stage of development, and it carries a kind of cow-catcher in front. M. Lafore's car looks like an overturned Nautilus shell. The appearance of these cars in London would, we think, evoke that ridicule which kills. It is evident that none of these designers have considered the æsthetic element. A London omnibus or "growler" may not be as artistic as Apollo's chariot (we believe that gentleman used to take occasional carriage exercise), but they are things of beauty compared to the motor-cars in question. To use the language of the distinguished reporter to the jury they certainly are *not* calculated to arouse either enthusiasm or admiration, but we admit with him that the subject involves much difficulty.

Notwithstanding the disappointment with which Motor-car Competitions have so far resulted in, our French friends are determined to solve the problem of producing a motor-car that will replace the dray and wagon. That enterprising and patriotic body, "L'Automobile Club de France," whose efforts in the direction of automobilism we cannot sufficiently appreciate, have evidently intended that if we claim the honour of the locomotive, to France shall belong the honour of producing the "really satisfactory" (will *The Engineer* please note) motor van. To this end they have arranged for a competition for automotors and other tractors intended for heavy weight the minimum weight to be carried being one ton, either of passengers or goods. The object of the vehicles being for use either as street cars or, as we should say, railway omnibuses or as parcels vans. The competition will take place on August 5th of this year, near Paris, and is international. A competitor can enter as many vehicles as he pleases, provided they are not of the same type. Each vehicle pays an entrance fee of 200 francs, and double that if entered after the official date, June 1st. The list of engagements closes on June 25th. Since writing the above we hear that the competition has been postponed for a month, at the request of competitors. We hope that at the last minute the "L'Automobile de France" will not be disappointed as was *The Engineer.*

The Technical Commission is composed of MM. Barbet, Bourdi, Broca, de Chasseloup, Laubat, Collen, Jentaud, Lemoine, Mommerqué, Perignon, Talansier, Varennes, Hospitalier, Forestier, Panhard, Michelin, Mors, and Quesnay. M. Le Compte de Chasseloup is the organising director.

According to *Les Sports* the entries have been very numerous, but we do not hear that any English firms have entered. If we might suggest, we should say that the Liquid Fuel Company, of Cowes, and Mr. Thornycroft, of Chiswick, might enter their motor-cars with decided prospects of success. It is all very well for our contemporary *Les Sports* to decry the exhibits at the Crystal Palace Show, but we cordially recognise that even they could not approach the motor-cars which were shown at the Magasins du Louvre—in sheer ugliness. *Les Sports* says that the decision of the jury in the latter case has been most severely criticised; we should think so, indeed. The French have undoubtedly a keener artistic perception than we have, and how anyone can commend these things passes our comprehension.

Automobilism in France is evidently a matter which involves (and rightly so) a commendable attention to the inner wants of the human motor, which somehow finds in automobilism no end of excuses for the consumption of pleasant "fuel" in the shape of dinners, which, in their turn involve free "lubrication" through the valves, &c. Thus the members of the Automobile Club de France find it necessary, in order to undergo the severe mental and physical hardships involved in their search after *The Engineer's* "really satisfactory" motor, to recuperate themselves with dinners, picnics, &c. (a course of conduct of which we ourselves highly approve). On this side of the channel, however, automobilism is under a cloud at present, and hence we take our bread and cheese sadly, and *don't* ask our friends to share the repast.

MOTOR-CAR FITTINGS.

It is a significant sign of the growth of the motor-car industry when we see the leading steel makers laying down plant especially to cater for the trade. Among those who are devoting themselves to the manufacture of the various forgings, stampings, &c., used in the industry, we should mention the Kelham Rolling Mills Company, of Sheffield. This firm of ironmasters possesses plant and equipment for the rapid and accurate production of all

those parts which must be light and yet very strong. Their speciality is, however, tyres; these they make of every conceivable section and size, several rims being specially designed to take the rubber motor tyre of Mr. Jessop Browne, of 104-107, Great Brunswick Street, Dublin, one of which we illustrate herewith.

Improvements in Gas Motors.—Mr. Tremlett Carter has worked out the details of a new gas-engine cycle which he has invented. According to the *Electrician*, the principal improvements in the Otto cycle which this new cycle is directed to effect are :—(1) The useful recovery of heat wasted in the jacket and the exhaust, which in the Otto cycle is represented by some 70 to 80 per cent. of the total heat; (2) the abolition of the idle revolution, without the use of two working cylinder ends, and without the use of a pump for compressing the explosive mixture; (3) an increase in the power obtained from a given-sized cylinder; (4) prompt and efficient regulation without omission of explosions; and (5) a means of increasing the power of the engine considerably beyond the normal, to enable it to take extra heavy loads for short intervals. The consumption of gas by an engine working on the new cycle is expected to be from 50 to 60 per cent. only of the gas consumed in the Otto cycle, the thermal balance-sheet showing a thermo-dynamic efficiency of 40 per cent. for engines of moderate size.

CORRESPONDENCE.

**** We do not hold ourselves responsible for opinions expressed by our Correspondents.*

**** The name and address of the writer (not necessarily for publication) MUST in all cases accompany letters intended for insertion or containing queries.*

RUBBER TYRE PATENTS.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

DEAR SIR,—It has been our misfortune not to see your excellent JOURNAL until just lately, and only yesterday were we able to obtain the February number, in which we find reported on page 202, a report of the hearing of the application by the Shrewsbury and Talbot (S. T.) Cab and Noiseless Tyre Company (Limited), for prolongation of Carmont's patent, No. 703, it is therein stated that Mr. Alexander, Q.C., and Mr. Baker appeared for "various opponents," this is an error which in justice to ourselves (though late in the day) we must ask you to be good enough to correct. WE ALONE took out a caveat, entered objections, and took the very costly course of getting up a case against the application of the S. T. C. Company, by accountants, experts, and others, and by appearing by Counsel before their Lordships of the Judicial Committee of the House of Lords, when, owing to, as we are informed, our action the petition was dismissed. We should be obliged by your inserting this letter in your next issue. Kindly see enclosure.—We are, dear Sirs, yours truly,

Per pro KELHAM ROLLING MILLS COMPANY (Limited),
J. B. BOOTH, Director.

Kelham Island, Sheffield,
May 29th, 1897.

(Enclosure referred to.)

Extract from the "Sheffield Daily Telegraph," February 4th, 1897.

IMPORTANT ACTION BY A SHEFFIELD COMPANY.—The Kelham Rolling Mills Company (Limited) were successful in an important case decided yesterday. The action was one heard before the Judicial Committee of the Privy Council, including Lord Herschell (president), Lord Davey, Lord MacNaghten, and others, for the prolongation of a patent, No. 703, for the manufacture of tyres for rubber-tyred vehicles. The patent was one taken out by Mr. William Hassalwood Carmont, consulting engineer, and the Kelham Rolling Mills Company objected to the patent being prolonged. Mr. Sutton, Q.C., appeared for the Attorney-General, Mr. Cozens Hardy, Q.C., and Mr. Wilkinson for Mr. Carmont and the Shrewsbury Talbot Noiseless Cab and Tyre Company, and the Kelham Rolling Mills Company were represented by Mr. Alexander, Q.C., and Mr. Baker (instructed by Messrs. Porrett and Fawcett, Sheffield). The hearing of the action occupied a long time, and many expert witnesses were in attendance. Their Lordships finally gave judgment in favour of the Kelham Rolling Mills Company, and decided not to grant a prolongation of the patent.

THE BRITISH MOTOR SYNDICATE'S "MASTER PATENTS" AND ROOTS AND VENABLES.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

DEAR SIR,—Referring to the correspondence between the British Motor Syndicate's solicitors and ourselves which you inserted in the May issue, we think that the detailed contents of the No. 6 letter to which you made reference should prove of particular interest to your readers generally, as we especially wanted to draw attention to the points as follows, viz., that having written on the 17th and 25th of March each time asking for numbers and dates of the patents which it was alleged we were infringing, and still receiving no reply from Messrs. Sharpe and Parker, we then informed Messrs. Sharpe and Parker that whereas they alleged we were infringing the patent or patents of the British Motor Syndicate, we claimed that an infringement of these patents was impossible, because, firstly, our patents deal with petroleum *oil* motors, while the patents of the B.M.S. are in connection with petroleum *spirit* motors and use that dangerous spirit benzoline. Secondly, ours is the only carriage *oil* motor, and, therefore, is in another class to the *spirit* motors of the B.M.S. Thirdly, our patents are prior as to date to the B.M.S. patents. Mr. Roots made the first oil-engine, although another firm put one on the market first; our patents are therefore, the only master patents, although this has been widely claimed by the B.M.S.

So far from our infringing the B.M.S. patents, we have been authoritatively informed that the B.M.S. is infringing our patents, and we shall endeavour to obtain evidence on this point.

After then referring to the suggested use of our patent, No. 23,786, as stated by you, we then mentioned that when our Mr. Roots in 1893 sold a vehicle oil-motor to Messrs. Peugeot, he gave them permission to use this invention (No. 23,786) on that vehicle only, to which his motor was fixed, and no other, and we then asked, as appears in the subsequent letters, as to whether the Daimler carriages of the B.M.S. use this method of cooling the motor jacket water.

By inserting this letter in your next issue we shall be obliged.—Yours faithfully, ROOTS AND VENABLES.

100, Westminster Bridge Road,
London, *May 25th*, 1897.

THE MOTOR-CAR COMPETITION.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

SIR,—I have read with both interest and regret the leader on the above subject in *The Engineer* of the 4th inst.

The opinions and suggestions as set forth there raise such momentous questions that some further consideration of them cannot fail to be of interest.

The Engineer roughly outlines the probable conditions of service of the successful motor-car, which, as I understand them, are that it must be capable of being steered, managed, and maintained by one semi-skilled man—a man knowing about as much of engineering as the average groom or coachman knows of veterinary surgery. A discussion of the possibilities of constructing such a motor-car will probably be instructive. In my opinion—and I have had some experience of steam launch machinery run by half-skilled men—it is impossible that such a man as has been referred to could satisfactorily take care of a compound high-speed engine, water-tube boiler, and surface condenser suitable for a motor-car; but it does not follow that it is impossible to make machinery for this purpose which he could manage. It is into the peculiarities of this machinery that I propose to inquire.

The boiler must be of simple and strong construction, incapable of explosion, and yet not too heavy; it must also be capable of regulating its own water level and furnace temperature, for no one could steer a carriage in ordinary traffic and at the same time have to be constantly handling feed and fuel cocks. The only boiler which seems at all promising as likely to comply with these conditions is some form of instantaneous generator. Possibly a combination of steam tubing could be arranged to form such a generator which, if feasible, would possess the advantages of great cheapness and facility for repair.

With such a generator a pressure-piston balanced by a spring would suffice to regulate both water supply and furnace temperature. Of course, I assume that petroleum would be the fuel used, as with a suitable burner it does away with stoking and smoke, besides being under perfect control and being capable of great ranges of power. The engines of this conveyance probably present greater difficulties than the boiler. They must be able to run for very extended periods without anything but the most elementary adjustment; they must be able to do with no oil one week and half a pint per hour the next, and must be able to stand cleansing with a stable hose. This looks rather a large order, but it is not quite as extensive as it seems. Of course, it excludes anything like high-speed compounds and such-like engines, and it precludes the possibility of using the lightest possible engines, which, however, there is no necessity for; in fact, it is hardly likely that any form of double-acting engine would stand such treatment.

The most promising line of advance is in the single-acting direction. A single-actiug engine, either simple or compound, can be built which may be simplicity itself, and as it has pressure only in one direction and no bottom cylinder covers, wear in the bearings only increases the clearance, and adjustment is unnecessary for a very long time. For instance, a single-acting compound engine with two cranks at an angle of 180° can be arranged with the ports in the cylinder walls, the piston acting as slide valves, and the high-pressure cylinder exhausting direct to the low pressure. Some extra clearance would have to be provided to obviate back pressure, but the loss from this source would be amply compensated by the total absence of complication. The only valve required would be an admission valve—a tappet valve, if you like—to the high-pressure cylinder. Or, as we have a valve we can make it work full time, and by controlling the high-pressure exhaust do away with unnecessary back pressure in this cylinder.

Such an engine can be safely boxed in, and given a crank pit oil bath which will carry sufficient oil in ordinary work for a long time if the party in charge should happen to forget he has such a thing as an engine to look after. Parsons's steam turbine would be an ideal car motor; but I am informed that there is a difficulty in reducing the speed, and I believe one has to use two of them if one wishes to reverse.

As to the condenser, nothing like a circulating fan can be admitted. Our only sources of circulating energy are the waste funnel heat, as with a funnel casing, and the force of the exhaust. With a surface condenser the former is the only feasible plan, and the weight would be considerable. Some time since an engineer of high standing suggested the use of an air-jet condenser, using the exhaust steam to carry air into a condensing chamber, and in this way there is a chance of making a cheap and indestructible condenser. Some waste of water would be inevitable, but with the boiler suggested no great harm would result from filling up at the nearest pond. It may be as well to pause here to remind intending builders of motor-cars for the market that the party in charge of them is fairly certain, sooner or later, to fill them up at a horsepond. This is worth bearing in mind when designing a boiler. Along these lines it may be possible to build motor-car machinery sufficiently hardy for the public use.

Finally, I may be able to give a word of consolation to those who feel disappointed over the result of *The Engineer* competition. As a maker of petroleum burners for motor-car furnaces, I am in a position to know that some of the best firms in England, beyond those mentioned in *The Engineer* entry list, are working at the motor-car problem.

Camborne, *June 8th*. J. S. V. BICKFORD.

[We agree with our correspondent; elsewhere we have pointed out that more engineers are quietly working out the automotor problem than our contemporary is apparently aware of. We have also expressed a high opinion of the suitability of Parsons's turbine.—ED.]

A HINT TO ENTERPRISING FIRMS.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

DEAR SIR,—I often experience great difficulty in finding out where to get parts made for autocars, such as hinged axles, large sized ball bearings, large wheels, tubular or other frames, and other parts. I have sometimes written to a number of firms who make carriage parts, but they often decline to undertake special work for motor carriages.

If those firms who are laying themselves out for this work would advertise their names in your JOURNAL it would assist many who, like myself, are working out improvements in autocars, and it would undoubtedly be to their own advantage. I enclose my card, and remain, yours faithfully,

PATENTEE.

June 10th, 1897.

PROCEEDINGS OF SOCIETIES.

Petroleum as Steam-Engine Fuel.*

PETROLEUM as liquid fuel has been used much more largely than other oils, but gas tar, creosote oil, and green oil from gasworks have also been found to be very effective. The first experiments in Russia with petroleum were made in 1874, but it was not until 1883 that liquid fuel was used to any great extent in locomotives. Many experiments were tried in the direction of using atomisers or pulverisers for the purpose of making liquid fuel into the form of a spray, and amongst them may be mentioned those of Lentz, Artimeff, and Brandt. In 1884 a communication as to the use of liquid fuel for locomotives in south-east Russia was made by Mr. T. Urquhart to the Institution of Mechanical Engineers, and that communication contains very full information as to the way in which the work was done.

While there is little doubt that there are great advantages in the use of petroleum refuse for raising steam, either in locomotive or other boilers in a country like south-east Russia, where such fuel can easily be obtained, the difficulty of obtaining it at a reasonable price in this country has been a barrier to the introduction of liquid fuel as an article of considerable consumption, although its great convenience and adaptability render it a very desirable fuel if anything can be done in the way of ensuring a constant supply at a moderate price. Roughly speaking, the author has found that with Lancashire coal at 9s. per ton, liquid fuel ought not to cost more than 1*d*. per gallon to do equivalent work. In the south of England, where coal is dearer, the conditions are somewhat more in favour of oil. The use of oil is in some respects not unlike the use of gas in a gas-stove, as it can be turned off at once when it is not wanted, and started again at a moment's notice, thus preventing waste. The combustion can be made so perfect as to get rid of all smoke, and, if proper precautions are taken, no damage whatever is inflicted upon the fire-box plates. These no doubt have to be protected in some instances by a lining of brickwork where the spray impinges upon one spot constantly, but, on the other hand, the fire-box sides in a locomotive are relieved from the constant abrasion of the coal which tends to wear down the plates between the stays and thus reduces the life of the fire-box.

A liquid-fuel system does not necessitate the radical alteration of a boiler, as in most cases arrangements can be made:—1st, either to burn coal alone; 2nd, coal and oil in such proportions as may be convenient; and 3rd, oil alone.

The theoretical evaporative value of different kinds of oil compared with coal has been as under:—

THEORETICAL EVAPORATIVE VALUE OF PETROLEUM FROM AND AT 212° F.

	Lbs. of water per lb. of fuel.
Pennsylvanian heavy crude oil	21·48
Caucasian light crude oil	22·79
,, heavy ,, ...	20·85
Petroleum refuse	20·53
Good English coal	14·61

The methods of applying the oil-jet in a locomotive boiler have been varied a good deal, in some cases the oil being introduced through the fire-hole door, and in other cases the jet being inserted below the foundation rings; so that, as Mr. Urquhart pointed out, he was able where he burnt nothing but liquid fuel to close up the fire-hole door altogether, thus obtaining more heating surface in his fire-box.

The method adopted by Mr. Holden on the Great Eastern Railway is to put in two special openings through the fire-box casing, into which are entered the oil-jets.

There are on the Great Eastern Railway 37 locomotives, 13 stationary boilers, and 4 furnaces fitted with liquid-fuel firing at present. In the case of the locomotives, the oil-fuel is carried in two cylindical tanks placed on the tender, leaving the central space perfectly free to hold coal as before. Suitable provision is made for warming the oil in these tanks in the winter. From these tanks the oil is carried by pipes to the engine foot-plate, where, after passing through the necessary valves, it is sprayed into the fire-box by the injectors. Sections of one of these injectors are shown in the figures on next page.

An ingenious addition to this form of injector has a pipe at the end through which heated air, heated by the waste heat in the smoke-box, can be drawn through the injector, which it enters at a temperature of 300° F., and combined with the oil as it enters the fire-box. Another use which is made of this induced current where a locomotive happens to be fitted with the automatic vacuum brake, is to couple the injector up with the brake-pipes and make the fuel-injector act as an ejector for maintaining the vacuum throughout the train. Where this is done, of course the advantage of the heated air going into the fire-box is not obtained. Should oil-fuel be used alone, it is only necessary to cover the fire-bars with a thin coating of broken fire-brick so as to prevent the in-rush of too much cold air.

The consumption of fuel for doing corresponding work is stated to be, on the Great Eastern Railway, as follows:—

			Lbs. per mile.
When using coal only			35·4
,, ,, ,, and oil combined	coal	11·8	
	oil	10·5	
			22·3
,, ,, oil only...			16·5

* Excerpt of paper read before the Institution of Civil Engineers, by J. A. ASPINALL, Esq., M.I.C.E., &c.

Once the use of oil is arranged for in considerable quantities, it becomes an easier matter to supply the locomotives with their fuel than in the case of coal, as the oil can be allowed to run out of suitable tanks with great facility into the reservoirs provided upon the tender. The fuel employed on the Great Eastern Railway until recently consisted of Russian astatki, or petroleum refuse, having a specific gravity of 0·906, and an ignition temperature of 336° F., but the quantity imported to this country is not sufficient at present to make it readily obtainable. At present green oil is being used, and this is obtained from gas-works, and has a specific gravity of 1·1, and a flash-point of about 220° F.

The author has fitted several Lancashire and Yorkshire Railway Company's locomotives with oil-burning apparatus for use on the Liverpool Dock lines, the main object in this case being, not to economise in fuel, but to get rid of fire risk, on account of the emission of sparks, and also to avoid the production of smoke, which would have been most objectionable in passing some of the Liverpool streets. In this case Holden's injector was used, and the author has reason to believe that this course has been followed by the other railway companies who make use of the Liverpool Dock lines. In the case of the Liverpool engines, creosote oil has been largely used as being the cheapest fuel available, but gas-tar has been found to give very good results.

The use of liquid-fuel for the production of steam cannot be said to be in any way in the experimental stage so far as mechanical appliances are concerned, in fact, it may be called an ideal method of raising steam, the only difficulty arising being that of the question of supplying fuel at a reasonable price, a difficulty not easily surmounted in a country so far removed from the oil-fields.

HOLDEN'S LIQUID-FUEL BURNER AS USED ON THE G.E.R.

Roller-Bearings.*

THE constantly increasing application of roller-bearings to rolling stock and other purposes, and the advantages claimed from such applications, have excited so much attention, that the author feels no apology is needed for introducing this subject to the Institution.

It is certainly somewhat strange that although full knowledge of the advantages of rolling motion, when applied to tractive purposes, has existed for centuries, as illustrated by the use of wheels for transporting heavy loads, it is only within quite recent times that any serious attempt has been made to introduce the same movement between the axles or journals of such wheels and their bearings.

To realise the importance of easy traction it is only necessary to consider the vast sums of money which have been expended in producing surfaces favourable to traction by rolling motion, as exemplified by the railway, tramway, and road systems of this and other countries. It would, therefore, appear that, if by the introduction of roller-bearings to the journals of the rolling stock or to the axles of the vehicles running upon such surfaces, a further and considerable reduction in the tractive effort can be obtained, and this at a comparatively small additional expenditure, the application of such bearings would become general.

The following are the principal advantages claimed for rolling motion in bearings: reduction in starting effort, decreased tractive and revolving effort, economy in lubrication.

If these theoretical advantages are accepted as arising from the application of rolling motion to bearings, the practical question is, Can such bearings be constructed to withstand the shocks of present railway loads and speeds, as also the heavy stresses connected with modern tools and machinery, at reasonable cost?

The requirements of satisfactory roller-bearings may be summarised as follows:—(1) That the proportions of their parts and the materials of which they are constructed are suitable to withstand the stresses imposed upon them. (2) That the bearing-rollers must be kept parallel with their axle or journal, and that they must not be allowed to touch each other. (3) That the bearings must be as simple and contain as few working parts as possible, and that they must be so designed that they can be applied and adjusted by any intelligent workman. (4) That they can be produced at reasonable cost. Simple as these requirements may appear, it is probable that only those who have tried to construct such bearings know how difficult they are to obtain.

The reduction in starting effort in roller as compared with ordinary bearings, which reduction reliable experiments have proved to amount to from 50 per cent. to as much as 83 per cent., is of such importance in all cases of mechanical, electrical, or animal traction, that, if this was the only advantage, it would warrant, other things being equal, the adoption of these bearings. In the case of steam or other mechanical traction, the reduction of starting effort allows of heavier trains or vehicles being controlled by the existing locomotives or other motors than can at present be dealt with. In railway vehicles the starting effort has been found in many cases to be as low as 3 lbs. per ton of load. The following are the results of careful experiments made to ascertain the relative starting effort and running friction of tramcars fitted with ordinary and roller bearings:—

Starting Effort.—Cars weighing 4 tons 15 cwt.; ordinary bearings, 196 lbs., or 41·63 lbs. per ton; roller-bearings, 30 lbs., or 6·53 lbs. per ton.

Running Friction.—Gravity test.

A car fitted with ordinary bearings and weighing 2 tons 15 cwt. was let loose from a point 56 feet up an incline with 1 foot 6¼ inches rise. It ran down this incline and 57 feet along the level line at foot of same, or a total distance of 111 feet. The force expended was, therefore, 6,160 lbs. falling through 1·521 foot, or 9,364 foot-lbs. The average frictional resistance was 9,364 ÷ 111, or 84 lbs., equal to 30·5 lbs. per ton. A similar car fitted with roller-bearings, being let loose from the same point, ran the full length of the level line available, namely, 320 feet, and had not then quite come to rest, the total distance traversed being 376 feet. The force expended was as above, 9,364 foot-lbs. The average frictional resistance was 9,364 ÷ 376 = 29·4 lbs., or about 9 lbs. per ton of load.

In the case of animal traction any reduction would not only be of great economical value by increasing the average life of the animals employed, but would also enable them to perform their duties with much less distress than under present conditions—a result much to be desired.

The following figures are of interest, and are founded on the results of actual experiments in tramway practice:—Relative starting effort of a tramcar on a gradient of 1 in 20—ordinary bearings, 100; roller-bearings, 77; saving 23 per cent. On a gradient of 1 in 80—ordinary bearings, 100; roller-bearings, 50; saving 50 per cent. On a gradient of 1 in 140—ordinary bearings, 100; roller-bearings, 39·6; saving 60·4 per cent.—results which require no comment.

As to decrease in tractive or revolving force, as the case may be, decrease in tractive force is of great consequence in railway, tramway, and road vehicles, as it reduces the constant or "fixed charge" upon the locomotive, motor, or animal; and similarly a reduction in the force necessary to revolve shafting and other machinery is of the greatest economical value, seeing that the amount of power expended in driving the main and counter shafts in workshops has been proved to amount to as much as from 50 to 80 per cent. of the total power employed.

The reduction in the amount of lubrication required is purely an economical question; experiments have, however, shown that at least 50 per cent. saving can be effected by the use of roller-bearings. With a perfect roller-bearing no lubricant is required, but oil must be used to prevent rusting.

As to the possibility of realising the theoretical advantages of roller-bearings

* Paper read at Institution of Civil Engineers, by W. BAYLEY MARSHALL, Esq., M.I.C.E.

in practice, which is the question engineers have to consider, the results so far obtained are to the author's knowledge so satisfactory that his conviction is, that their adoption will be greatly increased in the immediate future. The following examples appear to prove that the experimental stage has been passed, and that roller-bearings have now developed into practical realities :—

The Corporation of Blackpool have had some of their tramcars fitted with roller-bearings, and these cars have been running on their electric tramway for over three years, and with results so satisfactory that they have applied similar bearings to all the new cars which have been constructed since the advantages of these bearings were established; and their consulting engineer some short time ago certified that at least 30 per cent. of energy is saved by the use of such bearings as compared with those in ordinary use.

The Liverpool Overhead Railway made their first trials with roller-bearings some two years ago, and are now gradually fitting them to the whole of their rolling stock. Mr. Cottrell, the engineer and general manager, has been good enough to send examples of the bearings after they have performed a considerable mileage.

The City and South London Electric Railway are now experimenting with roller-bearings applied to their carriages.

The engineers for the Waterloo and City Railway have specified roller-bearings for the whole of the stock ordered for this line.

A passenger train of six carriages fitted with roller-bearings throughout has been running for two years between Brighton and Kemp Town, and has shown a saving of from 12½ to 15 per cent. in the consumption of fuel, which saving has been obtained under disadvantageous circumstances, inasmuch as the engine has to be kept in steam for about 16 hours, whilst its actual running time is under seven.

The Western Railway of France are fitting a complete train with roller-bearings for experimental purposes, and the report of their engineers will undoubtedly be of great value, as investigations of this kind are carried out with great care and skill by our Continental neighbours.

Experiments are being made in some of our Colonies, as also on some of the principal railways in South America.

Roller-bearings have been fitted to many horse-cars with results most beneficial to the animals employed, and it is estimated that the use of them would so prolong the life of the horses that the reduction in their depreciation alone would show a saving of considerably over £10 per car per annum.

In general application, perhaps the most interesting is the fitting of roller-bearings to the big bell of St. Paul's Cathedral, "Great Paul," which with its headstock weighs some 25 tons, and which gave considerable trouble when mounted on ordinary bearings.

It would also appear that there is a large field for the introduction of these bearings to the thrust and ordinary bearings of propeller shafts. The foregoing illustrations of actual application of roller-bearings serve to show the importance of the question and the headway already made, and the author hopes that discussion will throw further light on this important subject.

The Application of the Compound Steam Turbine to the purpose of Marine Propulsion.*

THE manufacture of the compound steam turbine was first commenced in the year 1885 with the construction of small engines for the driving of dynamos; successive improvements were made, and larger engines constructed, but up to the year 1892, the consumption of steam was not such as to justify the application of this class of engine to the purpose of marine propulsion, though on account of its light weight, small size, and high speed of revolution, it presented great advantages over ordinary engines for certain classes of work.

In the year 1892, however, a highly developed compound turbine, adapted for condensing, was constructed for the Cambridge Electric Supply Company, and when tested by Professor Ewing, F.R.S., showed a consumption of steam equivalent to 15·1 lbs. per indicated horse-power per hour, the boiler pressure being 100 lbs., and the steam superheated to 127° F. above the point of saturation.

More recently, compound turbine engines have been constructed up to 900 horse-power, both condensing and non-condensing, and consumptions of steam as low as 14 lbs. per indicated horse-power with saturated steam, and 100 lbs. boiler pressure, have been ascertained in engines of 200 horse-power, and still lower consumptions in engines of larger size. Many of the original engines are still doing good work; some, especially the larger sizes of 500-horse and upwards, are frequently kept at work for several weeks without stopping. The returns of the Newcastle and District Electric Lighting Company show a yearly cost of up-keep of 2½ per cent. per annum, and the total horse-power of turbines now at work in England exceeds 30,000 horse-power.

In January, 1894, a syndicate was formed to test thoroughly the application of the compound steam turbine to marine propulsion, and a boat was designed for this purpose. In view of the large amount of alteration that would probably be required before a satisfactory issue was reached, and the large amount of time and expense necessarily involved, it was decided to keep the dimensions as small as possible, but not so small as to preclude the possibility of reaching an unprecedented rate of speed, should all the parts work as satisfactorily as was anticipated.

The fulfilment of these anticipations was, however, much delayed, and almost frustrated, by a difficulty which, though foreseen, proved to be of a much more serious character than was anticipated. This difficulty was that termed by Mr. R. E. Froude "The cavitation of the water," or, in other words, the hollowing out of the vacuous spaces by the blade of the screw, and this pitfall for the designers of screws for very fast vessels, though indicated by theory to exist, came upon us in the case of our very fast running screw, taxed beyond the usual extent, in its most aggravated form. When the boat and machinery were designed, the trials of the "Daring," which first drew attention to this difficulty, had not taken place.

The "Turbinia"—as the boat is named—is 100 feet in length, 9 feet beam, and 44½ tons displacement. The original turbine engine fitted in her was designed to develop upwards of 1,500 actual horse-power at a speed of 2,500 revolutions per minute. The boiler is of the water-tube type for 225 lbs. per square inch working pressure with large steam space, and large return water legs, and with a total heating surface of 1,100 square feet, and a grate surface of 42 square feet; two firing doors are provided, one at each end. The stokeholds are closed, and the draught furnished by a fan coupled directly to the engine shaft. The condenser is of large size, having 4,200 square feet of cooling surface; the circulating water is fed by scoops, which are hinged and reversible, so that a complete reversal of the flow of water can be obtained should the tubes become choked. The auxiliary machinery consists of main air pump and spare air pump, auxiliary circulating pump, main and spare feed pumps, main and spare oil pumps, also the usual bilge ejectors; the fresh-water tank and hotwell contain about 250 gallons.

* Excerpt of paper read at the recent spring meeting of the Institution of Naval Architects, by the HON. CHAS. PARSONS.

The hull is built of steel plate, of thickness varying from $\frac{3}{16}$ inch in the bottom to $\frac{1}{16}$ inch in the sides near the stern, and is divided into five spaces by watertight bulkheads. The deck is of steel plate, $\frac{1}{16}$ inch thickness.

The approximate weights are—

Main engines	3 tons 13 cwt.
Total weight of machinery and boiler, screws, and shafting, tanks, &c....	22 tons
Weight of hull complete	15 tons
Coal and water	7¼ tons
Total displacement	44½ tons

Trials were made with screws of various patterns, but the results were unsatisfactory, and it was apparent that a great loss of power was taking place in the screw.

From experiments it would appear that in all screws, of whatever slip ratio, there will be a limiting speed of blade, depending upon the slip ratio and the curvature of the back—in other words, on the slip ratio and thickness of blade; beyond this speed a great loss of power will occur; and that should the speed of ships be still further increased, the adoption of somewhat larger pitch ratios than those at present usual will be found desirable.

The boat has been run at nearly full speed in rough water, and no evidence of gyroscopic action has been observable, though such a result would be anticipated from the known small amount of these forces under actual conditions; indeed, the "Turbinia" has so far proved herself an excellent sea boat.

The oiling of the main engines is carried on automatically under a pressure of 10 lbs. per square inch by a small pump worked off the air-pump engine; a small independent duplex oil pump is also fitted as standby. The main engines require practically no attendance beyond the regulation of a small amount of live steam to pack the glands and keep the vacuum good.

The advantages claimed for the compound steam turbine over ordinary engines may be summarised as follows :—

1. Increased speed.
2. Increased economy of steam.
3. Increased carrying power of vessel.
4. Increased facilities for navigating shallow waters.
5. Increased stability of vessel.
6. Increased safety to machinery for war purposes.
7. Reduced weight of machinery.
8. Reduced space occupied by machinery.
9. Reduced initial cost.
10. Reduced cost of attendance on machinery.
11. Diminished cost of upkeep of machinery.
12. Largely reduced vibration.
13. Reduced size and weight of screw propellers and shafting.

APPENDIX.

TRIALS OF THE "TURBINIA."

In December of last year several runs were made on the measured mile, and the maximum mean speed obtained after due allowance for tide was 29·6 knots per hour, the mean revolutions of the engines being 2,550 per minute.

Since then new propellers of increased pitch ratio have been fitted.

Further trials were made on April 1st. The mean of the two consecutive runs gave a speed of 31·01 knots per hour, the mean revolutions of the engines being 2,100 per minute, the fastest run being at the rate of 32·61 knots per hour.

The utmost horse-power required to drive the boat at the speed of 31·01 knots is 946, as calculated from experiments on her model, made at Heaton Works, on the method of the late Mr. William Froude.

Assuming the ratio of thrust horse-power to indicated horse-power to be 60 per cent. (which appears to be the ascertained ratio for torpedo boats and ships of fine lines), the equivalent indicated horse-power for 31·01 knots is 1,576.

The feed-water supplied to the boiler was measured by a Siemens' water metre previously calibrated under the working conditions, and found to be substantially correct.

These measurements were made when running at a speed of 28 knots, and the consumption at 31·01 knots has been calculated from these measurements according to the known law between steam pressure and consumption, and by the observed steam pressures on the engines at the respective speeds. The consumption at 31·01 knots is approximately 25,000 lbs. per hour, or 15·86 lbs. per indicated horse-power. It should be observed that the assumption of the thrust horse-power being 60 per cent. of the indicated horse-power presupposes that the propellers are of the best form attainable, and should those now fitted be superseded by others of higher efficiency, as is possible, and, indeed, probable, then the figures of consumption per indicated horse-power will be correspondingly improved, and the speed of the boat increased.

The consumption of steam at 11·4 knots speed has been measured by meter, and found to be 2,700 lbs. per hour, or equivalent to a coal consumption of about 24·6 lbs. per knot.

CONDITIONS OF RUNNING OF "TURBINIA" AT 31·01 KNOTS SPEED.

Mean revolutions of engines	2,100
Steam pressure in boiler	200 lbs.
Steam pressure at engines	130 lbs.
Vacuum at exhaust of engines	13¼ lbs.
Speed of boat	31·01 knots.
Calculated thrust horse-power	946
Calculated indicated horse-power	1,576
Consumption of steam, reduced to basis of 31·01 knots	25,000 lbs.
Consumption of steam per indicated horse-power per hour...	15·86 lbs.
Total weight of machinery, including boiler, condensers, engines, auxiliaries, shafting, propellers, tanks, water in boiler, and hotwell, in working order	22 tons.
Indicated horse-power per ton of total machinery	72·1 tons.

Owing to adverse weather these trials have been much delayed, and had finally to be made under unfavourable circumstances. They are, however, believed to be substantially accurate.

The Value and Scope of Inland Navigation.*

To arrive at a just opinion of the "Value and scope of Inland Navigation in England" is more difficult than in many other countries, owing to the lack of statistics on the subject.

In Germany and in the United States, and especially in France, the Government supply very complete and useful information on this, as on many other matters of general and commercial interest which are not so fully dealt with by the British Government.

The Board of Trade publishes annually statistics of railways, tramways, shipping and building societies, &c., but not of inland navigation. The canals were anterior to the age of statistics, and had hitherto managed to evade the duty of supplying them to the Board of Trade.

The only attempt at an exhaustive return was made in 1888, and this, owing to its novelty and other circumstances, proved to be very defective.

Whenever opportunity offered I have referred to the insufficiency of this return, and as the question has been at last taken up by many Chambers of Commerce, I look forward to another return being called for on an improved form, and hope that the information sent by the various companies will be carefully sifted, so that the return when published may be useful to traders, carriers, and the public generally.

The importance of inland navigation has been lost sight of in this country for many years, but the time seems to be coming when it will receive greater attention. Sixty years ago, and for many previous years, transport in England cost less than elsewhere, thanks to the sea and the system of inland navigation.

It appears that the rate of freight for perishable goods was 3*d*., for imperishable 2½*d*. per ton per mile, and that this was about half the cost of conveyance by road.

Before the advent of railways, the British canal system of nearly 4,000 miles was without doubt the best in the world, and at this period the average cost of transport in Europe was probably upwards of 8*d*. a ton a mile.

How much the average cost of transport by rail amounts to in England, it is hard to say, as the returns deal only with weight and not with tons per mile, as they do in many other countries.

The *Journal des Economistes* states that in England it costs 1·4*d*. a ton a mile; in Italy, 1·25*d*.; Russia, 1·2*d*.; France, 1·1*d*.; Germany, 0·82*d*.; Belgium, 0·8*d*.; Holland, 0·78*d*.; United States of America, 0·4*d*.; so that Englishmen pay more than their competitors; 75 per cent. more than the Belgians, and 350 per cent. more than the Americans.

Good and cheap transport is essential to manufacturing and mercantile prosperity. The railways are good, but it is clear they are not cheap, and for merchandise they are distinctly dear.

The average charge per ton of minerals is 1*s*. 6½*d*., of goods 5*s*. 1*d*. The receipts from 200,275,270 tons of the former amounted to £15,414,154 as compared with £20,703,007 for 80,048,772 tons of the latter in 1895. The author is not prepared to endorse many of the figures put forward by out-and-out advocates of canals, but there are palpable advantages which have only to be used aright, to enable water-carriage to compete efficiently with railways. One of these is cheapness of construction compared with capacity for traffic.

The average cost of railways in England was never less than £34,000, and is now upwards of £47,000 a mile. The Bridgewater Canal cost from £4,000 to £5,000 a mile, and allowing another £5,000 to have been spent in improving it and making it fit for steamers, the cost per mile becomes £10,000, rather more than one-tenth the average cost of a railway.

The traffic passing over a portion of this water-way, which has a depth of only 4 feet 6 inches, amounts to 1,300,000 tons per annum.

The maintenance of way and works is heavier on a railway than on a canal, and increases more uniformly with an increase of traffic. The life of permanent way is largely dependent on the volume of traffic carried over it, whereas on a canal the additional cost entailed by an increase of traffic is trifling. Expensive arrangements for signalling are not needed on canals. The outlay on canal vessels for an equal tonnage is less than on railway trucks and locomotives, while the number of men employed on a good-sized barge canal is the same approximately, ton for ton, as on a railway.

In facilities for loading and discharging along the route, canals have also an advantage, and the expense of terminal arrangements is much less than on railways. A steam barge 90 feet long will carry 300 tons; a mineral train to carry this would be 550 feet long, an ordinary goods train more than double that length.

A well-managed railway must always have the advantage as regards speed, but there is an immense amount of traffic for which high speed is unnecessary. Regularity is very desirable, and this can be obtained on canals if the system is properly organised.

The American railway rates are the lowest in the world, but this does not prevent the use and improvement of canals.

In 1691 the freight rate for wheat per bushel of 60 lbs. from Chicago to New York was, by rail, 15 cents; by lake and rail, 6·5 cents; by lake and canal, 5·9 cents; the latter was reduced to 5·6 cents in 1892. In order to stimulate competition the State of New York has voted £1,800,000 to improve the Erie Canal and two of its branches, so that the available depth may be increased from 7 feet 6 inches to 9 feet 6 inches, and a considerable length has been taken in hand during the past winter.

The great interest taken, and the expenditure which has been incurred of late years in America, France, and Germany shows the high value put upon inland navigation among the leading competitors of England for the trade of the world.

For twenty years the French have been aiming at making their canals available for craft of 300 tons, and in 1892 there were 2,500 miles of this capacity, and while so doing they have added 81 per cent to the traffic. The improved canals carry two-thirds of the tonnage in weight, and the work done on them amounts to four-fifths of the total ton mileage, carried over nearly 8,000 miles. The mean length of voyage is 91 miles as against 82 miles by rail; a portion of the St. Quentin Canal carries 4½ million tons annually.

Six million tons of goods enter Paris by water as against 15,000,000 tons by rail. Berlin is supplied to the extent of one-half its imports by canal.

In the United States 27½ per cent. of the traffic is waterborne, in France 30 per cent., and in Germany 23 per cent., whereas in the United Kingdom it is less than 11 per cent.

The dead weight carried on French canals amounted in 1892 to 26,000,000 tons; this compares with 34,375,000 tons carried in England in 1888. It is, therefore, evident that the traffic in this country is well worth providing for; but how little has been done to improve the position of navigations is proverbial.

Of the 3,520 miles navigable, 1,264 miles are in the hands of railway companies. There are about 130 different canals under 100 different ownerships. Consequently there is little or no organisation of traffic possible, and a great deal of unnecessary expense is incurred.

The improvement in the permanent way and equipment of railways has been most marked. Locomotives of four tons and rails of 35 lbs. had given place to locomotives of 50 tons and rails of 103 lbs., whereas over nine-tenths of the water-ways no change has been made for a century.

There are undoubtedly certain lines of communication which would pay well for adequate improvement, and, as the attempt to obtain a reduction of railway rates at the hands of Parliament has proved unsuccessful, this appears to be the only means left by which the mercantile and manufacturing community can obtain relief from a state of things which is very detrimental to the commercial position of this country. The cost of internal transport is of such great importance that unless it is materially reduced, I believe the public will ere long become as alarmed on this question as it has been in recent years at our neglect of technical education, and then the nation would be hurried into a wasteful expenditure of capital. In the author's opinion a good system of canals would do much to avoid this, and he considers, therefore, that the value and scope of inland navigation is very apparent.

* Paper read at the Institution of Civil Engineers, by L. B. WELLS, Esq., M.I.C.E.

NEW INVENTIONS.

Claiming particularly to apply directly or indirectly to Motor Vehicles, &c.

Compiled for "THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL" by HERBERT HADDAN and Co., Registered Patent Agents, of 18, Buckingham Street, Strand, W.C., London.

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Patents Applied For.

Abbreviations: Impts., Improvements in; Relg., Relating to.

1897.

May	1.	10,861.	T. L. HAGUE. Noiseless driving motor for carriages, &c.
,,	1.	10,916.	WM. LANGFORD. Impts. steering apparatus.
,,	3.	10,932.	J. A. COOKE. Impts. relg. propelling mechanism.
,,	3.	10,957.	J. R. HILL. Saddle supports for cycles and motor-cars, &c.
,,	3.	10,961.	SARGEANT and LONGHURST. Impts. relg. handle bars.
,,	4.	11,064.	G. A. MELLEY. Impts. motor-cars, cycles, carriages, &c.
,,	4.	11,142.	J. HARPER, Jun. Impts. motor-cars.
,,	5.	11,199.	J. F. O'NEILL. Automatic cut-out for electrically-propelled vehicles.
,,	6.	11,325.	J. F. SARGEANT and F. LONGHURST. Impts. relg. storage of cycles.
,,	6.	11,327.	W. MULLAN. Impts. engines or motors.
,,	6.	11,333.	J. VAUGHAN-SHERRAN. Impts. motor-carriages.
,,	7.	11,367.	WOODFIELD and PHELPS. Impts. manufr. of chain-wheels.
,,	7.	11,391.	FRANKLYN and TAYLOR. Improved hand rest or grip for cycles, motor-cars, &c.
,,	7.	11,415.	T. COOPER. Impts. reversing gear.
,,	10.	11,615.	J. BERRY. Impts. autocars or automotors.
,,	11.	11,667.	J. H. KEERLE. Impts. driving chains.
,,	12.	11,758.	BOX and MÜLLER. Impts. cycles, motor-cars, vehicles, &c.
,,	12.	11,791.	PLAYER and PEARSON. Impts. in joints for frames.
,,	13.	11,901.	J. ELLIS. Impts. motor-car wagons.
,,	15.	12,046.	J. T. ELLIS. Impts. cycles and vehicles, motor or otherwise.
,,	15.	12,069.	J. G. STIDDER. Impts. relg. frames.
,,	17.	12,158.	G. KIRBY, Jun. Variable speed gear.
,,	18.	12,225.	W. B. THOMPSON. Impts. relg. motor-cars and traction of vehicles.
,,	18.	12,293.	A. APPLEBY. Driving-chain for cycles and other vehicles.
,,	19.	12,344.	W. BOBBETT. Improved holder for lamps.
,,	19.	12,378.	E. B. KILLEN. Driving apparatus.
,,	19.	12,400.	H. A. LAMPLUGH. Impts. cycles and motor-vehicles.
,,	20.	12,510.	J. R. TRIGWELL. Impts. steering and controlling gear.
,,	20.	12,543.	P. J. G. ROUQUETTE. Impts. relg. propulsion of velocipedes, motor-cars, &c.
,,	20.	12,550.	A. R. SENNETT. Impts. gearing for mechanically-propelled vehicles.
,,	20.	12,558.	F. HENRIOD-SCHWEITZER. Impt. relg. motor-cars, &c.
,,	21.	12,604.	E. DAVIES. Impts. velocipedes and motor-vehicles.
,,	24.	12,783.	J. H. BLAKESLEY. Impts. gearing of cycles and motor-cars.
,,	27.	13,003.	F. HENRIOD-SCHWEITZER. Impts. relg. motor-cars, &c.
,,	27.	13,019.	GIBBS and WRIGHT. Joints for frames.
,,	27.	13,020.	GIBBS and WRIGHT. Impts. parts of cycles, motor-cars, &c.
,,	27.	13,047.	J. H. HUNTER. Seats for motor-cars, &c.
,,	27.	13,118.	PATTISON and Others. Impts. relg. self-propelled vehicles.
,,	29.	13,309.	M. H. SMITH. Impts. steering apparatus.
,,	29.	13,321.	MANES and BARNES. Impts. non-slipping devices.

Specifications Published.

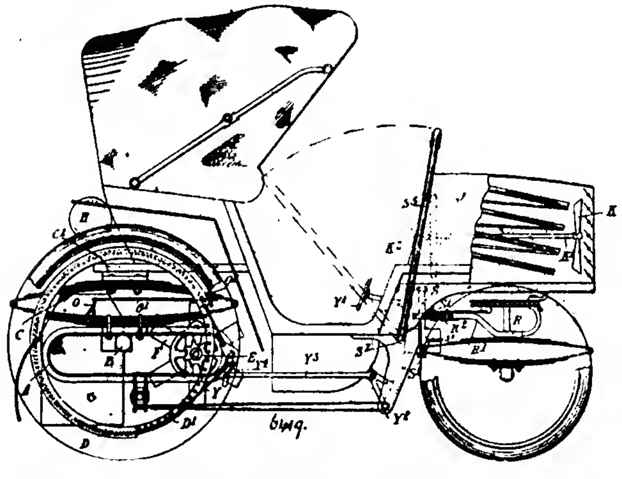
6,419. Self-Propelled Vehicles. Herbert Churchill Capel, 168, Dalston Lane, Middlesex, and Thomas Clarkson, Grove Villa, Carshalton Grove, Sutton, Surrey. March 23rd, 1896.

Relates to:—1st. The mounting of the apparatus upon or in immediate connection with one of the axles, preferably the back axle of the vehicle, so that an existing vehicle can be easily converted.

2nd. An improved system of steering, whereby the fore-carriage usually employed in horse vehicles may be retained and utilised for the new requirements.

3rd. The increasing of the efficiency of the condenser by employing a fan or equivalent driven by the exhaust steam from the engine, so that the speed of the air-propeller may vary according to the quantity of the steam used, and, so far as the motive power is concerned, complete duplication of the whole system.

Two frames, A, are securely attached to the axle, B, of the road wheels, and are conveniently shaped so that the motor and driving mechanism, with or without the fuel tank, and also the boiler if the motor is steam-driven, may be attached to them and enable all these parts to be mounted upon or in immediate connection with, and to be supported by, the axle, B. The latter is non-rotating, and attached, either directly or through the framing, A, to the springs, C, which are connected to the ordinary framing, C¹, of the body of the vehicle. The driving-wheels, D, run loose upon the axle, B, and each carries



on its inner face an internally toothed annulus, D¹, with which engages a pinion, E, carried upon a shaft, E¹, driven directly by the engines. Each of the shafts, E¹, runs in bearings carried by the framing, A, and is provided with an independent motor, F. This arrangement of duplicate shafts and motors enables differential gear to be dispensed with, and also permits of the road wheels being arranged out of the vertical plane, as is commonly the practice.

The motors, F, are preferably operated by steam, and are of the multi-cylinder type, with the cylinders radiating. The boiler, which is of the water-tube type, is enclosed in a casing, G, attached to the frames, A. The tank, H, containing the liquid fuel for the boiler may be placed, as shown, behind the hood of the vehicle, or may be arranged in more immediate connection with the boiler.

A condenser is carried upon the fore-carriage in a casing, J, the front of which is provided with louvres to permit of free access of air. Immediately at the back of these louvres is arranged a fan, K, mounted on a light shaft, K¹, and adapted to be driven by a turbine operated by the exhaust steam from the engine. A casing enclosing the turbine receives the steam from the latter, and either returns it through suitable tubes to the boiler direct, or takes it to the condenser and general circulating system.

The boilers are preferably in duplicate.

The steering device adopted so as to utilise the usual fore-carriage may be arranged in the following manner:—To the framing, R, of the fore-carriage and preferably to the existing shaft receptacles, R¹, is attached a toothed arc, R², the fore-carriage being turned round so as to bring this toothed arc upon the side nearest to the body of the vehicle. In suitable bearings mounted upon the framing of the vehicle is arranged a vertical shaft, S, which carries a pinion, S¹, engaging with the toothed arc, R², and also carries the drum, S². Around the latter passes a cord, S³, either endless or with its ends attached to the drum in such a manner that by pulling the cord one way or the other the drum, S², is rotated, and consequently the fore-carriage turned. The cord, S³, passes from the drum round pulleys and through the tubular sides, S⁵, of a frame which is pivoted at S⁷, so that it can be moved from the position shown in full lines into that indicated by dotted lines. The tubular sides, S⁵, are connected by a cross-bar, the cord passing round pulleys at the corners, and across from one side to the other of the frame. The portion of the cord lying between the pulleys is exposed to the grip of the driver, so that by drawing this portion one way or the other across the vehicle the fore-carriage can be turned in the manner described.

The vehicle is provided with a hand brake, the band, Y, preferably operating upon the exterior of the toothed annulus, D¹, a foot lever, Y¹, pivoted at Y², and connected by a link, Y³, with the lever, Y⁴, affording means of putting the brake into operation. An improved construction of boiler and method of mounting the motor are also described.

6,659. Motive Fluid Engines. Robert Christian John Dicken, of 21, Weltje Road, Ravenscourt Park, Middlesex, and George Dicken, of Rose Villa, Melbourne Road, West Bridgford, Nottingham. March 26th, 1896.

In order to prevent steam or other motive fluid from being wasted in the cylinder of a steam or motive fluid engine on account of the length of the ports between the interior of the cylinder and the valve face, the latter is made curved and concentric with the internal surface of the cylinder, the slide-valve being suitably formed to fit thereon.

The invention also relates to improved means for distributing steam to and from engine cylinders.

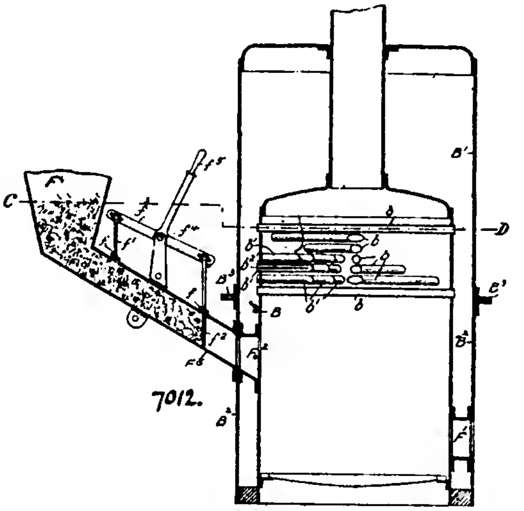
The slide-valve comprises a hollow body, the ends of which are made concave to fit the convex surface of the valve face of the cylinder on which they work, and are provided with ports adapted to be brought alternately into correspondence with the cylinder-ports so as to allow live steam to pass from the interior of the valve into the cylinder. In the portion of the body of the valve remote from the cylinder there fits a hollow plug or tubular piece, which works against a seat on the inner side of the cover of the valve-chest, and by means of which the interior of the body of the valve is kept in constant communication with a steam-inlet in the said cover. This hollow or balance plug is of such dimensions that it and the valve body will be pressed against the cover and valve face respectively with no more than the requisite amount of force to keep them thereon, so that unnecessary wear will be avoided and the power necessary to actuate the valve will be reduced. A spring is provided between the valve body and hollow plug for keeping the plug against the valve face when the engine is not under steam. In exhausting, the steam issues from the cylinder past the ends of the valve into the valve-chest and escapes therefrom through a suitable outlet. The cylinder may advantageously be turned externally and fit into a casing adapted to form both the valve-chest and a steam jacket. Modifications are described.

7,012. Steam Generators and Motors. George Francois Gabriel des Vignes, Teddington, Middlesex, and Stephen Harding Terry, M. Inst. C.E., 17, Victoria Street, London. March 31st, 1896.

Relates to steam generators and motors for self-propelled road carriages.

The boiler is of the vertical type with internal closed firebox. The firebox, B, is fitted in its upper part with a number of superposed cross water-tubes, b, b, of the full diameter of the box which radiate at different angles or spirally from the vertical centre line of the box one above another at suitable vertical intervals apart. In the same horizontal plane as each of these full diameter cross-tubes, b, b, is a number of radial or centripetally disposed closed ended water-circulating tubes, b^1, b^1, of the same or less diameter than said cross-tubes, each having preferably (or where its diameter admits) an internal circulating diaphragm plate, such as illustrated at b^2, in one tube, b^1, extending from the expanded or fixed end of the tube, b^1, for a suitable distance towards its closed end. The uptake may be arranged as usual at or near the top of the box and passing through the crown of the shell as shown, or laterally therethrough as most convenient. The boiler shell is made in two parts, B¹, B², with a central bolted flange, B³, for affording access to the firebox and tubes when required for cleaning, repairing, and the like. In the boiler we prefer to employ two fire holes, one, F^1, about the grate level for lighting up, cleaning out, and so forth, and adapted to be closed up during work; the other, F^2, at a much higher level and preferably at the opposite side of the box as illustrated for firing purposes. The fuel is preferably fed automatically to the upper hole, F^2, by a shoot such as F^3, having an inclination slightly superior to the angle of the rest of the fuel, which is contained in an upper hopper, F^4. In this shoot two suitably formed "cut-off" slides, f^1, f^2, with knife-edged bases work in slots f, f, and are connected by a lever, f^3 fulcrummed at f^4, and having a hand lever such as f^5, or other convenient operating device. The arrangement is analogous to that of the measuring necks of old-fashioned shot pouches, and by it, on oscillation of the lever, f^3, the measured quantity of coal always lying between the slides, f^1, f^2, will be discharged into the furnace as will be readily seen, and afterwards a fresh charge will take its place.

The boiler is connected to the motor, which may consist of a half-speed, self-lubricated engine of the closed compound type, preferably tandem or double-crank, with two separate eccentric rods for the slide valves of the high and low-pressure cylinders, and the novelty of our improvement in such a motor is that we use and arrange the high-pressure valve gland and sometimes the low-pressure valve gland so as to be always exposed to view, for in a completely closed engine experience has shown that it is with these glands and especially the high-pressure gland that trouble by unseen leakage always occurs.



The condensing apparatus consists of a novel kind of combined surface and jet condenser, by which also the feed water for the boiler and the air supply to its furnace are heated, and by which all water of condensation is recovered, whereby great economy and efficiency accrue.

10,781. Application of Electricity to Vehicles Driven by Mechanical Means. Herbert John Dowsing, 24, Budge Row, London, E.C. May 19th, 1896.

This invention relates to apparatus for the production, storage, and utilisation of electricity in connection with vehicles driven by mechanical means, and it is particularly applicable to motor-cars or other vehicles in which petroleum, benzine, or other explosive vapours are used to drive the engine.

An electric generator or dynamo of the continuous current type is fixed on the vehicle and properly geared to the engine, so that the surplus power given off from the engine when driving the vehicle is utilised in driving the dynamo, the current so produced being stored in a secondary battery provided for the purpose. This current may be utilised for firing the engine, or producing light or motive power. The connections between the dynamo and battery can be so arranged that when the speed of the machine falls below the normal and electricity is produced at a lower pressure than that of the storage battery, the current from the battery flows through the machine which then becomes an electro-motor producing mechanical power.

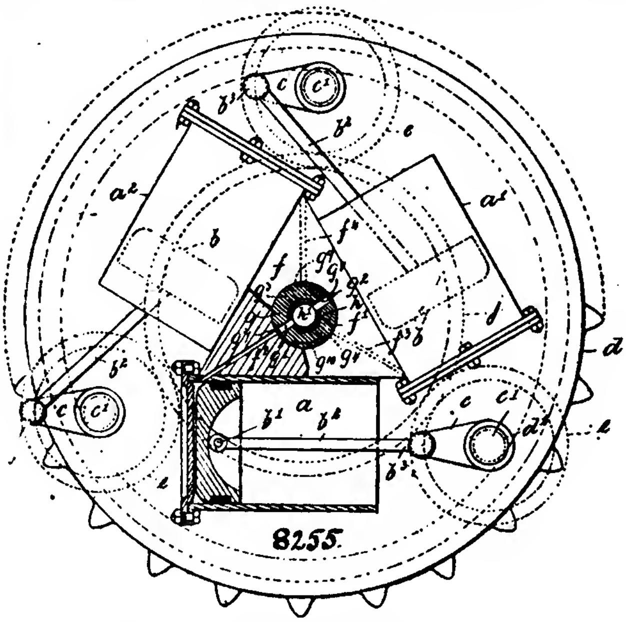
The power of the motor is transmitted by means of belting or other gearing to the engine which it aids to overcome its load, or if the engine is at rest, the power transmitted from the electro-motor will start it. When the engine generates sufficient power to drive the electro-motor at its full speed electricity is again generated, and the pressure being greater than that given off from the battery, storage again takes place.

The connection between the dynamo or motor and battery can be varied or broken either by hand or other means. Automatic contrivances can be employed for making or breaking connection according to the varying speed or current and these may be worked by electro magnetic or mechanical means.

The most suitable dynamo to use for the double purpose of dynamo and motor is a machine of the shunt wound type, as the direction of rotation is the same when generating or using the current.

8,255. Motors Driven by Steam, Compressed Air, Mixtures of Gas and Air, Petroleum and Air, or other Explosive Mixture. James Osmonde Dale, Glendene Grove Lane, Handsworth, Stafford. April 20th, 1896.

a, a^1, a^2, are three trunk cylinders, having pistons, b, reciprocating within them and each having jointedly connected to them at b^1, a piston rod, b^2, whose outer end, b^3, is likewise jointedly connected to a crank, c, mounted upon a countershaft, c^1, passing through a



bearing, d^1, formed in the walls of a plate or carrier wheel, d, and having made fast to its opposite end a spur pinion or driving toothed wheel, e. The cylinders which comprehend or are arranged in the planes of an equilateral triangle are bolted to and carried by a bed, bracket, or boss, f, coming upon or within, the said carrier wheel, d, and with the central hole or bearing, f^1, taking over and working upon a concentrically arranged valve or plug, g, having supply passages, g^1, g^2, and exhaust passages, g^3, g^4, leading respectively from the supply entrance, h^1, and exhaust exit, h^2, of the hollow spindle, h, to the supply ports, g^7, g^8, and exit ports, g^9, g^{10}, whilst directed radially from the central hole, f^1, in the cylinder bed are passages, f^2, f^3, f^4, leading respectively to the cylinders, a, a^1, a^2, and acting in proper sequence and coming alternately over the supply and exhaust ports of the valve as the said bed is bodily rotated, with the cylinders, driving plate and cognate parts of them around the valve as a centre. The driving plate or wheel, d, which may have sprocket teeth upon its periphery for communicating the motion of the motor by chain to a driven shaft, or may be in the form of a drum and have its motion transmitted by a band, carries a brake drum, i, around the periphery of which a braking hand or other like frictional or retarding device comes for the purpose hereinafter described, whilst the spur pinion, e, which, as shown, have each 16 teeth, intergear with the principal toothed wheel, j, having 32 teeth, and being made fast upon the hollow spindle, h^1, carried in end bearings, mounted in suitable supports, and provided with a brake drum, which is normally held fast (when the other part of the motor is at work) by the application of a brake band or other friction or retarding device.

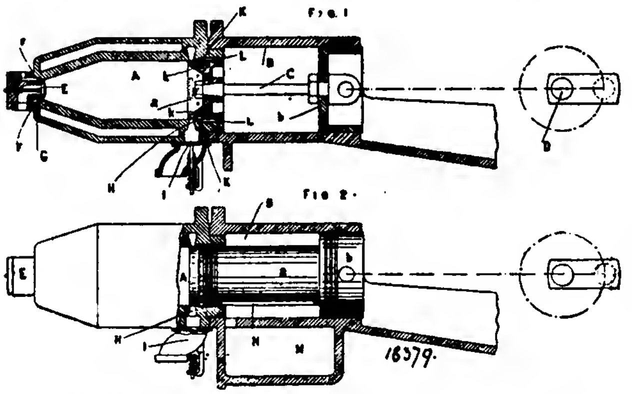
The means for successively exploding the charges of the cylinders of a gas or similar engine is as follows:—

The explosion chamber in the back cover of the cylinder is fitted with a small insulated spring buffer, or equivalent arrangement, against which a projection on the back of the piston comes and makes a contact every time the said piston completes its back stroke. This buffer or spring contact is in connection by a lead wire with a brush of which a number corresponding to the number of cylinders in the engine are mounted upon an insulating ring made fast to and rotating with the driving part of the motor, and these brushes are arranged to wipe over a commutator made fast on the spindle, so that the said brushes come successively upon and make electrical contact with a plate, covering only a small portion of the circumference of the commutator and proceeding from a complete ring, with which the spring tongue or terminal of the electric circuit is in constant connection. A wire leads from one pole of the induction coil or battery the other pole of which is coupled to any suitable part of the engine.

On the piston nearly completing its back stroke, the projection and spring buffer come together, and on the forward stroke being commenced they are again separated, an electric spark passes between them and the charge is fired.

18,379. Improvements in Gas and Petroleum Engines. John Johnston, Engineer. July 1st, 1896.

This invention relates to gas and petroleum engines. Fig. 1 is a longitudinal vertical section. Fig. 1 is an open ended cylinder of two diameters, A, B. The inner cylinder, A, is the smaller one, and it serves as the power cylinder. The outer cylinder, B, is a larger one and acts as a pump.



Two pistons, *a* and *b*, connected rigidly together by the piston rod, C, work their respective cylinders, A and B. These pistons, *a* and *b*, are connected in the usual manner to a crank shaft, D, as shown diagrammatically at Fig. 1. The larger piston, *b*, on its outstroke creates a partial vacuum between itself and the smaller piston, *a*. This vacuum is utilised to charge the power end, A, of the cylinder by first sucking out the exhaust gases left after the working stroke, and then drawing in a charge of gas and air. The inlet gas and air valve, E, is of the ordinary conical seated type and the seat is provided with holes, F, F, opening into an annular channel, G, connected to the gas supply.

The cycle of operation of this engine is as follows:—Assume the double piston, *a*, *b*, to move out after compression and explosion under a power impulse; then at the out end of the stroke a groove, K, in the piston, *a*, communicating with the cylinder, A, by means of a number of holes, *k*, *k*, over-runs the first port, H, controlled by the conical-seated lift valve, I, opening outwards, and the expanded gases discharge to atmosphere. On the further movement of piston, *a*, the groove, K, over-runs the annular port or groove, L, thus putting the front end, B, of the cylinder into communication with the back end, A. Simultaneously with this movement the back end of the piston, *a*, covers the port, H, thus cutting off communication between the cylinder, A, and the atmosphere.

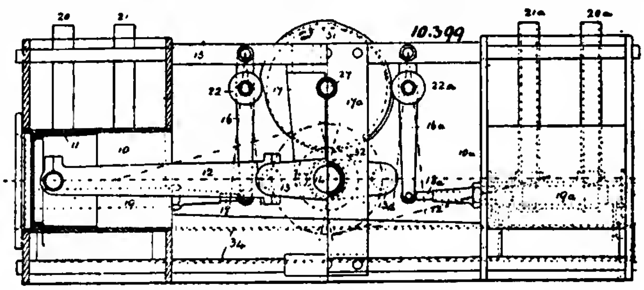
This particular position of the double piston in the cylinder is shown clearly at Fig. 1, and as there is a vacuum existing between the two pistons, *a*, *b*, the exhaust gases are drawn from A into B by way of the holes, *k*, groove, K, and annular port, L; while simultaneously the automatic gas and air valve, E, opens and a charge is drawn into the cylinder, A. On the return stroke compression of the mixture takes place, at the same time the exhaust is discharged as soon as the outer end of the piston, *a*, over-runs the port, H, slight compression of these gases taking place until this occurs. This cycle of operation thus gives an explosion for every revolution of the crank shaft.

Ignition of the mixture when compression is complete is arranged for in any known manner, preferably by means of a hot igniting tube.

Fig. 2 shows a modification of the double pistons, *a*, *b*. Instead of connecting the two pistons by a rod such as C, Fig. 1, a trunk piston is formed by a reduced prolongation of *b*; in which case a reservoir, M, is provided of sufficient volume in conjunction with the annular cylinder space, B, to enable the act of exhausting the cylinder end, A, and similarly drawing in the necessary charge of gas and air through the valve, E, to be performed. To exhaust from B on the return stroke, a port, N, runs along the trunk and up to the piston rings, so that the gases may be discharged through the exhaust valve, I, by way of the ports, N and H.

10,399. Gas, Oil, and Spirit Engines. Thomas James Bennett, 160, Walton Street, Oxford, and Walter Frederick Thomas, 37, Bloomsbury Street, Birmingham. May 15th, 1896.

This invention relates to improvements in gas, oil, and spirit engines, and its object is to provide a combination and arrangement of mechanism whereby such engines may be capable of being worked either upon a single or non-compressive cycle, or upon the com-



pressive (or Otto) cycle; also means by which the engine may be started upon the non-compressive cycle, and then at will transferred to the compressive (or Otto) cycle; also means whereby the engine, when in full work, being upon the compressive cycle, the act of stopping returns the mechanism to the single cycle, ready for restarting; also the combination and arrangement with such engines of a combustion chamber which is common to two opposite cylinders for simultaneous explosion, thus neutralising the shock and preventing vibration; also the combination with such engines of two sets of cams for the different cycles and reversing purposes.

10, 10ª, are cylinders forming a pair, which are opposite to each other, each having their respective pistons, 11, and connecting rods, 12, connected up to cranks, 13, 13ª, placed at an angle of 180° on the shaft, 14. These cylinders are strongly tied together by tie-rods, 15, which also serve as fixtures to which and from which the levers, 16, 16ª, may be carried, and also the brackets or frames, 17, 17ª, are connected thereto. 18, 18ª, are the valve rods, to which preferably piston valves of suitable type are attached, and which are arranged for inlet and exhaust openings to and from the cylinders, such valves being situated at 19, 19ª, the exhaust ports being shown at 20, 20ª, and the air and gas supply ports being shown at 21, 21ª. Other forms of valve may be used if found necessary. The lower ends of the levers, 16, 16ª, are coupled to the valve rods, 18, 18ª. Upon these levers are rollers, 22, which are acted upon by cams, 23. These cams are secured upon a shaft, 27, which is capable of an endway sliding motion.

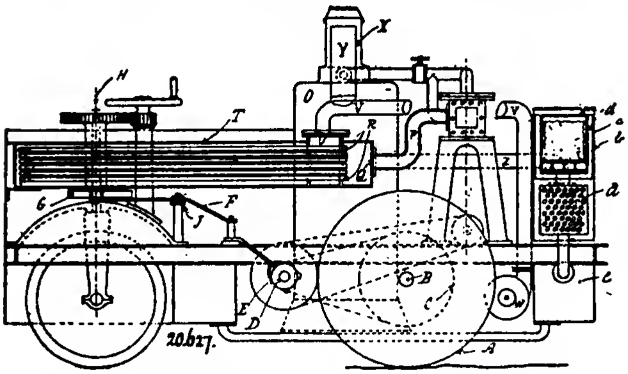
This cam shaft is rotated by means of suitable gearing, the proportion of which is preferably one revolution of cam shaft to two revolutions of main crank shaft.

The valve, 19, is employed to supply and exhaust from both cylinders of one pair, and the valve, 19ª, is independently used for a second pair of cylinders, that is the valve, 19, may be used for the two cylinders, 10, 10ª, while the valve, 19ª, may be used for similar cylinders on the other side.

The cams 23, act diametrically upon each valve rod.

20,627. Road Locomotives. Thomas Ballard Marchant, Verney Wharf, Verney Road, Rotherhithe New Road, Surrey. September 18th, 1896.

The figure shows a side elevation of a road motor propelled by steam power. A are the two driving road wheels, revolving each upon the axle ends, B. Affixed to the said wheels, A, are their respective driving-chain or toothed wheels, C, by which the road wheels are driven, the said chain or cog-wheels deriving their rotary motion in either direction from the countershaft, D, and upon each end of the said shaft, D, is placed a friction clutch shown at E, and



these clutches are each moved in or out of gear by suitable levers, applying motion and force to the clutches independently of each other, so that by controlling these levers marked, F, or their equivalents, the said clutches are in or out of gear with their respective road wheels which they drive, and the said control is given to the levers, F, by their attachment to the double cam, G, which cam is mounted upon the centre spindle of the steering mechanism, H, and this double cam is so designed that when the steering road wheel is in its central position the larger portions of the cam are holding out at their widest limit the ends of the said clutch levers, F, and where, as in this instance, the levers are pivoted at some intermediate point in their length, as at J, it is clear that both of the clutches are being forcibly held in contact with the countershaft, and are consequently transmitting the required power to rotate the two wheels, A, and thus to propel the motor in a straight line, as shown. Now, when the motor is required to turn around a curved path the person steering the machine will rotate the spindle, H, and with it its steering road wheel, and likewise the cam, G, and at a required point the said cam in revolving will present to the lever end, F, the portion of its circumference, K, which is removed, and in consequence the one lever (according to the direction of rotation of the cam) will be liberated, and with it its clutch, and of course its respective driving-wheel, A, and under these conditions the whole of the motive power is then being transmitted to the particular driving road wheel which is required to traverse the outside of the circular path in which the motor has to travel, and it will now be apparent that this automatic mechanism will materially lessen the loss of motive power usually wasted in turning corners, and will entail absolutely no thought upon the person actuating the same; slight modifications will have to be made to suit engines of different constructions. The levers, F, are guided and connected by a sliding grooved frame in which the clutch levers, F, can move as far as required in either direction.

The condensing apparatus is as follows:—Steam for motive power is generated in a boiler, O, which steam is passed to the cylinder of a steam-engine in the usual manner. When the said steam emerges from the said cylinder or cylinders by an exhaust pipe and passage, P, it is conveyed preferably first into a chamber, Q, and from which are taken a number of thin small tubes, R, which said tubes convey the exhaust steam along them until they terminate in a second chamber, S. Around the tubes, R, is constructed an air-tight casing, T, and into this casing at one end or other, and through one of the openings, U, is fixed a pipe, V, which conveys atmospheric air from a blower or pump, or fan. When the said air has been compelled to traverse the casing surrounding the said tubes, R, it is, if necessary to combustion of fuel, directed under the grate or ash-pan of the boiler, and if not necessary for that purpose it is allowed to escape to an annular space, X, where it escapes to open air, together with the products of combustion from the chimney, Y, of the boiler. The steam remaining uncondensed is carried through a pipe, Z, into one end of a water surface condenser, *a*, preferably sending the steam through the interior of the condenser tubes as is usual. When the steam has passed through the surface condenser, *a*, and it has not yet been totally liquefied, or its resultant water is of too high a temperature, a further cooling effect is brought to bear upon it as follows.

Fitted in a convenient part of the machine, preferably over the water surface condenser last described, is a chamber, *b*, made to store ice, *c*, in any convenient form, usually in the form of artificially formed blocks, as it is of course mostly required in warm weather when the combined cooling effect of the air cooling current and the water surface condenser might not of themselves be sufficient. The cooling effect of the ice is brought to bear upon the condensing steam to ensure perfect condensation and the required vacuum.

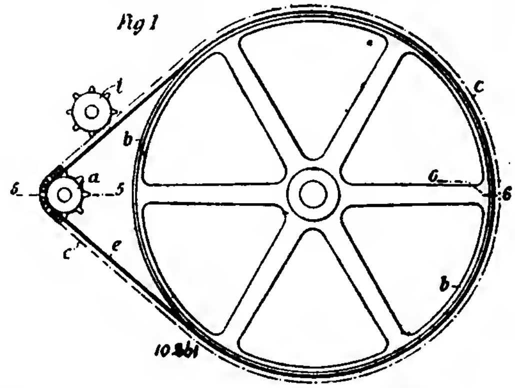
The said ice receptacle is made with hollow walls, thus leaving a surrounding space, *d*, in which may be placed non-conducting substances to prevent radiation, and loss of ice, or it may be surrounded with cold water on its way from the cold water tank, *b*, to the surface of the tubes of the condenser, *a*, and which is being driven by a circulating water-pump in the usual way in surface condensing steam-engines.

10,861. Driving Mechanism for Road Carriages. Chaimsonovitz Prosper Elieson, Broad Street Avenue, London. May 19th, 1896.

The object is to obtain all the advantages of belt transmission as regards the provision for slipping with the advantages of chain transmission in so far as regards non-slipping upon the motor-shaft. To effect this end, a combined belt and chain transmitter is used—that is to say, a belt having a chain fixed to it and moving therewith. The pulley on the motor shaft is provided with teeth adapted to engage with the chain, whilst the pulley on the driven shaft or travelling axle is plain. With this arrangement it will be understood that no slip can take place between the pulley on the motor shaft and the belt, whilst the belt is free to slip upon the pulley of the travelling axle.

a is the sprocket pinion on the driving shaft, and *b* is the belt-wheel or pulley on the driven shaft; *c* is the driving chain which runs around the pulley, *b*, and is in engagement with the teeth of the sprocket pinion, *a*, so that the said chain is positively driven. Pins project from the sides of the chain, the said pins being of a length approximately corresponding with the width of the driven pulley. These pins carry leather bands or belts, e, *e*, the said bands being secured to the pins by any suitable means in such a manner that they will run in contact with the surface of the wheel, *b*. The said bands are secured to the pins by means of small sockets, into which the pins are inserted, and which are secured to the said bands by rivets. In order to keep the bands, e, e, taut upon the pulley, the sprocket wheel, *a*, is made wide enough to allow of the said band running around the same, or loose pulleys may be used for the purpose.

With the arrangement hereinbefore described it will be obvious that the motion of the driving shaft will be communicated through the sprocket wheel, *a*, to the combined chain and belt without any liability of the latter slipping thereon; whilst as the pulley, *b*, is



plain, that is to say, unprovided with sprocket teeth, it will be obvious that the power which is transmitted from the driving pinion through the chain will be received by the driven wheel through the band which is free to slip upon the surface of the said driven wheel. The driven wheel, *b*, is recessed on the periphery at that part adjacent to which the chain, *c*, runs; however, such recessing is not essential.

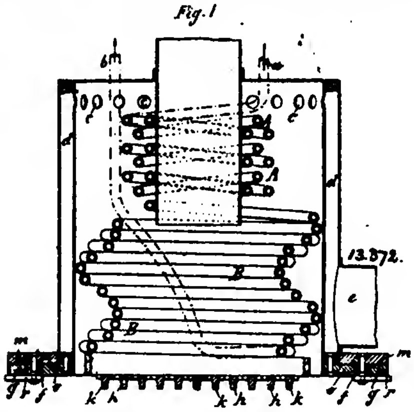
In order to retain the transmitter at the required tension, there may be combined therewith a loose sprocket wheel, such as that indicated at *i*, which is adapted to be moved at will towards or away from the transmitter, to give the latter more or less grip upon the pulley as required.

18,372. A Boiler for Steam-driven Velocipedes or like Vehicles. Eugène Labitte, 177, Boulevard Pereire, Paris, France. June 17th, 1896.

Relates to a light and compact construction of boiler, presenting large heating surface and capable of rapidly generating and superheating steam for driving a velocipede or like vehicle.

The upper coil, A, which is supplied at *a* with the feed water is connected at its lower end with the superheating coil, B, which consists of straight parts connected by bent parts, each convolution

Fig. 1



forming a triangle which is turned partly round relatively to the next, so that between the successive convolutions there are narrow passages for the flame and combustion gases, which play upon both the inner and the outer surface of the coil. From the lowest convolution of B, the superheated steam is led to the steam engine by a pipe, *b*, which ascends through the combustion chamber, as indicated by the dotted lines.

The combustion gases pass through holes, *c*, at the top of the chamber into the annular space, *d*, within the casing, and descend to the outlet, *e*, leading to the chimney.

The fire grate consists of two sets of bars, *h* and *k*, which alternate and are carried on two rings, *f* and *g*, respectively. The ring, *f*, is attached to a ring, *m*, which rests by segments, *n*, on a flange, o, fixed to the base of the boiler casing. This flange has segments, *p*, cut out of it to allow the segments, *n*, to pass up, these being then turned partly round so as to be held in the manner of a bayonet joint. The ring, *g*, which carries the bars, *k*, is held outside the ring, *f*, by turn buckles, *r*, pivoted on *f*. Other brackets, *t*, serve to hold the ring, *g*, up to *m*. When it is desired to shake out ash or small cinders, the ring, *m*, is turned a little to and fro between suitable stops, thus shaking the grate. In order to clear the grate from larger pieces the brackets, *t*, and the turn-buckles, *r*, are disengaged, and the ring, *g*, with the bars, *k*, is lowered, thus leaving larger spaces between the bars, *h*. Fuel descends by the central tube, the shake of the vehicle ensuring its descent.

Between the boiler and the engine may be arranged a slide-valve by which the steam is directed either to the cylinder or to the escape pipe, or partly to each according to the engine power required. In case very little or no power is required as in descending a slope, the feed may be cut off, and as there is no longer exhaust in the chimney the fire becomes deadened.

6,573. Gas Engines. Herbert John Dowsing, 35, Queen Victoria Street, London, and Henry Sheehy Keating, Queen's Gate Mansions, Queen's Gate, Kensington, London. March 25th, 1896.

The object of this invention is to ensure more perfect combustion and thereby obtain increased power from a given charge of combustible.

For this purpose an ozonising apparatus of any suitable known kind is combined with the engine and through this is passed the air which is to form part of the combustible charge, thereby converting its oxygen or a portion thereof into ozone, which acts more effectually in combustion than oxygen itself does.

As, in ozonising air, considerable heat is absorbed, it is preferred to heat the air either before or after it is ozonised, for which purpose it may be passed through the cylinder jacket or through or along tubes or other extended surfaces heated by the exhaust products of combustion from the cylinder. By ozonising the air in contact with the cylinder, the heat of the cylinder may to some extent be reduced.

2 D

THE AUTOMOTOR AND HO LESS VEHICLE JOURNAL

A RECORD AND REVIEW OF APPLIED AUTOMATIC LOCOMOTION.

Circulates amongst Makers and Users of Motor-Cars, Cycles, etc., in the United Kingdom, the Colonies and the Continent.

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CONTENTS.

THE AUTOMOTOR INDUSTRY.

A Visit to Messrs. New and Mayne's Works at Woking.

LONG before that oracular utterance, "There is no motor-car industry," was pronounced by a contemporary to an astonished public, we had arranged to give in each issue of the AUTOMOTOR an account of the industry as carried on in the principal centres. We commence with a description of the automotors, &c., manufactured by Messrs. New and Mayne (Limited), of Woking and London. Woking in Surrey is not exactly a Birmingham, but is, nevertheless, the home of several industries connected with automobilism. Messrs. New and Mayne's premises are extensive and straggling, owing to the number of separate industries in which the firm is engaged. Steps are, however, being taken to locate all the purely engineering and constructive works under one roof. The automotors manufactured by Messrs. New and Mayne are the result of a long investigation of the properties of various internal combustion-engines, supplemented by an equally long and costly series of experiments. How very expensive scientific investigation is, may be gathered from the fact that in perfecting their various appliances used in their automotor industry, Messrs. New and Mayne have spent no less than £50,000. In their oil motor which we illustrate, Messrs. New and Mayne have succeeded in effecting many improvements whereby the general efficiency is increased. Figs. 1 and 2 are respectively an end and side elevation, while Fig. 3 is a part sectional elevation; the scale is a quarter of the full size. It will be seen that the motor is of the twin cylinder vertical, enclosed crank type; the cylinders are 2½ inches diameter by 6 inches stroke. The cylinders form in themselves a really very special feature, and in this design is ample evidence of the proper application of science to practice which, in our opinion, alone constitutes real engineering. The cylinder of a gas-engine has to bear the stresses not unlike those set up in a gun, although, of course, of much less intensity. Hitherto it has been the practice to make the cylinders of gas-engines of fine-grade cast iron, and where weight and space are of little account and low first cost essential this practice is good and proper. For automotor work, whether for land or water, we wish to associate the maximum of strength and the minimum of weight with also small cost. To this end Messrs. New and Mayne decided to employ a steel of a similar specification to that used in the manufacture of quick-fire ordnance; this steel has an ultimate strength of about 65,000 lbs. per square inch and is exceedingly tough and ductile. As will be seen by Fig. 3 the cylinders are thickened at their rear ends so as to provide ample strength to withstand the stresses set up by the explosions; the initial pressure being about 260 lbs. per square inch. The cylinders are jacketed by the outer casing. The engine works on the "Otto" cycle, but the essential features, however, of the New and Mayne motors, and which differentiate them from others, are the inlet spraying valve and the electric and self-firing ignition device. Whilst being able to use any kind of petroleum, either light or heavy oil, or coal gas, they also possess the great merit of starting almost immediately and without any previous heating up of tubes, &c., by lamps. There is no vaporiser, carburiser, or similar device. The engine is altogether simpler, stronger, and more easy to manage. Owing to the perfect combustion the exhaust is almost colourless.

The *inlet spraying valve*, unlike those used in most engines, is a positive action one, and hence does not require delicate adjustment of the spring which retains it in its seat. This positive action also enables the velocity at which the mixture of oil and air enters the cylinder to be adjusted to a nicety; the compression on the return stroke to be varied and set accurately;

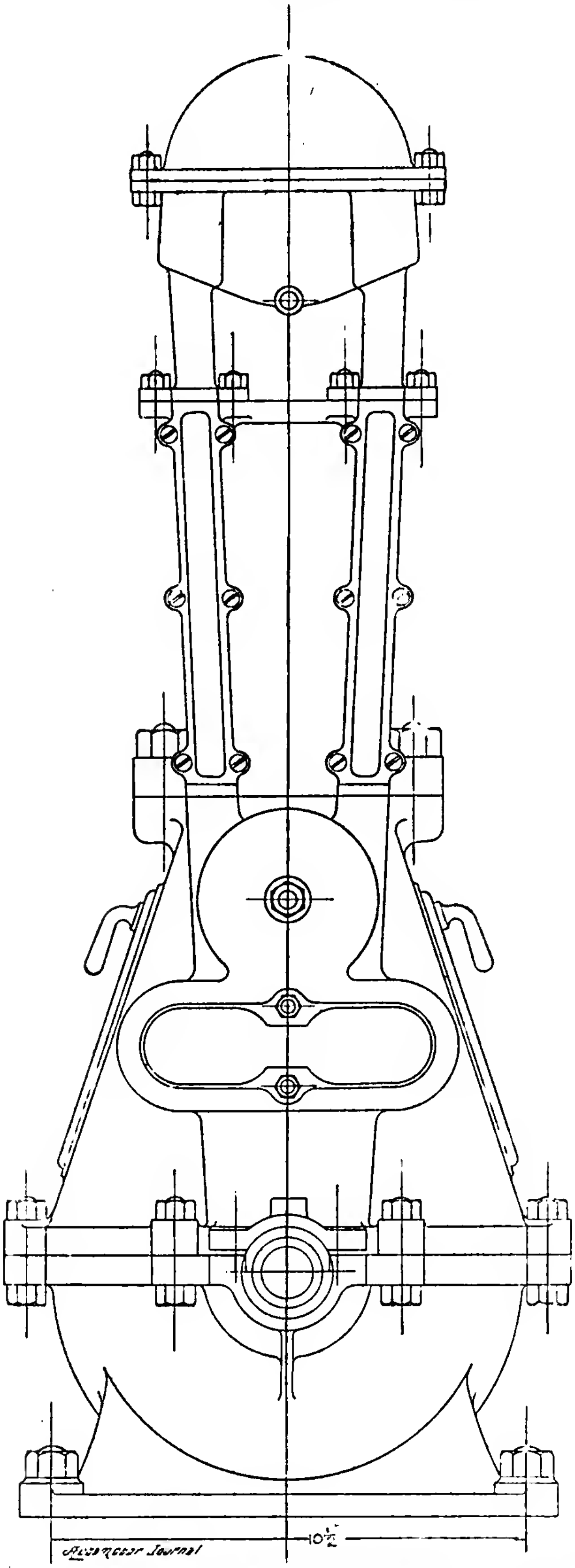


FIG. 1.—NEW & MAYNE'S TWO-CYLINDER VERTICAL OIL-ENGINE End View.)

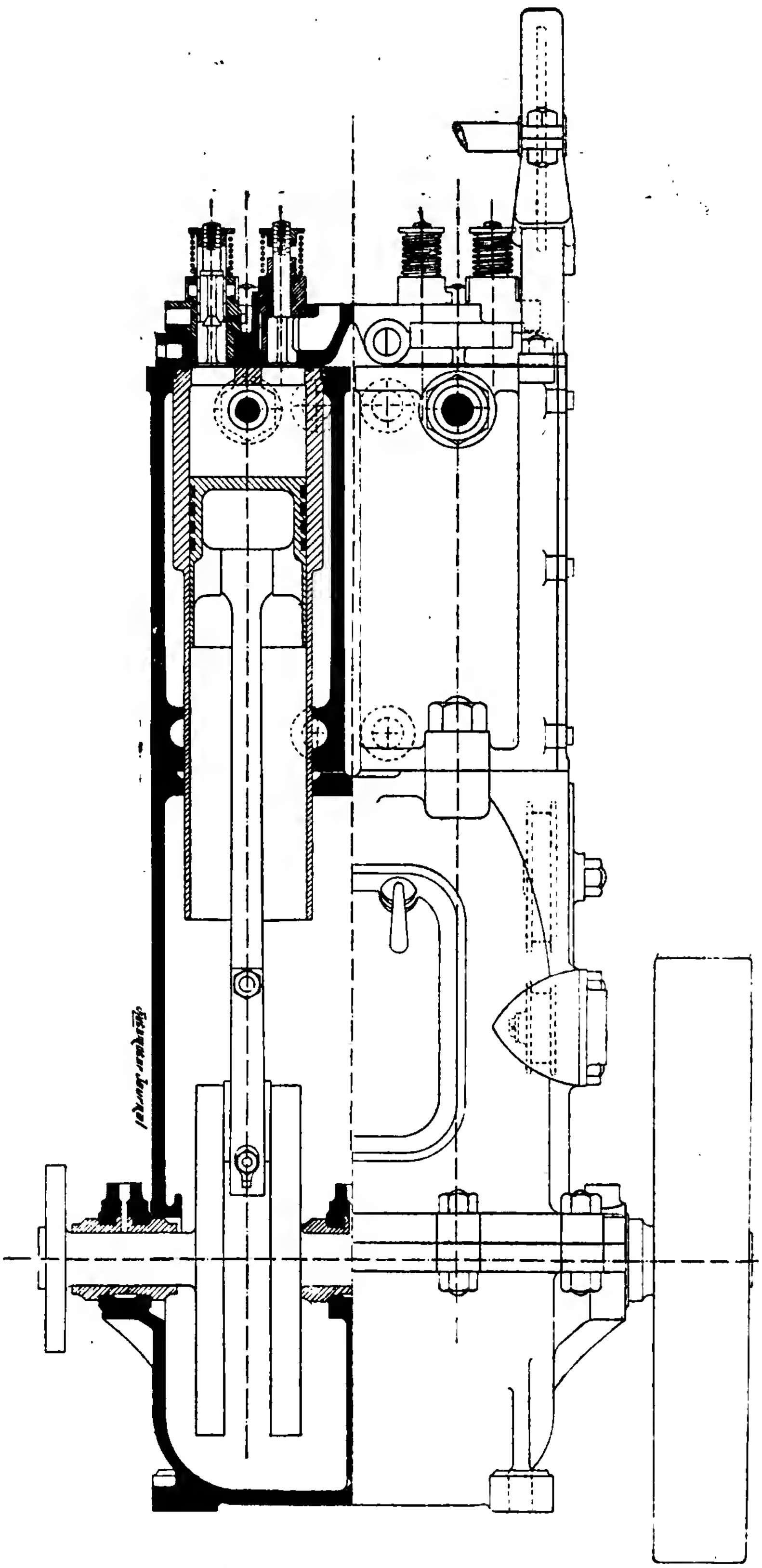


FIG. 3.—NEW & MAYNE'S TWO-CYLINDER VERTICAL OIL-ENGINE (Side View.)

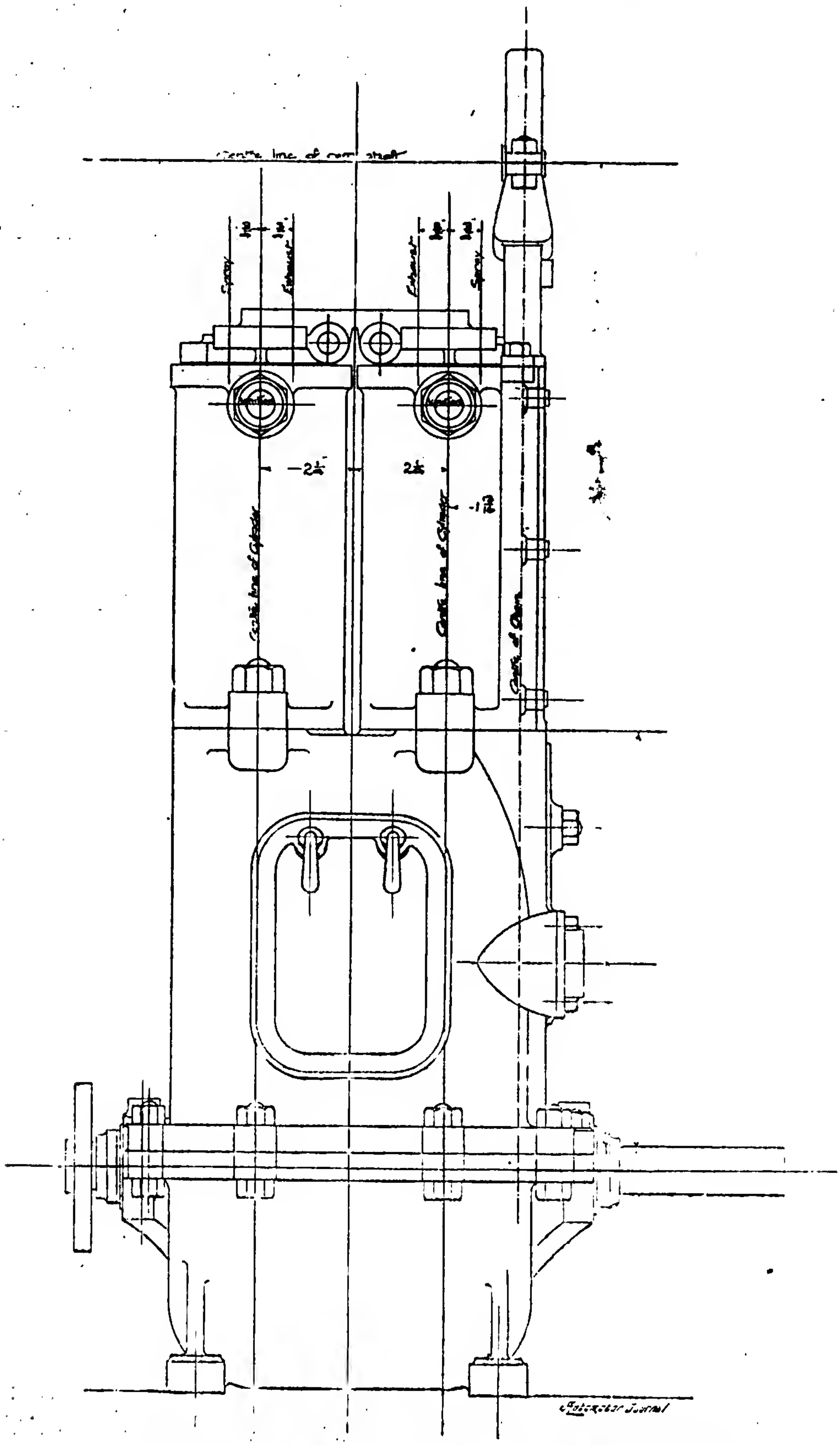


FIG. 2.—NEW AND MAYNE'S TWO-CYLINDER VERTICAL OIL-ENGINE (Elevation).

and the amount and proportion of oil and air to be varied to requirements, or to be automatically controlled by the governor.

The valve is actuated by means of a cam, in a similar manner to that employed (in nearly all similar engines) for the exhaust valve. This cam is made in such a manner that it can be adjusted to open the inlet valve earlier or later in the cycle of the engine, and to close it earlier or later.

of detail in these engines as made, but these two parts are chiefly dealt with in the numerous patent applications held by Messrs. New and Mayne.

Referring to the current required to render the ignition tube incandescent, Messrs. New and Mayne make the carriage of a battery of accumulators a part of their system of automobilism.

Fig. 4.—Arrangement of New and Mayne's Direct Coupled Engine and Dynamo (Side Elevation).

for such a short time that quite a small battery of secondary cells suffices for a long period. On passing the current for a few seconds, the ignition tube becomes red hot. The engine can then be started immediately, and after it has run for a minute or so the electric current is switched off, and not required again until the motor has been stopped and is again wanted to work. The firing of the mixture in the cylinder is, after starting, effected automatically, because the sleeve is kept sufficiently hot by the constant explosions. This sleeve not only serves the purpose of automatic igniter, but is essential even for starting, as it shields the ignition tube from the inrushing cold mixture of air and vapour, and thus prevents it from being chilled, as it otherwise would be. There are other minor points

They maintain that the advantages of this combined oil and electric system are:—(1) That the oil-engine can be automatically started, without any labour, by using the dynamo as a motor from the accumulators. (2) That the engine always has a "full load," and hence runs more quietly and free from vibration. (3) That for extra power required for short periods (such as for hills) the accumulators *assist* the engine. (4) That electric current is always available for lighting and the other numerous conveniences for which it is so especially applicable.

It will be seen that all the valves are worked off the main shaft by a chain. The cranks are placed at 180° apart, and are balanced. There is also a heavy fly-wheel; there is thus very little vibration. In the smaller sizes the connecting-rods are made so as to permit a slight increase or decrease in their length, with a view to obtaining greater or less compression of the firing charge. Large bearing surfaces are provided for all the motion parts, and, the cranks being enclosed, ample and efficient lubrication for long periods without attention is ensured. Altogether the workmanship in these motors is of a very superior character.

With the increased use of high-speed reciprocating engines of late years, a phenomenon somewhat akin to hysterisis in electro-

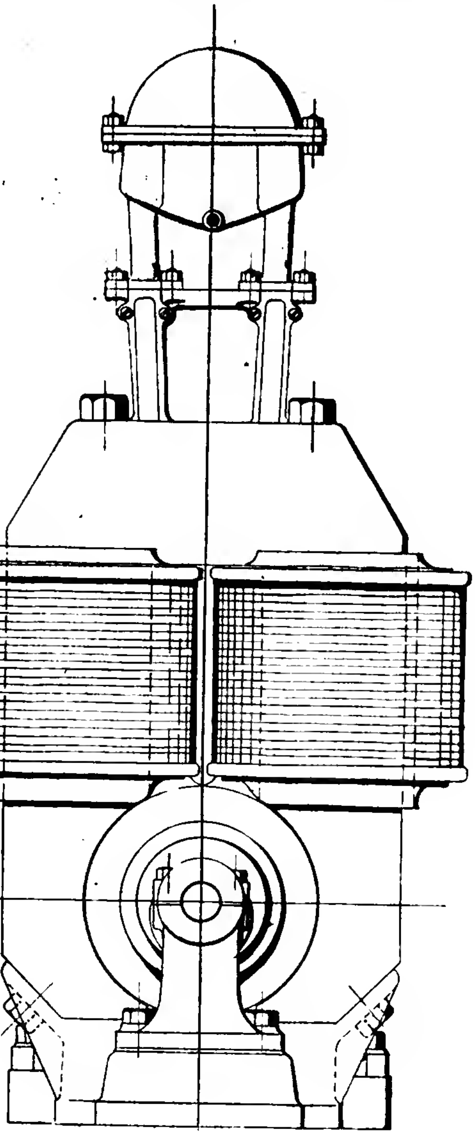


FIG. 5.—ARRANGEMENT OF NEW AND MAYNE'S DIRECT COUPLED ENGINE AND DYNAMO (End Elevation).

dynamics is often noticeable. In other words, each engine seems to have some critical speed or speeds at which synchronism is maintained in all parts of the machinery; at other speeds the parts are out of place and vibration results. In oil-engines this hysterisis manifests itself by checking the flow of oil to the cylinders; that is, when the admission valve is opened for oil, unless the pipe, &c., is synchronising with the motion of the engine, the result is either an acceleration or retardation in the flow of oil to the cylinder, with, of course, great variations in the power. In order to get over this difficulty, Messrs. New and Mayne have devised an exceedingly ingenious automatic valve. The oil is made to pass into a chamber, not unlike the vacuum chamber of an aneroid barometer. Any relative motion between the two ends is transmitted by a stalk to a tiny bell crank lever which actuates the needle valve, which is kept in its place by a small coiled spring; should the oil be forced forward the needle tends to close, and *vice versâ*. This arrangement has been found to answer its purpose very effectively.

These motors are made either with single, double (as illustrated), or with four cylinders, two on each side of the shaft. The following table contains the principal data relating to them:—

Number of Cylinders.	Diameter of Cylinders.	Stroke.	Revolutions.	B.H.P.	Over-all Dimensions.	Weight, with casing, &c., in cwts.
1	2½″	6″	800	1	33″ × 13″ × 9″	1½
2	2½″	6″	800	2	33″ × 13″ × 13″	2
4	2½″	6″	800	4	33″ × 13″ × 15″	2¾
1	4″	8″	500	3½	42″ × 15″ × 12″	3¾
2	4″	8″	500	7	42″ × 15″ × 14″	4¾
4	4″	8″	500	14	42″ × 15″ × 22″	6

These weights are considerably reduced by employing aluminium which, while equally strong, is so much lighter than cast iron that the saving effected varies proportionally from ½ cwt. in the case of the one H.P. motor to 1½ cwt. in the 14 H.P. Expressed in terms of weight per H.P., these motors run out at about 72·8 lbs. per B.H.P. for cast iron, and at 54·2 lbs. per B.H.P. when of aluminium.

The consumption of petroleum (ordinary paraffin) is about 1½ pints per B.H.P. per hour in the smallest size, and very much less in the larger ones. The larger sizes of these motors have been very successfully applied for the propulsion of light vans, carriages, &c., while in a somewhat modified design the smaller sizes are used for bicycles and tricycles. For the latter purpose two fly-wheels are attached, one on each side, to the spindle of the driving-wheel, but while the latter revolves freely on the spindle the fly-wheels are rigidly keyed to it. To the ends of the axle are fixed the cranks of the motor. Suitable gearing, such as a sun or planet wheel motion or differential gearing, is used to transmit the energy, with the object of enabling the axle to revolve at a greater speed than the driving-wheels.

An interesting application of the New and Mayne two-cylinder motor is shown on Figs. 4 and 5, which show the motor coupled direct to the dynamo, thus forming a very compact plant, very suitable for country house, shop, or ship lighting. The dynamo as shown gives at 800 revs. 12 ampères at 100 volts; this is equal to 20 16 C.P. or 40 8 C.P. lamps.

As regards electric traction, we illustrate in Figs. 6, 7, and 8 Messrs. New and Mayne's char-à-banc, which carries, including driver and conductor, 24 persons. These drawings are self-explanatory, and show the arrangement of the various parts. The most interesting parts are, however, the change and differential gear (Hardingham's patent) shown in Fig. 9. It will be seen that the electro motor carried underneath the rear of the car drives, by means of a raw hide pinion, the friction wheel, P, of the drum, R, which is keyed on to the boss of the pinion, N, which revolves on the sleeve or hollow shaft, B; A being the main shaft. Keyed on to shaft, B, is the arm, D, which carries the planet wheel, M, on the spindle, H′, this pinion, M, gearing with the internal teeth, E, of the drum, L. When the brake-wheel, K, is held, the wheel, E, drives the arm, C, by means of three intermediate pinions, F, of which only one is shown, which revolve around the fixed wheel, J; this gives an increased speed between the wheel, R, and the sleeve, B, and is the full speed gear.

When the wheel, L, is held by the wide brake, the arm, D, is driven round by the wheel, N, through three intermediate pinions, M, which roll round the internal rack, L. This gives a diminished speed between the wheel, P, and sleeve, B.

The power is then transmitted by the sleeve, B, to the

2 D 4

differential gear, the outer case of which revolves, carrying three bevel pinions, T, on the three armed forging, V.

The driving shaft is divided into two portions, the division

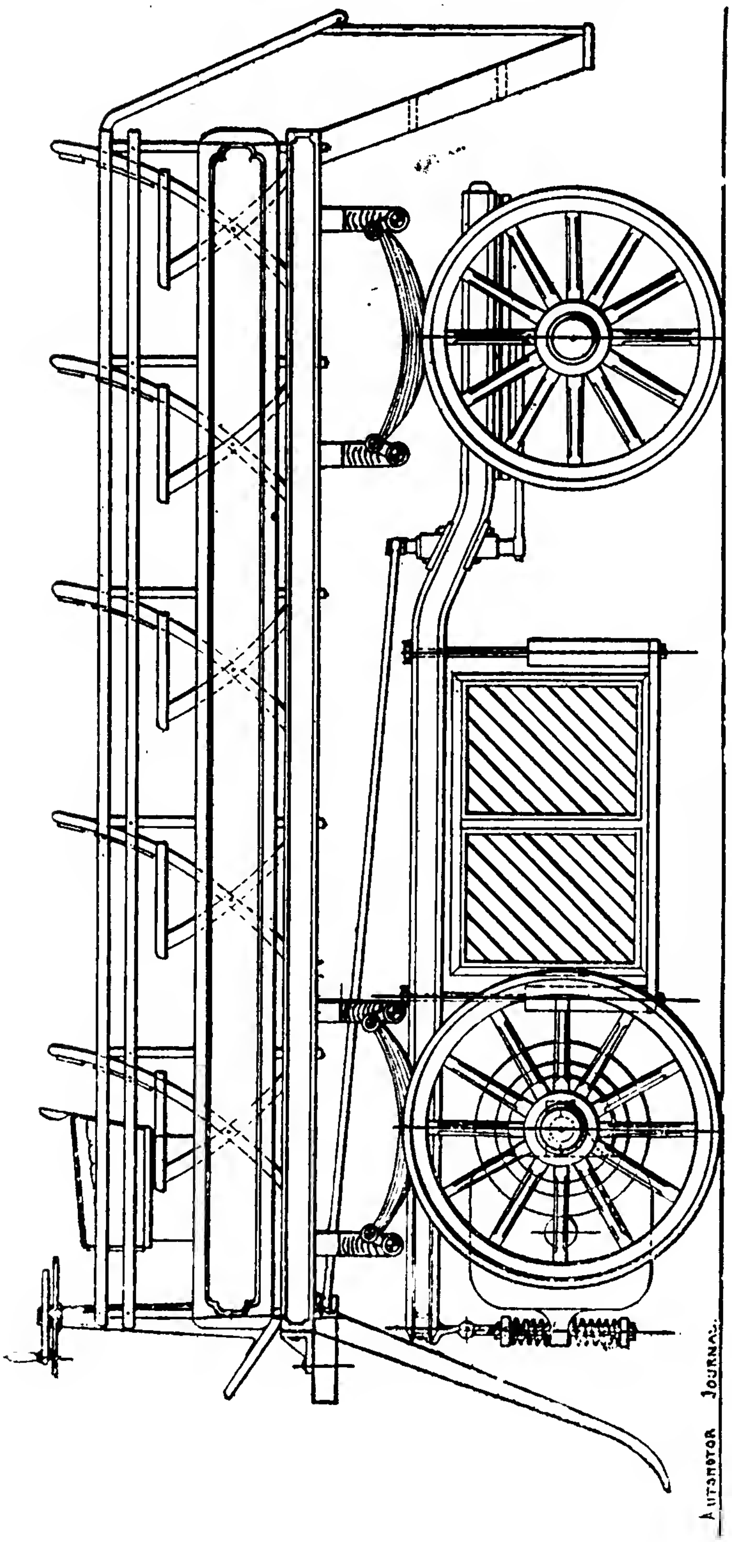


FIG. 6.—NEW AND MAYNE'S ELECTRIC CHAR-À-BANC (Side Elevation).

being on the centre line of the bevel pinions. To each portion of the shaft is keyed a bevel wheel, Y and S. When the motion of the car is straight ahead, the two wheels, Y and S, are carried round by the pinion, T, which then do not revolve on their pins, Y. When going around corners, either wheel can remain stationary in the well known way. The brake on the differential gear case is merely used to retard the motion of the vehicle.

Another automotor speciality designed and manufactured by Messrs. New and Mayne is their "Motor-trailer." This apparatus consists of a specially designed electric motor, in which all the necessary gearing for the reduction of the speed of the moving and driving part is self enclosed. In appearance (*see* Fig. 10) it resembles a pulley or drum mounted on a shaft. If the shaft is held the drum rotates when the machine is supplied with an electric current, and may then be connected by a belt with any machinery which it is intended to drive, or may be fitted with a rubber, leather, or other tyre, and used for driving direct on to a road; in this latter case it is assumed that it is fixed to the vehicle in a suitable position and manner, preferably between the main driving wheels and in the centre of the carriage. For vehicle driving it possesses the special advantages of saving a great portion of the friction loss in the reduction of speed, which is always necessary, owing to the fact that the driving wheel itself is small; saving weight and space, and also being absolutely dust proof; and, lastly, that of being readily attached to existing vehicles without serious alteration in their structure.

As regards the efficiency of this trailer, the particular electric motor used in it being an experimental one and only having an efficiency of about 70 per cent., we give a few figures obtained from recent trials, and it will be seen that the real efficiency is very high, and it forms a thoroughly reliable apparatus at small cost of production. A similar machine is also constructed by New and Mayne (Limited), with an oil machine as the driving power, and in this case a variable gear is used instead of the fixed gearing mentioned above, but the application is similar :—

TESTS OF MOTOR-TRAILER.

Volts.	Ampères.	Revolutions.	Miles per hour.	E.H.P.	B.H.P.	Efficiency = $\frac{\text{B.H.P.}}{\text{E.H.P.}}$
73·5	20	98	5·5	1·97	·96	48·9
75·5	15·5	120	6·8	1·56	·77	49·5
111	30	118	8·38	4·45	2·35	53 (nearly)
114	20	210	11·9	3·05	1·67	54·8
115	18	230	13·1	2·77	1·36	49·2

In another branch of automobilism Messrs. New and Mayne have attained considerable notoriety and success. The River Thames at this time of the year, especially in the upper reaches, presents a good deal of variety in the way of all sorts and descriptions of craft. From the scientific, nautical, and pleasure points of view no craft are more interesting than electrically-propelled launches. In most boats there is usually much space which should be utilised for ballast, and unless a boat *is* properly ballasted, and especially a pleasure boat, in which there will often be people who *will* stand up and who *will* crowd to one side, there is great risk of a capsize, owing to what is scientifically known as an insufficient metacentric height, or, as the vulgar have it—topheaviness. The use of secondary or storage cells is then emphatically the proper thing for small craft, so long as they ply within range of a central station. Deriving power from storage cells is, of course, no new thing. It is in the arrangement of the motor and propeller that Messrs. New and Mayne have made a radical departure, and one which at first sight startles the seaman and naval architect.

The apparatus, a drawing of which appeared in the April number of the AUTOMOTOR, consists of an electric motor, specially constructed in the shape of a small torpedo, to which the necessary conductors are conveyed from the yoke or tiller bar through the supporting tube which forms part of its construction. The rudder is fitted with an adjustable frame, which enables it to be attached to any boat without in any way altering its construction or making any special provisions. The yoke or tiller bar and the adjustable frame are easily detached from the motor, as also is the propeller, thus enabling the machine to be fitted with a small pulley wheel, and to be used for other purposes in winter, such as driving a sewing machine, lathes, or other light machinery. The rudder is provided with rudder lines, which terminate in metal plugs, and these fit into

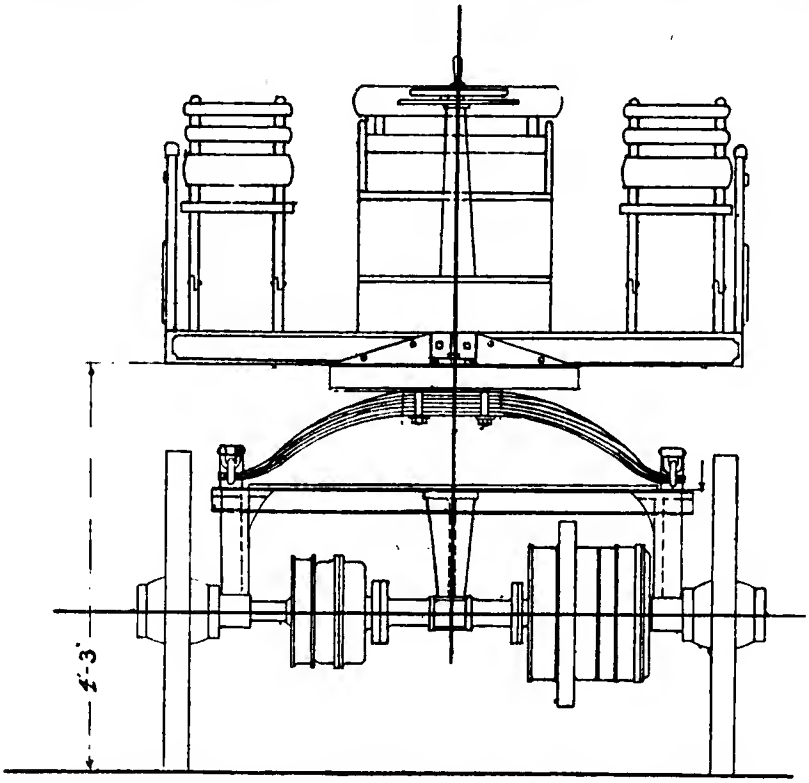


Fig. 7.—New and Mayne's Electric Char-à-Banc (End View).

Fig. 8.—New and Mayne's Electric Char-à-Banc (Plan).

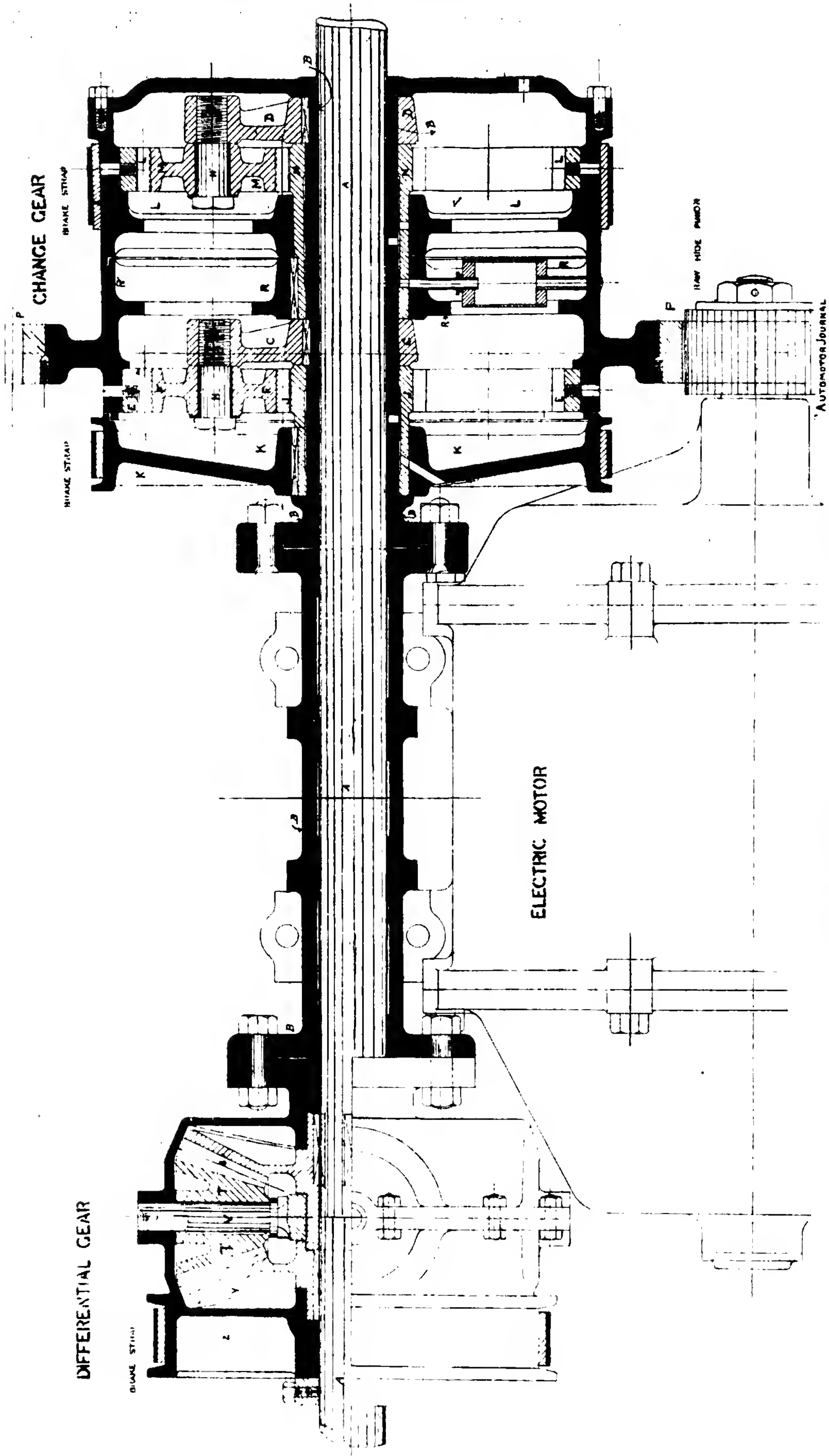


Fig. 9.—New and Mayne's Differential and Change Gear.
(Hardingham's Patent.)

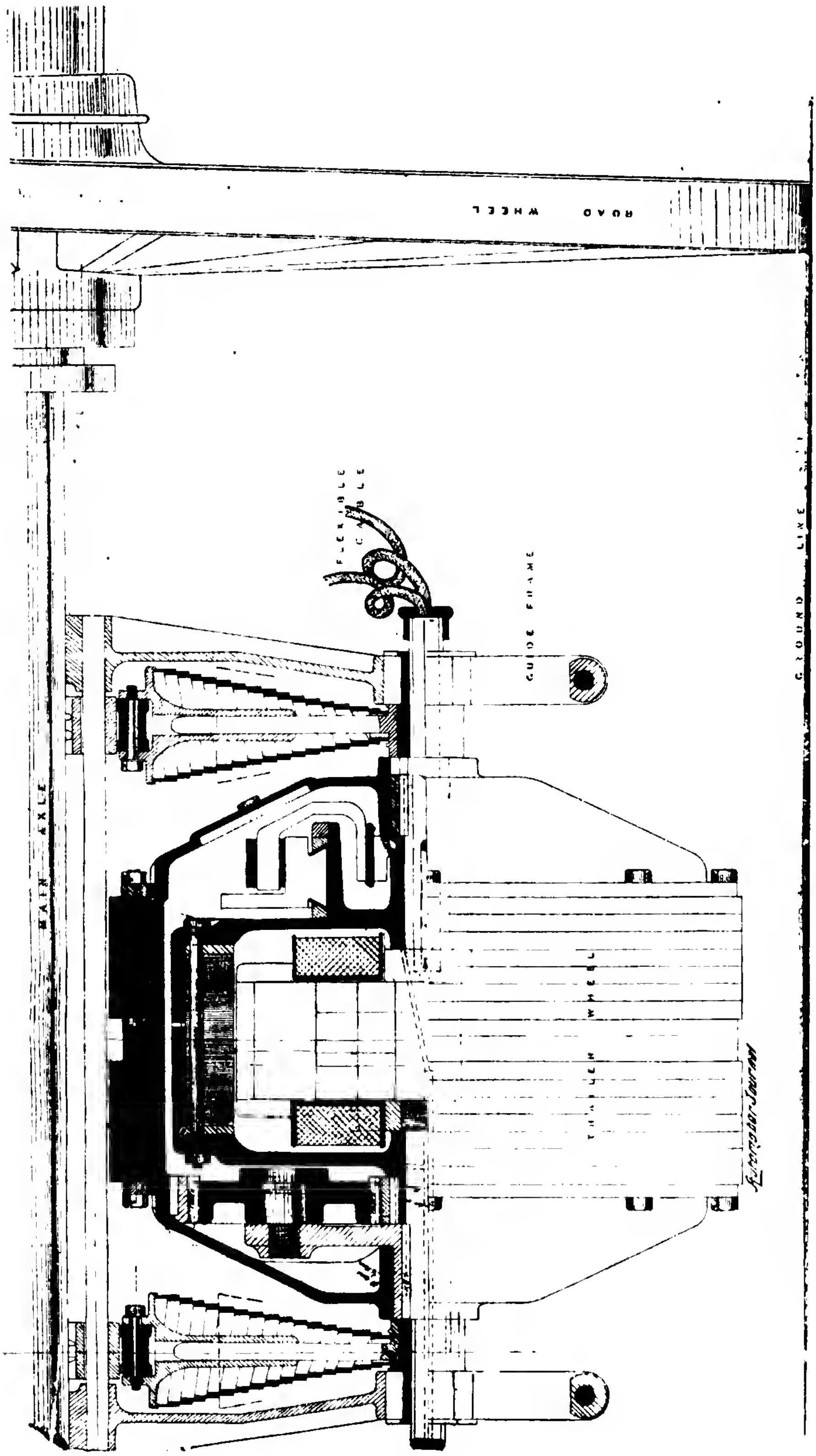


FIG. 10.—NEW AND MAYNE'S ELECTRIC TRAILER WHEEL.

sockets provided on the switch inside the boat; these lines not only serve for steering as in the ordinary way, but also make the necessary electrical connection between the switch and the motor. A small propeller is fitted on a projecting shaft at the end of the torpedo, and when in place on the stern of the boat lies close up to the keel. This propeller revolves at a very high speed when current is supplied to the motor. The motor is also fitted with a thin metal fin, which enables the rudder to be used in the ordinary way when sailing or rowing. The pivoted point of the motor is where the supporting tube passes through the frame to the yoke, and this takes an ample bearing in the frame. The frame is fitted with two thumbscrews, which press small pads against the stern of the boat and hold it perfectly rigid. Owing to the fact that the propeller moves with the motor, extremely sensitive steering is obtained when the motor is running, and thus the most complete control and manœuvring power to the operator is secured. The battery consists of a number of accumulator cells which are fitted into compact boxes, these boxes being of convenient size and weight for portability. The battery supplied with each set is capable when fully charged of supplying current to run the motor at full speed for five to six hours. The boxes are all fitted with sockets, into which the necessary connecting wires and plugs fit, making complete electrical connection. The connections and sockets are marked, so that it is impossible to make any mistake.

The regulation of the current and speed is effected by a switch which enables any one to regulate the speed of the motor from rest to half or full speed, in either direction. This is effected by the movement of a single handle, which is free to move rapidly or slowly from one position to another; an indicating pointer attached to it denotes its position at any time. This switch is also arranged in the smaller sizes in such a way that in one of its positions all necessary connections are automatically made for re-charging the accumulators. The connections and switching arrangements are shown in Fig. 11.

In the following table we give particulars of this motor and battery as we think there is a considerable field for its use:—

H.P. of Motor.	Volts.	Charging Ampère.	Cells.	Total Plates.	Weight of Rudder Motor.	Weight of cells.	Weight of Switch.
					lbs.	lbs.	lbs.
½	24	20	12	108	55	320	14
1	48	20	24	216	110	640	14
2	48	35	24	360	200	1,080	20
3½	96	35	48	720	550	2,160	20

Needless to say Messrs. New and Mayne manufacture many other things besides those described above. Indeed, as indicated elsewhere, the automotor industry as carried on at Woking is quite subsidiary to their more important one, that of electric lighting machinery manufacturers. As, however, this branch is beyond our province we do not describe it. A visit to Woking is, however, to the student of automobilism something in the nature of a liberal education.

Here, then, we take leave of Messrs. New and Mayne. We have in this sketch amply justified our contention that not only is there a legitimate automotor industry in this country, but that it is also one which is, and must be, in the hands of such firms as that whose works we have attempted to describe—progressive.

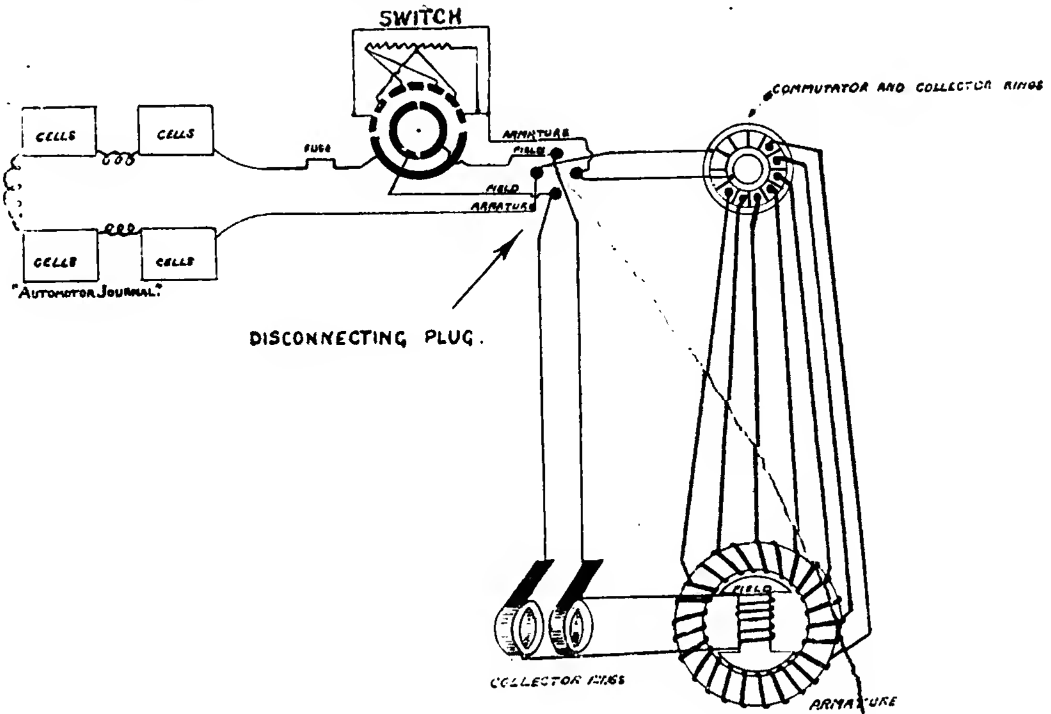


FIG. 11.—NEW AND MAYNE'S RUDDER-MOTOR CONNECTIONS.

WHEN computing the horse-power of a steam-engine, and you have multiplied together the piston area, the mean effective pressure, the double stroke, the revolutions per minute, and all that, if you divide by 44,236, instead of by 33,000, you will have your power expressed in kilowatts instead of in horses. A kilowatt is 1,000 watts. One horse-power is equal to 746 watts. If kilowatts must be had, and some people want them, it may save labour to get the horse-power in the old-fashioned way, and then multiply by ·746. Having the power in kilowatts, multiplying by 1·34, or more accurately by 1·3404825 +, gives the horse-power.

PROCEEDINGS OF SOCIETIES.

Liquid Fuel.*

THE writer's experiences with this form of fuel has principally been with petroleum residues on board of steamships, and the contents of this paper may, therefore, be taken as applying more particularly to its use in this direction. The application of liquid fuel for the purpose of raising steam in boilers is now no longer in the experimental stage, a large number of boilers, both on board ship and ashore, being fired with this fuel, and there is no doubt that as the numerous oil-fields in the various parts of the world develop, its application will rapidly extend. In addition to the oil wells of Southern Russia and Pennsylvania, oil has been found in varying quantities in most countries all over the globe. The late Mr. B. G. Nichol, in his paper on this subject before this Institution in 1886, mentions the countries in which petroleum had then been discovered. Since that time several of these oil fields have been developed, and are now producing petroleum in considerable quantities, especially those of Peru, Burmah, Sumatra, and Beluchistan. The principal source of fuel oil is Russian petroleum residuum or "astatki": this is the oil remaining in the distillery apparatus after the lighter naphthas and paraffins have been distilled over. Russian crude petroleum yields a very much smaller percentage of burning oils than American crude oil, as is shown in Table 1, but fuel oil in Russia, where astatki is used for this purpose, is cheaper than in America, where crude oil is used.

The percentages of the various oils that, with the perfected process of distillation now used, could be obtained from Caucasian naphtha are as follows:—

TABLE I.

—		Density at 17° Centigrade.	Percentage.
Light oils ...		0·725	3
Illuminating oil...	Kerosene ...	0·822	30
	Solar oil ...	0·863	14
Lubricating oils...	Spindle oil ...	0·895	10
	Machine oil ...	0·908	16
	Cylinder oil ...	0·915	5
Oil fuel ...		0·93	17
Loss ...		—	5
			100

American oils contain a very much higher percentage of burning oils, about 80 to 90 per cent., instead of only about 50 per cent., as above.

The first steamer to use liquid fuel was the s.s. "Constantine" on the Caspian Sea in 1870, and in America it was used on the steamer "Thoroughfare" in 1885. The first steamer to cross the Atlantic burning oil as fuel was the s.s. "Baku Standard" in January, 1894.

TABLE II.

—	Specific Gravity.	Chemical Composition. Carbon.	Hydrogen.	Nitrogen.	Sulphur.	Oxygen.	Ash.	Heating Power. British Thermal Units.	Theoretical Evaporation. Lbs. from and at 212.	Lbs. air required per lb. 23% O.	Evaporation in lbs. from and at 212° F. by Experiment.
Petroleum—		%	%	%	%	%	%				
Pennsylvanian heavy crude ...	·886	84·9	13·7	—	—	1·4	—	20,736	21·48	14·50	—
Caucasian light crude	·881	86·3	13·6	—	—	0·1	—	22,027	22·79	14·74	—
Caucasian heavy crude	·938	86·6	12·3	—	—	1·1	—	20,138	20·85	14·28	—
Refuse	·928	87·1	11·7	—	—	1·2	—	19,832	20·53	14·12	16
Crude average, 15 samples ...	·870	84·7	13·1	—	—	2·2	—	20,233	20·94	14·29	—
Refined average...	·760	72·6	27·4	—	—	—	—	27,531	28·5	17·93	—
Scotch blast furnace oil... ...	·920	83·6	10·6	—	0·1	9·4	—	18,590	19·2	—	—
Coal—											
Welsh, 37 samples	1·315	83·5	4·8	1·0	1·4	4·1	4·9	14,470	14·98	—	9·05
Newcastle, 18 samples... ...	1·256	82·1	5·3	1·3	1·2	5·7	3·8	14,432	14·94	—	8·01
Derbyshire and Yorkshire, 7 samples ...	1·292	79·7	4·9	1·4	1·0	10·3	2·6	13,582	14·06	—	7·58
Lancashire, 28 samples ...	1·273	77·9	5·3	1·3	1·4	9·5	4·9	13,552	14·03	—	7·94
Scotch, 8 samples	1·260	78·5	5·6	1·0	1·1	9·7	4·0	13,804	14·29	—	7·70
Average British, 98 samples ...	1·279	80·4	5·2	1·2	1·25	7·87	4·0	13,968	14·46	11·34	8·13

* Excerpt of paper read before the North-East Coast Institution of Engineers and Shipbuilders in South Shields, by R. WALLIS, Wh. Sc.

In addition to the petroleum oils the following oils have also been used as fuels:—Shale oil, blast furnace oil, creosote, green, and other tar oils.

On the table are examples of Russian astatki, American crude petroleum; crude petroleum, which has been exposed in a lake to the influence of the atmosphere for twelve months; creosote oil; heavy and light tar oils.

Comparing the value of coal and oil as fuel, it will be found to vary considerably according to the quality of the fuel and the circumstances under which each are burnt, oil doing from 1½ to 2½ times the work of an equal weight of coal; taking the average conditions, the results of extended experience with astatki and crude petroleum show that these oils will be found to do twice the work of coal.

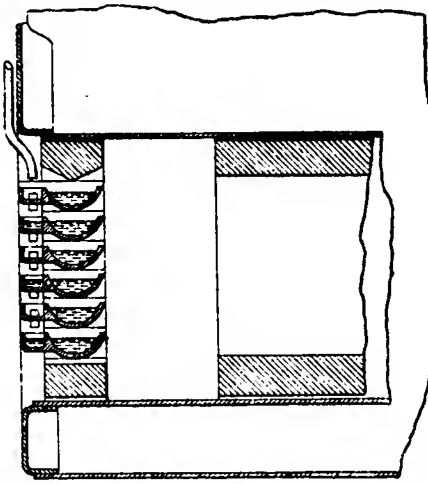


FIG. 1.—CUP FURNACE.

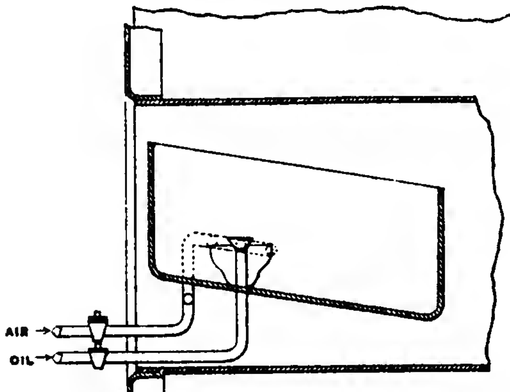


FIG. 2.

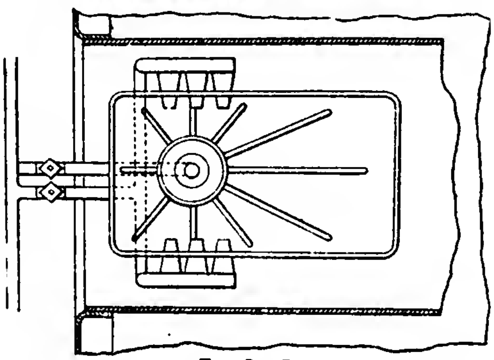


FIG. 3.—PLAN.

FIGS. 2 & 3.—BIDLE PAN FURNACE, 1862.

Table II shows the analyses of various oils and coals, together with their calculated calorific and evaporative values. This shows a value for oil of only 1½ times that of coal, and, therefore, some cause other than that of comparative heat value must be looked for to account for the result of a value of two to one in favour of oil fuel, which is found in practice. This difference may be accounted for to a great extent by the following causes.

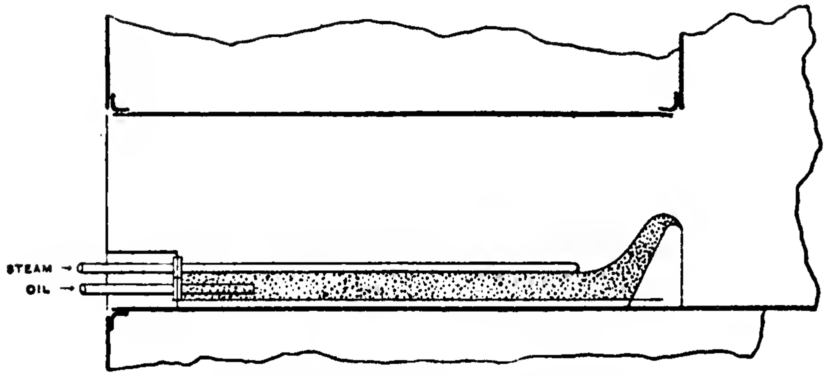


FIG. 4.—RICHARDSON FURNACE (ELEVATION).

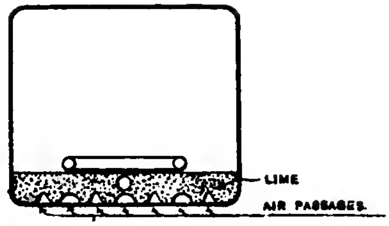


FIG. 4.—(TRANSVERSE SECTION.)

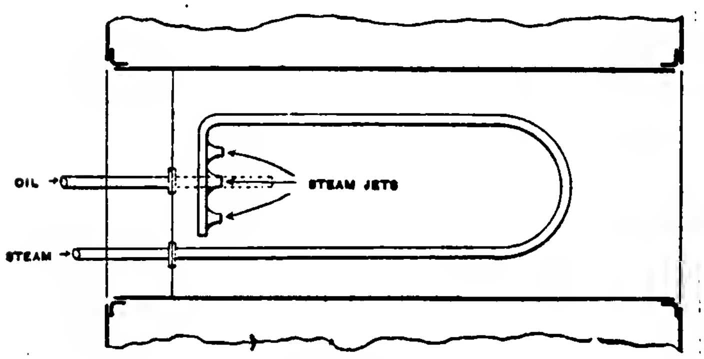


FIG. 4.—(PLAN.)

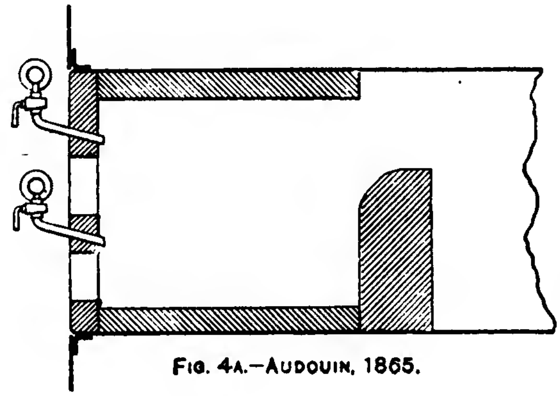


FIG. 4A.—AUDOUIN, 1865.

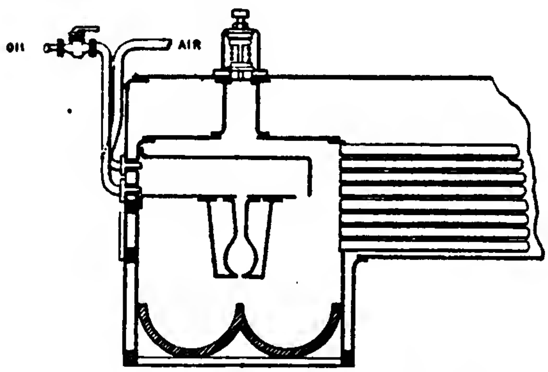


FIG. 5.—SHAW & LINTON, 1862.

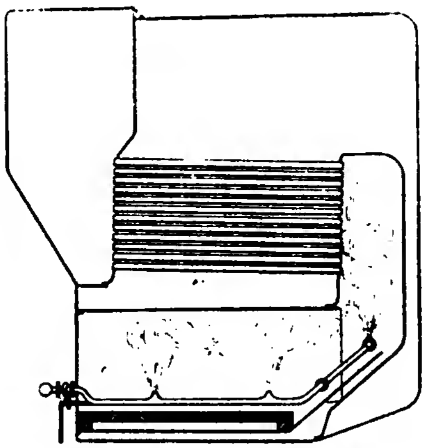


FIG. 6.—DORSETT & BLYTHE, 1868.

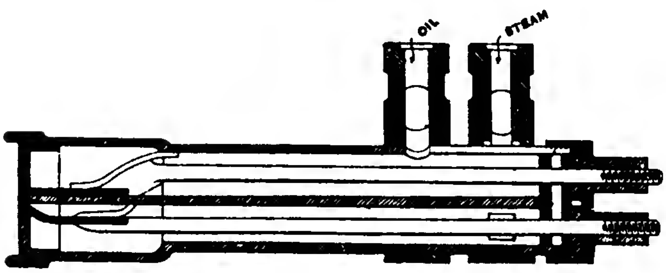


FIG. 7.—LENZ, 1870

FIG. 8.—LENZ.

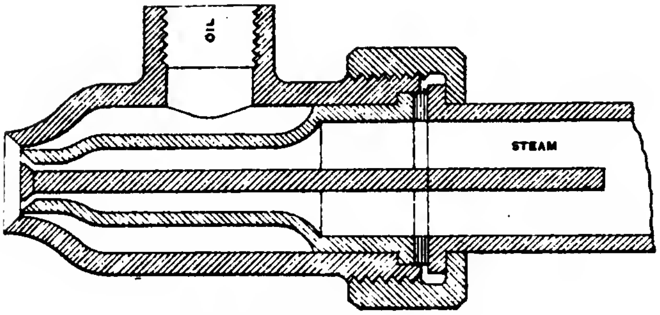


Fig. 9.—Korting, 1872.

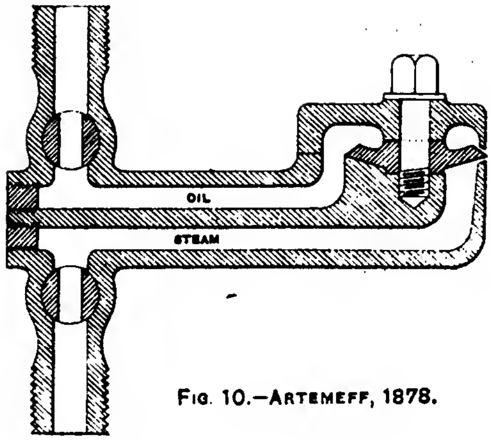
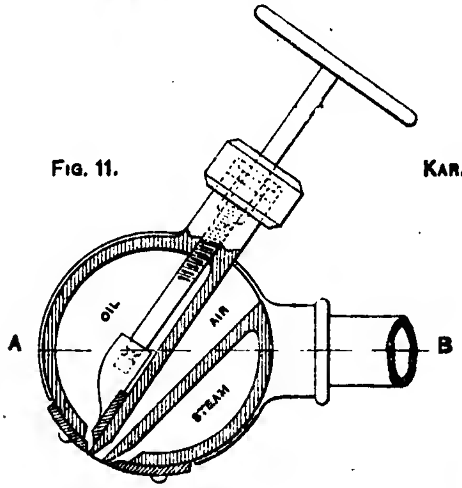


Fig. 10.—Artemeff, 1878.

Fig. 11. Karapetoff, 1880.



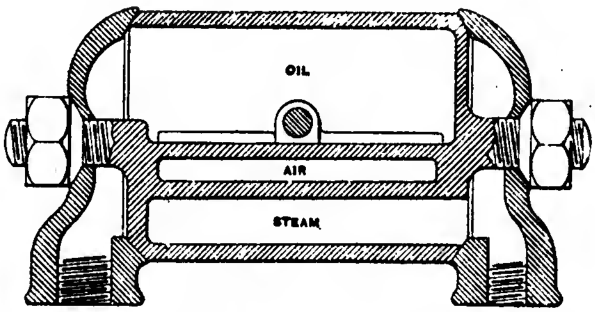


Fig. 12.—Section through A B

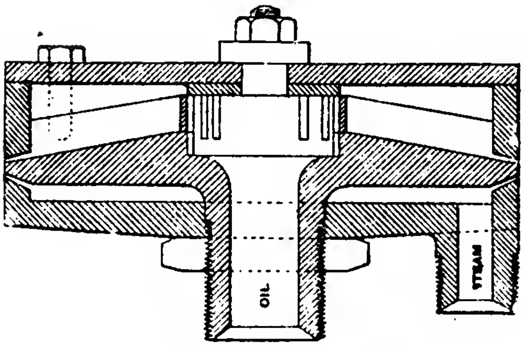


Fig. 13.—Brandt, 1880.

Fig. 14.—Bloomer & Korebut-Dachkeveich, 1886.

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Fig. 15.—Kauffmann.

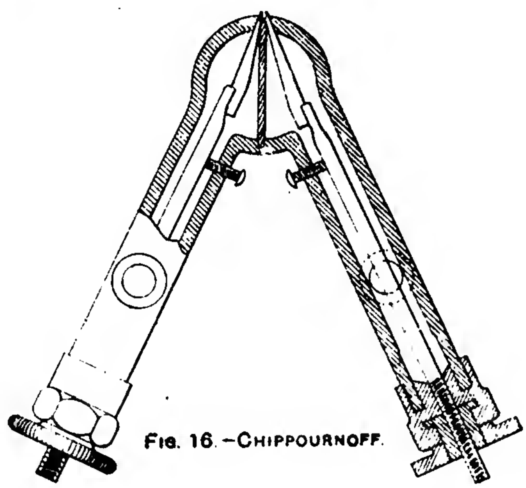


Fig. 16.—Chippournoff.

1. The combustion of the liquid fuel is complete, whereas that of coal is not, consequently in the former case there is no lost heat in smoke or soot.

2. There are no ashes or clinkers, and consequently no fires to clean, with the accompanying loss of heat and drop in the steam pressure—the steam pressure and revolutions of the engines being maintained at one point throughout the voyage.

3. The boiler tubes are always free from soot and clean, and therefore always in the best condition for transmitting the heat from gases passing through them to the water of the boiler.

4. The temperature of the escaping gases may be considerably lower than is required to create the necessary draught for coal firing. With coal the air has to be drawn through the bars and the fire in the furnaces; by natural draught this requires a temperature of the escaping gases about 600° to 700° F. But in the case of liquid fuel there are no bars or thick fire for the air to force its way through, and the required amount of air can be drawn through the furnaces by a much lower uptake temperature—about 400° to 450° F. being in most cases sufficient.

5. The admission of air to the furnace being under complete control, and the fuel being burnt in fine particles in close contact with the oxygen of the air, only a very small excess of air above that actually necessary for the complete combustion of the fuel is required. With coal, in order to ensure as complete combustion as possible, a very much larger excess of air is required.

In addition to its higher calorific value, liquid fuel has many other advantages, especially on board ship.

STOWAGE.—A ton of coal will occupy about 45 cubic feet of bunker space, and a ton of oil will require about 40 to 45 cubic feet. Assuming that both coal and oil will require the same bunker space per ton, then, since one ton of oil fuel is equal to two tons of coal, the bunker space necessary to steam the same distance at the same speed is only one-half. In addition to this, there is no lost space caused by the projection of frames, stringers, or beams. Also, portions of the ship which, if used as coal bunkers would be inaccessible, can be utilised for the stowage of oil.

TRIMMING.—This is altogether dispensed with, the oil being run or pumped into the fuel tanks through a deck connection, and beyond the opening and closing of the distributing valves, no other attention or labour is necessary for the shipment of the fuel; this makes a considerable reduction in the labour cost and the time occupied. When at sea the oil either gravitates to the furnaces, if the tanks are above them, or is pumped up if below, and no trimmers are required.

STOKING.—The sprayers require very little attention after they are once adjusted, and one man can attend to a large number of furnaces, and there being no ashes or dirt to remove the stokehold staff can be reduced to a single man for each watch in any ordinary vessel, or in a small vessel the sprayers can be attended to by the engineer on watch in the engine-room, as is done in many of the vessels on the Caspian Sea.

There are also no firing tools to repair, or firebars and floor-plates to renew, and the absence of smoke and dust enables the ship to be kept cleaner.

Regarding the various methods which have been adopted for the burning of liquid fuel these may be divided into three systems:—

(1) Furnaces into which the oil is run or dropped and burnt without gasifying or spraying.
(2) Furnaces in which the oil is first wholly or partially gasified.
(3) Furnaces into which the oil is sprayed.

1. This is the oldest form of burning oil, and is illustrated by the following examples:—

Fig. 1 shows the step or cup form of furnace, and is the latest form of a very old method of burning oil. Figs. 2 and 3: the pan furnace of Biddle used in North America in 1862. Fig. 4: Richardson furnace, patented in 1864. The bottom of this furnace is covered with ordinary slacked lime, which is kept saturated with the oil to be burned. Fig. 4A: Audouin furnace, first tried in 1865, consists of a large number of small tubes, from which the oil is constantly dripping, and is carried into the furnace and burnt by the draught through the openings in the front. The furnaces of St. Claire-Deville, 1868, Wagenknecht, 1870, Kamenske, 1869, MacKine, 1865, Verstraët, 1868, and Paterson, 1878, are all similar to one or the other of the above furnaces. The defect in all these is that the air is not brought in close contact with the burning fuel, with the result of imperfect combustion, accompanied by dense black smoke.

2. Fig. 5 illustrates Shaw and Lintou's gas furnace, patented in America in 1862. Fig. 6; Dorsett and Blythe gas furnace, tried in England in 1868 on board the steamer "Retriever." It may be observed that the disadvantage of all gas furnaces is that when using heavy residual oils the tarry deposits rapidly stop up the passages and pipes.

3. The furnaces into which the fuel is sprayed can be divided into three distinct classes:—(A) Flat slit sprayers. (B) Sprayers in which a jet of steam or air meets a jet of oil at an angle. (C) Circular sprayers.

(A) FLAT SPRAYERS.

Fig. 7 shows the first sprayer, which was constructed by Lenz in 1870, who commenced experimenting with oil as a fuel in 1868. Fig. 8 shows the later form of Lenz sprayer. Fig. 9: Korting's flat-mouthed sprayer of 1872. Fig. 10: Artemeff sprayer, 1878. A large number of these sprayers are used in ships on the Caspian Sea and the Volga. Figs. 11 and 12: Karapetoff sprayer, 1880. Fig. 13: Brandt's flat sprayer, 1880. The openings for both steam and oil in this sprayer are circular; it was designed for use in locomotive boilers, and was placed in the centre of the firebox at the level usually occupied by the firebars. Fig. 14: Bloomer and Korebutt-Dachkeveich, 1886. Fig. 15: Kauffmann's flat sprayer. Fig. 16: Chippournoff's sprayer. Fig. 17: Berseneff's sprayer, 1891. This very much resembles Brandt's sprayer (Fig. 13), with the addition of a second steam opening.

(B) JET SPRAYERS.

Fig. 18: The sprayer of Wise, Field, and Aydon was patented in 1865, and is one of the oldest methods of spraying fuel oils. It was first used on a Cornish boiler in 1866 in South Lambeth. Admiral Selwyn also experimented with this sprayer. Fig. 19: Aydon and Selwyn, 1867. This sprayer was tried by the Admiralty in 1868 at Greenwich, heavy tar oil being used as fuel and the steam superheated. Fig. 20: Benkston, 1874. This sprayer consists of two pipes flattened at one end, the oil pipe being bent over, and is the most simple form of sprayer. Fig. 21: Korting, 1876. This sprayer shows an attempt to carry in air with the steam jet before it reached the oil jet, but the spraying was found to be imperfect. Since 1880 Korting has used a sprayer very closely resembling that of Aydon and Selwyn (Fig. 19). Dickey's jet sprayer, 1878, is illustrated in the paper by the late Mr. B. G. Nichol.

(C) CIRCULAR SPRAYERS.

Fig. 22: Spakovski, 1870. This sprayer was fitted to the boilers of the steamship "Ivan," on the Caspian Sea, in 1870. Fig. 23: Lenz, 1872. Fig. 24: The first sprayer used by Urquhart in 1874. Fig. 28 shows his sprayer of 1832, and is the form now used so extensively on the Russian railways. Fig. 25: Salisbury,

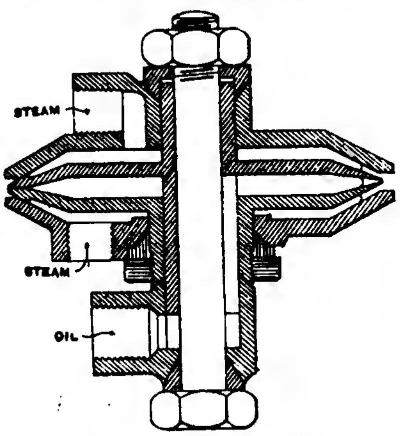


FIG. 17.—BERSENEFF, 1891.

1878. Fig. 26: Brandt circular sprayer, 1880. Fig. 27: Korting, 1881. Fig. 29: D. Aliest, 1885. D. Aliest carried out a large number of experiments, principally on board ship, using compressed air and steam for spraying the oil, and also with artificial draught. Sadler's, 1884, and Smith's, 1886, sprayers are illustrated

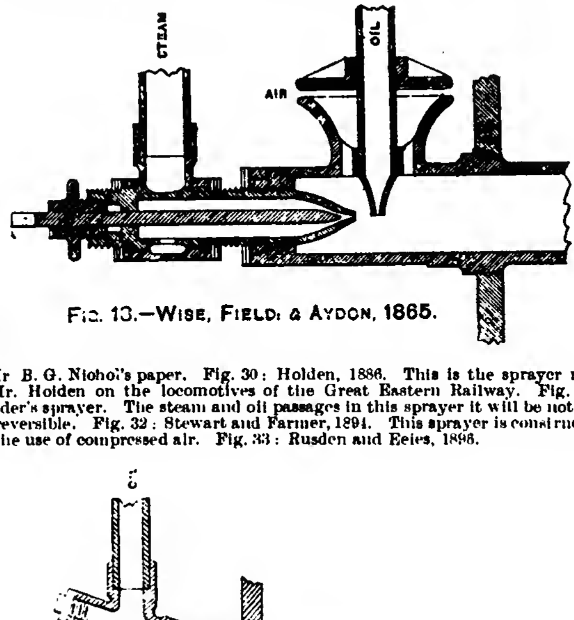


FIG. 18.—WISE, FIELD & AYDON, 1865.

in Mr B. G. Nichol's paper. Fig. 30: Holden, 1886. This is the sprayer used by Mr. Holden on the locomotives of the Great Eastern Railway. Fig. 31: Dunder's sprayer. The steam and oil passages in this sprayer it will be noticed are reversible. Fig. 32: Stewart and Farmer, 1894. This sprayer is constructed for the use of compressed air. Fig. 33: Rusden and Eeles, 1896.

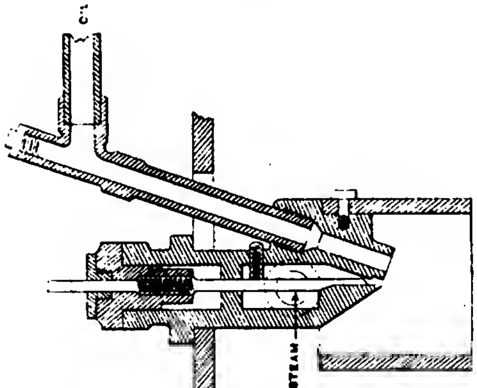


FIG. 19.—AYDON & SELWYN, 1868.

Several attempts have been made to spray the oil by other means than that of the steam jet, in order to overcome the difficulty of making up the fresh water drawn from the boilers in the form of steam. Air under pressure, especially if heated, has been found to give good results, but the flame is shorter, giving a more intense heat for a short distance than the flame from a steam sprayer, More air than steam is required for the spraying of the oil, and the air jets are more noisy than the steam. The danger of an explosion of oil gas in the furnace and combustion chamber when lighting up, especially if the furnace has been stopped for a short time only, is very much greater with air than with steam sprayers.

Comparing the economy of air and steam sprayers (notwithstanding the drawback of having to make up the water lost in steam used by the sprayers), the steam sprayers appear to be the most economical, and are certainly the

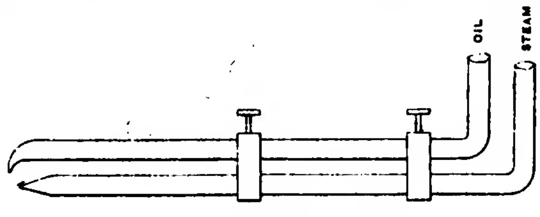


FIG. 20 —BENKSTON. 1874.

type mostly in use. The arrangement of the whole of the steam sprayer installation is exceedingly simple and not liable to derangement or breakdown, whereas the compressed air system is complicated and the risk of breakdown increased by the addition of the air compressor.

The essential requirements in a sprayer are :—

1. The oil and steam openings must be so arranged that the oil can be sprayed in the finest particles possible.
2. The steam consumption of the burner must be as low as possible.

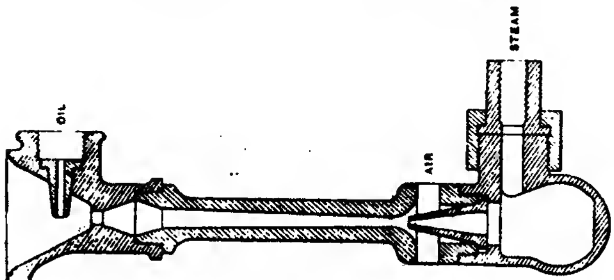


FIG. 21.—KORTING. 1876.

3. The sprayer must be constructed in such a manner that it can be easily and quickly taken apart for cleaning and quickly replaced.
4. The noise should be reduced to a minimum.

During the writer's experience and tests with a large number of sprayers, he has found that the "Rusden-Eeles" sprayer (Fig. 33) conforms more nearly to these requirements than any other. The spray is very fine; in fact, with astatki the flame can be regulated so as to have the appearance and character of a gas flame. The steam consumption is low, and the construction allows it to

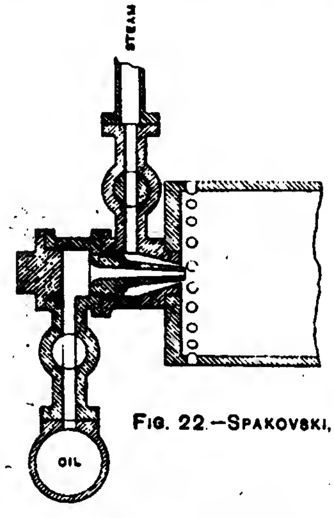


FIG. 22.—SPAKOVSKI, 1870.

be quickly and easily cleaned. In the latter sprayers the blow-through cock, shown in Fig. 33, is omitted, it being found easier and more effective to take the tube out and clean it than to blow the oil space through with the steam. Fig. 34 shows the arrangement of the complete installation as applied to a two-furnaced marine boiler.

In arranging an installation, the principal points are: (1) the superheating of the steam; (2) ample area in the fuel pipes, especially if heavy oil is used, and in the case of very heavy oils they may be required to be heated; (3) the supply tank should be placed in such a position as to ensure a constant and steady supply to the burner. Brickwork in the furnaces should be arranged in a manner so as to ensure the complete combustion of the fuel in the furnace, and to prevent the too rapid cooling of the furnace after the flame is extinguished.

In some cases, where the boiler is placed in a confined space, or there is not height enough to obtain a steady pressure on the burners from the supply tank, the oil may be pumped direct to the burners if a controlling valve is connected to the steam pipe of the pump; a valve of this character is illustrated in Fig. 35. This valve will regulate the speed of the pump automatically, and maintain a constant pressure in the oil supply pipes, no matter how many sprayers may be in use.

In relighting a furnace which has been extinguished for a short time lies the greatest danger of explosion of oil gas and the accompanying back flash from the furnace doors. Any small leakage or drip of oil finding its way into the heated furnace gasifies and forms an explosive mixture with the air, and if the lighting-up torch is introduced into a furnace under these conditions an explosion is sure to take place, and the person introducing the torch is very possibly burnt. Before lighting a furnace it should be well blown through with steam, and care taken to see that the steam jet is open first and the torch placed in the furnace before the oil valve is opened, in order that the spray may ignite as soon as it enters the furnace. If these precautions are taken, there is not the slightest danger of explosions, even if fuel with a low flash point is used.

The result obtained by several experimenters, that the average evaporation of liquid fuel is twice that of coal, has been confirmed by a long series of experiments conducted by the writer under the instructions of the Wallsend Slipway and Engineering Company (Limited), with various sprayers.

The boiler, which is of the ordinary marine type, evaporated with coal fuel from 7 to 8 lbs. of water from and at 212° F. for each pound of coal burnt, the uptake temperature being about 650° F.; with Russian astatki, the evaporation was from 13 to 18 lbs. from and at 212° F. per lb. of oil. The following are the average data from some experiment with a Rusden and Eeles sprayer, and a heat account from the same data :—

Kind of Liquid Fuel.	Russian Astatki.
Specific gravity	·9
Chemical analysis (approximate) :—	
Carbon	87 per cent.
Hydrogen	12 „
Oxygen	1 „
Temperature of stokehold	60° F.
„ escaping gases	450° F.
Weight of steam required to spray 1 lb. of oil ...	·3 lb.

Assuming that the air contained 23 per cent. of oxygen, and that the excess of air over that required for complete combustion passing into the furnace was 20 per cent., which would be about correct, because the slightest reduction of air caused smoke to issue from the chimney.

—		Heat Units.		Equivalent Evaporation from and at 212° F.
Total heat from combustion of 1 lb. of oil—				
Carbon ·87 × 14,500 ... ... =		12,615		
Hydrogen ·12 × 62,032 ... ... =		7,414		
			20,029	20·7
Heat lost in waste gases at 450° F.—				
Carbonic acid gas	3·19 lbs.	269		
Nitrogen	10·72 „	909		
Water vapour from combustion	1·08 „	1,452		
„ „ sprayer ...	·30 „	29		
Surplus air, 20 per cent.	2·78 „	257		
			2,916	3·0
			17,143	17·7
Heat lost in radiant heat, &c.			1,687	1·7
Heat absorbed by water in boiler...			15,456	16

In addition to the firing of boilers, liquid fuel has been used for various other purposes. Mr. Urquhart, in his paper before the Institution of Mechanical Engineers, shows how he has successfully applied it to scrap welding furnaces. Fig. 36 shows its application to a smith's hearth. Fig. 37 shows it applied to a brass melting furnace. It will be observed the furnace has two flues leading from it, one carries off the products of combustion and the other the fumes given off from the molten metal; this forms a convenient method of recovering a valuable bye-product. A furnace, with an arrangement somewhat similar to Fig. 1 has been used for the melting of wrought iron for the production of Mitis casting, the temperature of the furnace being about 4,000° F. In conclusion, the writer expresses his indebtedness to the works of Gulishambaroff, Carew, Brayley Hodgetts, Col. Soliani, Urquhart, and many others, for a great deal of the matter contained in this paper.

DISCUSSION.

Mr. G. D. WEIR said he was sure they all felt deeply thankful to Mr. Wallis for his very interesting and able paper. It appeared to him to supply a long-felt want among engineers, some of whom had a very hazy notion as to what sort of a machine an oil burner was, or if perchance they had examined the construction of some oil burners that were illustrated in the plates that were attached to Mr. Wallis's paper, which, perhaps, few of them present ever thought were in existence. The second paragraph on the first page of the paper seemed to be one of the points which it would be well to thoroughly ventilate, and he should feel extremely pleased if any member or friend present who had practical experience in the running of ships using liquid fuel would give the result of such experiences. For himself he felt that anyone having read or listened to Mr. Wallis's paper would think that it was high time vessels crossed the Atlantic with their bunkers full of oil instead of coal, and only a slight grey-coloured gas rising from their funnels in place of the dense volumes of jet-black smoke which they so often saw, and the problem of the smoke nuisance solved for ever. But would this state of affairs ever come to pass? He hardly thought so, and they might almost take for granted that they never would so long as the relation between the price of coal and the

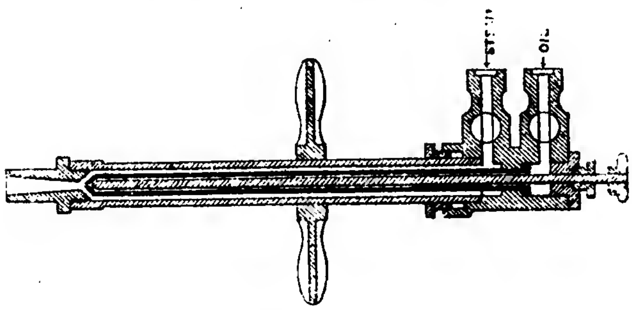


Fig. 23.—Lenz, 1872.

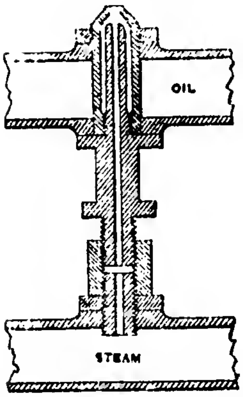


Fig. 24.—Urquhart, 1874.

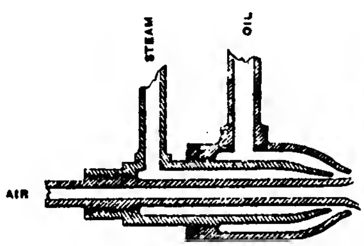


Fig. 25.—Salisbury, 1878.

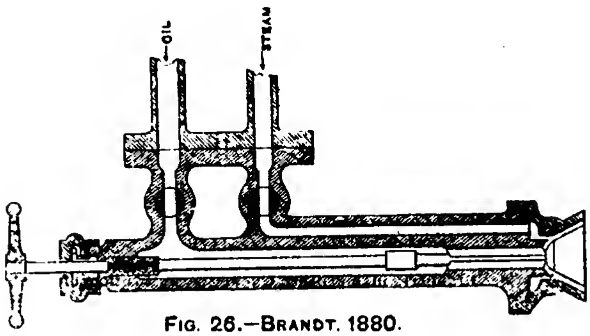


Fig. 26.—Brandt, 1880.

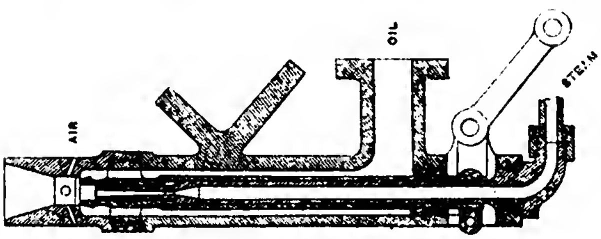


Fig. 27.—Korting, 1881.

price of oil remained as at present, even if they could get the best burner that it was possible to have (a combination of the good points in the numerous burners illustrated rolled into one). The fact was, that so long as a shipowner could get more steam from 20*s*. worth of coal than he could get from 20*s*. worth of oil, then so long would coal hold the field against its rival. That such was the case to-day could be easily seen without recourse to patent burners or costly experiments. If they took the figures given in Table II, p. 401, of the paper they found that one pound of refuse oil would give out 19,832 British thermal units of heat, and one pound of Newcastle coal would give out 14,432 units if consumed or burnt with a proper admixture of oxygen, *i.e.*, the theoretical heat-producing power of equal quantities of oil and coal were in the ratio of 19,832 and 14,432, and if they bought a ton of oil, say, at market value, 34*s*., they could

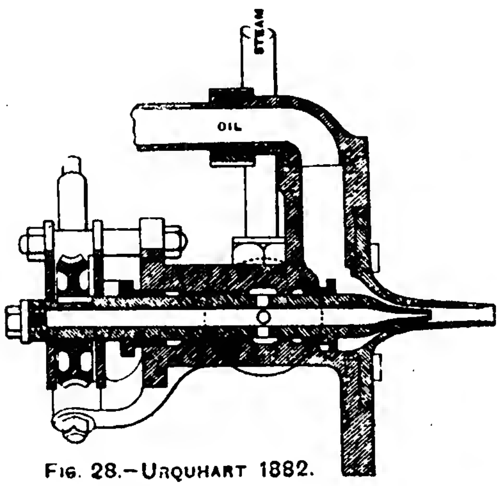


Fig. 28.—Urquhart 1882.

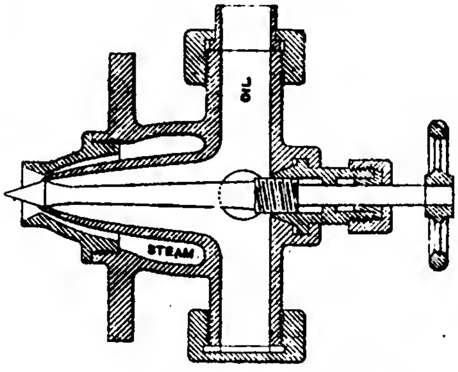


Fig. 29.—D'Allest, 1885.

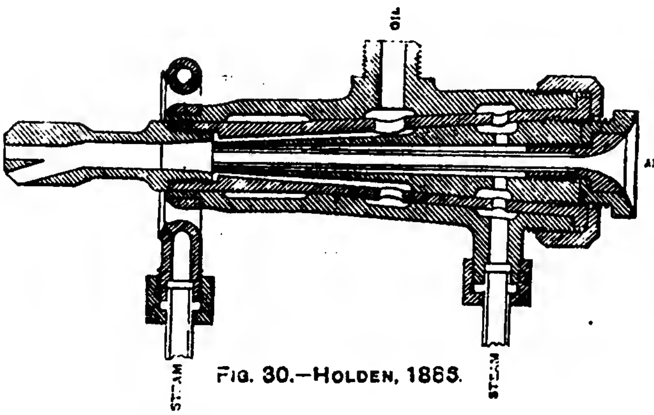


Fig. 30.—Holden, 1888.

buy four times the amount of coal, at, say, 8*s*. 6*d*. per ton, for the same money, and they got theoretically for the same money value 19,832 units of heat from the oil, and 57,728 units of heat from the coal, or if they turned to the end column of Table II, they could evaporate for the same cost twice as much water by using coal than if they had used oil, on condition that they bought the fuel in this country.

TABLE III.

Coal.	£	Oil.	£
600 tons of coal, at 8s. 6d.... ...	255	300 tons of oil, at 34s. per ton ...	510
6 men, at £4 per month	24	2 men, at £6 per month	12
Repairs to fire tools	10		
	£289		£522
	372	300 tons of cargo, at 10s. per ton	150
Gain by using coal	£83		£372

FIG. 31.—DUNDER.

In Table III were figures showing the amount of money which it would cost to run sister vessels, say with engines indicating 1,200 to 1,300 horse-power, one of the vessels fitted to burn oil as fuel, and the other to burn coal.

He had taken as an average consumption 20 tons of coal per day, and he had, for the sake of argument, taken the duration of the voyage from the United

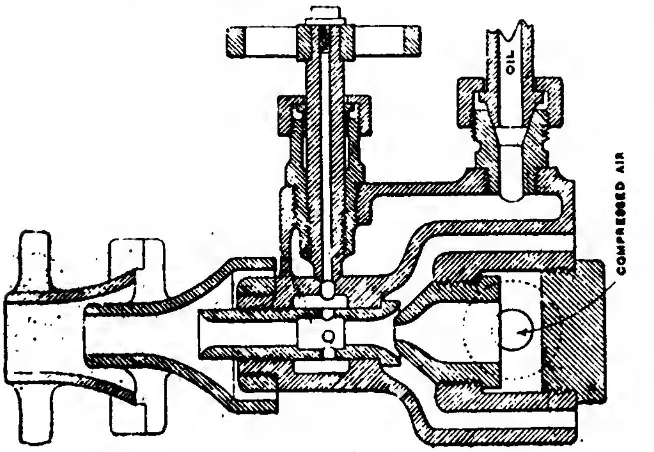


FIG. 32.—STEWART & FARMER. 1894.

Kingdom to be, say, 30 days or one month. He took Mr. Wallis's figures, viz., that it required twice the weight of coal compared with oil to give the same amount of steam, and as Mr. Wallis in his paper takes account of the cost of repairing fire-irons, &c., he (Mr. Weir) had debited the vessel burning coal with £10, which he thought was an ample allowance. From these figures they saw at a glance that the vessel using the coal was by far the less costly to run. He had not taken any account of the amount of fuel required for raising steam, nor of the amount of steam which would be used to drive the donkey for pumping the oil, so that the method of comparison was practically in favour of the oil, if anything. Perhaps, also, Mr. Wallis could say if the premium for insurance would be greatly increased in the vessel using oil, owing to the combustible contents of her bunkers. He should also be glad if Mr. Wallis could tell him if the wear and tear on the boilers was not greater when using oil than when using coal, owing to the intense heat concentrated in a practically small part of the furnace; and regarding this latter question he understood that there was a great deal of brickwork built into the furnaces, and perhaps Mr. Wallis would favour them with a sketch showing the method of arranging the brickwork, which he had found from his experience to give the best results. Of course, he did not wish it to be understood that it was not considerably cheaper to run vessels with liquid fuel when they were trading on, say, the Caspian or Black Seas, or even where vessels were trading regularly between such ports where the price of liquid fuel were less than the price of coal, or even if the price of oil was 60 per cent. greater than coal; then in such cases it would be found more economical to use oil, but unless the relative prices of the two fuels underwent a very considerable change, he did not think that they should ever see oil as fuel adopted by shipowners in this country. If, however, they turned from the stokehold of steam vessels and went to some of the large ironworks in the world he thought that at no very distant date they should find petroleum displacing coal. Some time ago, when looking into this question, he came across some very interesting statements, which perhaps would be of interest to them. At Woolwich, under ordinary circumstances, the armour-plate bending furnace was lighted some four or five hours before the plate was put in, the time occupied in heating the plate for bending depended upon its thickness, one hour per inch of thickness being allowed. Taking a 6-inch plate, they got from 10 to 11 hours from the time of starting till the plate was ready for bending. Let them now see what liquid fuel will do. The cold furnace was lighted, and after one hour it was found to be sufficiently heated, and a 6-inch armour plate, 7 feet 6 inches by 3 feet, was put in the furnace, and after one hour or an hour and a half it was ready for bending. Thus in two hours and a half they had the work of ten or eleven hours completely and satisfactorily performed. Nor did the advantages of this system stop there. The plate was remarkably free from scale, which could only be accounted for by the absence of the deterioratory influence of the products of combustion in the ordinary furnace. As proof of this it was said that thin plates, when heated by liquid fuel and bent double, showed no signs of cracking, as they usually did when heated in a coal furnace. This important feature was said to save 10s. per ton on the metal, which amount it would lose in deterioration under the modern mode of treatment. This method of supplying heat also offered another advantage, it could be applied to the whole or any portion of the plate. Thus, if a plate required to be bent at one end only, then the heat was directed to that part. Further, the rate at which the metal was heated could be regulated to a nicety by increasing or diminishing the number of jets in use.

TABLE IV.

	lbs.		lbs.
Total amount of iron in furnace	26,378	Iron put in scrap furnace ...	7,950
Amount taken out after being rolled	24,524	Taken out...	7,751
Loss	1,854	Loss	199
Loss in same amount of iron in coal furnace	2,901	Loss with coal	1,192
Saving in iron by using gas ...	1,017	Saving by using oil gas as fuel	993

2 F 2

The data in Table IV were taken from the results of the operation of an iron furnace at St. Louis (Missouri), an interesting fact brought out being that the increased yield of iron made it profitable to employ petroleum as fuel. He believed, also, the time taken to complete the operation was less than one-half of that required by the ordinary method when using coal, and besides the economy manifested in these instances, the cleanliness and freedom from smoke and cinders were important considerations.

In conclusion, it must be conceded by everybody that, weight for weight, petroleum was a more valuable fuel than the best coal; but it could only be used in competition with coal when the value in £ s. d. of the manufactured article more than counterbalanced the difference in the price of the two kinds of fuel; and for steam raising in this country, he thought coal would always hold its own. Again he thanked Mr. Wallis for his interesting paper.

Mr. E. W. De Rusett said he would like to ask the author a few questions. Could the oil be carried in the ordinary double bottom of the vessel? Also, would there be any danger of the oil firing? Was it necessary to make any special provision to prevent such an accident? Could Mr. Wallis also tell them what the flashing point would be of this crude oil? Another question he would like to ask was, whether, in the comparisons of the work done by oil and coal, the amount of power absorbed in the evaporator in making up the steam used in spraying the oil was included? for a large amount of steam was necessarily used for this purpose, viz., ·3 lb. of steam to every 1 lb. of oil consumed.

other way. With the ordinary Wells light he had found it difficult to keep the burner clean. Perhaps Mr. Wallis might enlighten them on that matter. As one of the advantages of oil Mr. Wallis claimed that the boiler tubes were always free and clean, and therefore always in the best condition to transmit the heat from the gas to the water in the boiler. He (Mr. Seaman) had expected lamp black and spray being part of the difficulties of oil burning, and was rather pleased to find he was mistaken. With reference to the statement that there was a saving of tools, he did not know, but that would be balanced by the extra cost of repairs, for he took it there would be an extra expense and extra wages, as agreed upon for oil-carrying steamers, to be paid. The first speaker (Mr. Weir) gave them a very interesting table (No. III, p. 407). Could he give them any information as to the construction of this furnace? He would like to know something about that, especially with reference to the difference in waste shown with oil and with coal fuel.

Mr. Weir said if he could find time he would make a drawing of it for the next meeting.

Mr. T. Whitfield said this was the first meeting of the Institution he had attended, and he did not think he should have to speak on this subject. He might say that 12 years ago, when manager with Messrs. Wigham, Richardson, and Co., he fitted up three steamers for the Caspian Sea that were to be fueled by oil. They received the drawings in the usual way, and he must confess he was a little confused at first how to go about the work. The furnaces were lined

FIG. 33.—RUSDEN & EELES, 1896.

Mr. J. H. Heck said he had listened to Mr. Wallis's paper with a good deal of interest and attention. He thought the paper was a very good one, and an addition to the literature on the subject. He had not had very much experience in the use of liquid fuel, but had paid a good deal of attention to the transport question. While it was true, as Mr. Weir said, that oil could not at its present price compete with coal, there was no knowing what they might get in the future owing to the rapid development in new oil-fields. If the supply ever increased to a great extent, then he thought the amount of information given in the paper would be valuable. He believed the total production of petroleum per annum in the world was about 8,000,000 tons, and the oil refuse only about 2,000,000 tons, while the output of the world's coal was 400,000,000 tons. The quantity of oil produced, even if they used it all, would hardly be enough for the steamships at present in existence. Petroleum was too valuable as an illuminant to be used for fuel, and there were only some countries where it could be used for steamers. As to the use of liquid fuel, he could say there was no danger in using astatki, or even crude oil, if suitable arrangements were made. There was one thing he should mention. In the past he believed they had over-estimated the dangers that attended the transport of refined oil, and at the same time under-estimated the danger and attention required in carrying crude oil. He wished to express his thanks to Mr. Wallis for his very valuable paper.

Mr. C. J. Seaman said he had heard that the great difficulty with any oil burner was to keep it clean. Could Mr. Wallis tell them what was the best way to clean burners? He noticed between the lines of the paper a hint not to blow the steam through the burner, but rather to take it out and deal with it in some

with bricks. He could not quite remember what class of burner they were using, and he could not say whether the steam or the oil was at the top. At the first trial they had the usual commotion, with a certain amount of fear in the stokehold when the thing had to be lighted; he opened the tank valves and the steam valves, and away went the oil for 2½ hours; but they got nothing but huge volumes of black smoke. Everyone was surprised. They could have got steam up with coal in half the time. But as soon as the bricks got into a white heat, they saw through the peepholes the smoke diminish, and things went all right. He had the data of the evaporation trials at home. The name of the first steamer, he thought, was the "Flora"; she went out to the Black Sea, and he heard nothing more about her. They fitted up two after that, and he believed they were greater successes than the first. The tanks were fitted above the boiler. They had a large tank on the lower side of the boiler, a storage tank, with a small donkey engine fitted to keep up the supply. The difficulty they had was to keep the burners clean. That was overcome by a universal joint, as it were; and when one was supposed to be blocked up they took it off, cleaned it out, and put it back in its place.

Mr. H. Fownes confessed that he knew little about oil burning; but one of the advantages of an institution like this was that papers were read which raised an interest in questions that the majority of them possibly did not know much about. It led them to think about the subject and apply the information to their own business. He had nothing to do with burning oil in steamers; but he had in the matter ventilated by Mr. Weir—the saving of iron shown in Table IV. p. 407. The saving of iron, or any other material in course of manufacture, was an important matter. Still, it did not amount to a great deal from what appeared on the face of it, fur in the manufacture of iron there was 40 per cent. of waste from the scrap to the manufactured article: take that at 50*s.* the ton, it came to 20*s.* according to that table. He saw they saved 10 per cent. of that waste by using oil fuel, which would mean a saving of 2*s.*, so it would require a very considerable saving in other ways to make up for coal; and as Mr. Weir had kindly offered before the next meeting to let them have a sketch of this furnace, he was sure to those, such as himself, engaged in that particular business, it would prove of interest, and one they should certainly study with a view to economy in their manufacture.

Mr. J. M. Rennoldson thought they might in South Shields congratulate themselves upon having such an interesting subject treated as they had that night. He did not know that they, as north countrymen, would be likely to congratulate themselves upon the discovery of any system by which liquid fuel would supersede the burning of coal, although they were told from time to time by various prophets that the days of their coal supply were numbered. He did not think it would happen in this generation, nor yet in the next. So far as they were personally concerned they had not much to fear. The time might come when the production of oil would be very much greater than coal, and consequently cheaper than coal. When that day came there was no doubt that this balancing of accounts, these comparisons, would be very greatly altered. Meanwhile the position between their own and oil countries was reversed. A steamer, as she went further from the coal-fields and neared the oil wells, would find the cost of "bunkering" very much altered, and, indeed, in favour of the oil fuel, and he took it that was the reason why these steamers built in this country were made to burn liquid fuel, because they were for trading at ports nearer the oil wells than the coal-fields.

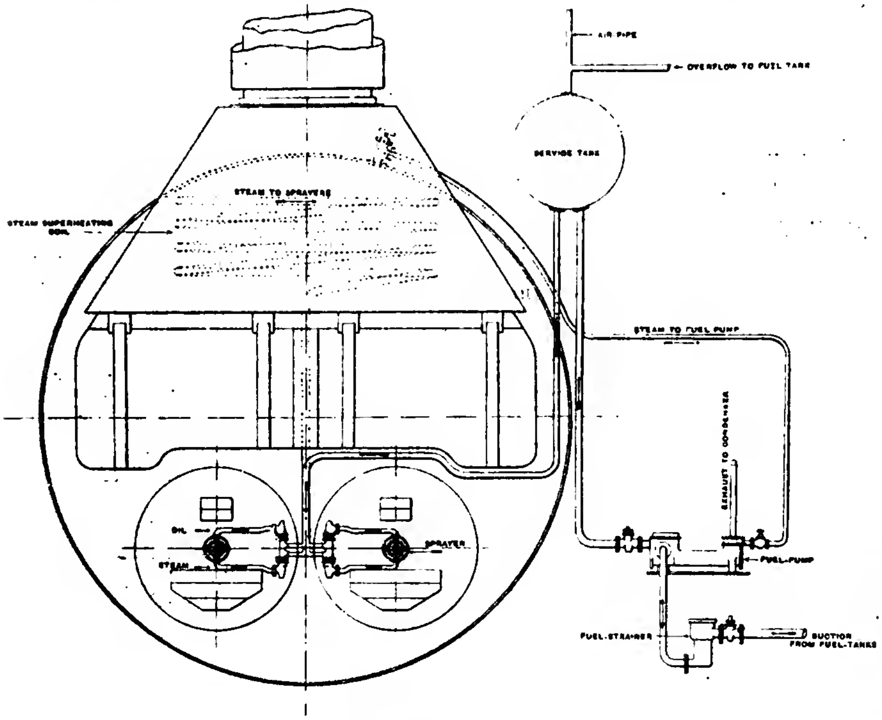


FIG. 34

One thing Mr. Weir omitted, and also Mr. Wallis, that was the cost of furnace bars, an item of very considerable importance in steamships, and certainly one that ought to be considered in favour of burning liquid fuel. There was one thing that would make this paper very much more interesting to members generally if to Fig. 34 was given a longitudinal section showing the brickwork. Several members had said they had had no experience in burning liquid fuel. That was a statement they could all endorse, for, with the exception of one or two firms on the river, no one in marine engineering had had much to do with the carrying out of liquid burning furnaces. Such an explanation, therefore, of the diagram would make the paper more interesting and intelligible generally. He hoped Mr. Wallis would be able to do something to clear up this point. He must thank Mr. Wallis for the very great trouble he had taken in the preparation of this paper; it was one of intense interest and certainly great satisfaction to them at that meeting.

Mr. F. W. Garbutt said there had been a question raised whether it was safe to use crude oil or astatki. He had been in Russia for the last two years, and had supplied most of the fuel oil to the Northern Caucasus Railway Company, who have over 250 locomotives at work. During the last year they had carried out a great many exhaustive experiments; also the Italian and German navies, and from the result of these trials they had come to the conclusion that it was not advisable to use oil fuel under a flashing point of 130° C. = 266° F.—and crude oil had a flashing point usually under 50° C. = 120° F.—and North Caucasian crudes of ·870 to ·878 specific gravity. Flashed below zero, mazoot or crude oil which had been exposed in open reservoirs long enough to allow the lighter and more volatile substances to evaporate was, however, mostly used on the Russian railways and Caspian Sea for fuel and lubricating purposes with very good results and it was found after an exposure of about three months to have a flashing point of 235° to 245° F. He quite agreed that oil fuel would never entirely take the place of coal in England, although the supply from Russia was almost unlimited, as the extra cost and transport charges debarred the use outside the limits where a regular and cheap supply could be obtained. He had been negotiating with the German Government, who had replied that, although they were highly satisfied with their experiments and the adoption of oil fuel, they could not leave themselves dependent upon a foreign country for the supply of fuel for their navy.

Mr. J. H. Heck said with reference to the use of crude oil as fuel, they could use it quite safely on a plan suggested by an English engineer residing in Italy. He (Mr. Heck) believed that gentleman was connected with some of the experiments made by the Italian Government. If his system were adopted it was impossible to have an explosion in the oil bunkers, and that was simply always to keep the oil bunkers completely full. The way to ensure this was that as the oil was used for consumption to allow water to go in, and so keep the oil bunkers completely full.

Mr. Garbutt said he referred only to the use of oil in locomotives, not for marine boilers.

The President said the subject was one which bristled with points of interest. To him it was especially interesting, as he had paid very great attention to everything concerning the carrying of petroleum and the burning of it, and there were a great many points which had not been touched upon, but which had an important bearing upon the subject. The comparison in Mr. Weir's table was taken with coal at 8*s.* 6*d.*, that was the price of coal at their own doors, and probably did not even include getting them into the bunkers. Even in London the price of coal would be very different from that; but going further afield, as Mr. Rennoldson remarked, the further from the coal supply and the nearer the oil supply, so would the advantage come in, and for war purposes, he believed, there was a great future in oil burning. One way in which it could always be utilised was for the smaller class of torpedo-boats. There was a difficulty in coaling them at sea, but in time of war there would be no difficulty in having a large tank-steamer anchored in a known latitude and longitude where these vessels could go and get a supply of oil fuel at any time without going to port for coals. Moreover, the transfer of oil from the supply steamer to the small vessels through pipes would be much more easily accomplished in a seaway than would the handling of coals. This was merely one incident in the matter.

At the next meeting of the Institution the Secretary read the following letter from Mr. L. Rusden, of Newcastle-on-Tyne:—

"I am very much indebted to the writer of this paper for the kindly reference to the oil burners that I am intimately connected with. Although oil burners of a different type were made long before the writer of this paper had anything to do with them, it was not until Mr. Alfred Suart gave the order to fit the s.s. "Baku Standard" for burning oil as fuel that serious attention was given to using oil in place of coal on English-owned steamers. The s.s. "Baku Standard" was the first steamer fitted for burning liquid fuel that crossed the Atlantic, and the result of the trial was anxiously awaited by many, as doubts were expressed about the use of this fuel as being unpractical. However, the use of liquid fuel in the s.s. "Baku Standard" was a marked success, and the owner (Mr. Alfred Suart) may be congratulated on the result; but, like many other things, owing to the exigencies of the trade, it had to be abandoned. If oil fuel could be supplied to meet the demands and could also be secured at a reasonable price, we should then begin another era in ocean steam navigation. The saving of oil fuel will be very considerable as compared with coal, more especially regarding labour and cleanliness, but I am afraid the day is far distant when oil will supersede coal, though on the Caspian Sea and district immediately surrounding it for some years have been using liquid fuel. The boiler for burning liquid fuel needs to be specially designed for economical results, although it can be used in an ordinary boiler. For instance, a boiler containing a certain number of square feet of heating surface requires to be less in diameter and of a greater length for using oil fuel than for coal, the furnaces and tubes being proportionably smaller. The brickwork in the furnace also needs careful attention. After the oil burner has been under way the brick arch built inside the furnace serves not only to break the force of the injected oil, but it serves in its heated state to assist the combustion, and to prevent too rapid cooling of the furnace when burners are put out. The heat being more uniform around the furnaces, the firebricks at the bottom cause a better circulation in the boiler. The writer of the paper has had considerable experience of the use of oil as fuel, he having carried out all the experiments with the oil burning for the firm he so ably represents."

Mr. J. R. Fothergill said that Mr. Wallis's paper treated upon a subject of very great interest. The consumption of liquid fuel instead of coal for general use in steamers had been frequently advocated, and no doubt was in certain districts, such for instance as the Caspian Sea, most advantageous, but there were considerations in its general application to steamers trading from this country which prevented its use. He apprehended there would be some difficulty in carrying petroleum in bulk. Mr. Wallis proposed utilising the present bunkers, but he was afraid it would be found a very difficult matter to make the bunkers absolutely tight.

Mr. R. Harkness: Not at all.

Mr. Fothergill said he deferred to the experience of Mr. Harkness, and was glad to hear such was the case. Possibly it might be more advantageous to use the ballast tanks in preference to the bunkers. There was, of course, no question as to the greater evaporative efficiency of petroleum as compared with coal, and that was readily seen by reference to Table 11, p. 401. From this table they might take it that in petroleum there was an average of 13 per cent. of hydrogen, whereas in coal 5 per cent. might be taken as the average, and it must also be remembered coal contained a very much larger percentage of oxygen. Hydrogen consumed to water-steam, evolves 62,000 units of heat, whereas carbon consumed to carbonic acid evolved only 14,500 units, and thus it was readily under-

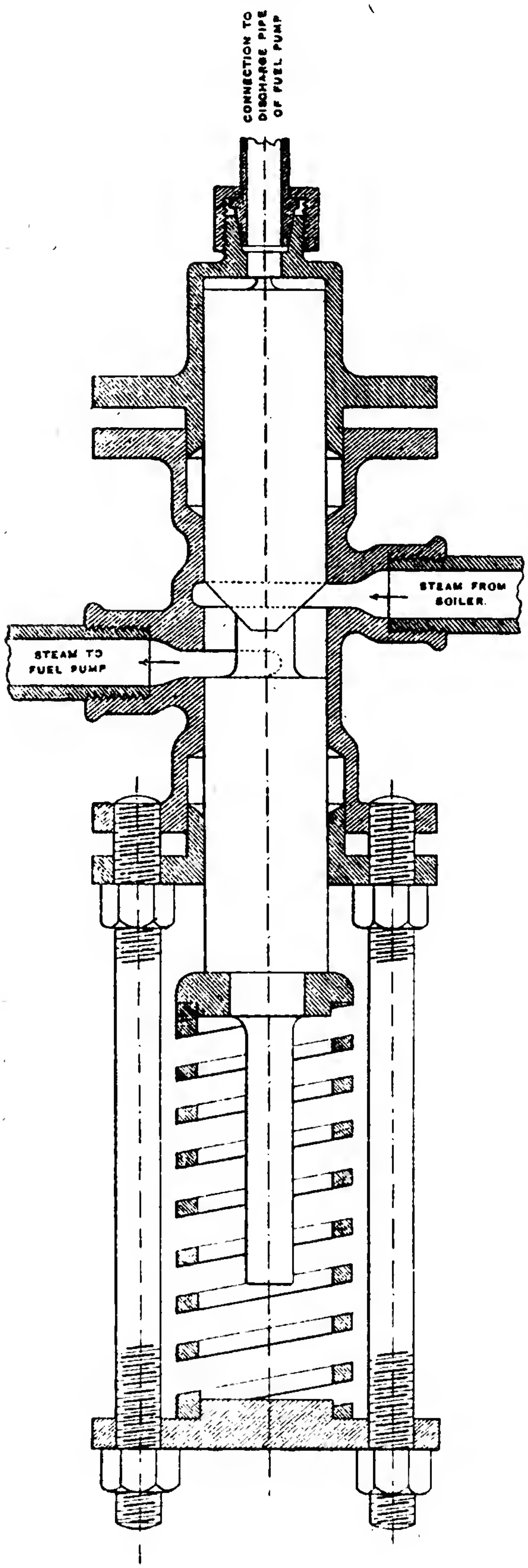


Fig. 35. Rusden & Eeles. Automatic Control Valve.

stood, from this consideration only, that petroleum offered in evaporative efficiency a considerable advantage over coal at least equal to 2 to 1. Then there were other advantages which Mr. Wallis had so lucidly described in his paper that it was quite unnecessary to repeat them. Mr. Wallis had classed various systems for burning liquid fuel under three heads. He (Mr. Fothergill) said, if they could readily vaporise or gasify petroleum oil, such vapour could be burnt to the best and highest evaporative efficiency, but they would be dealing with an article that was very dangerous, almost as explosive as gunpowder, and when dealing with it in large quantities, such as would be required for marine consumption, it was exceedingly danegrous and to be avoided. Experience

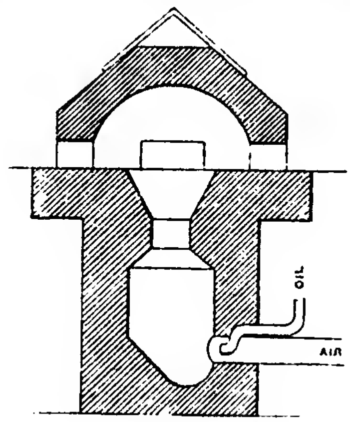
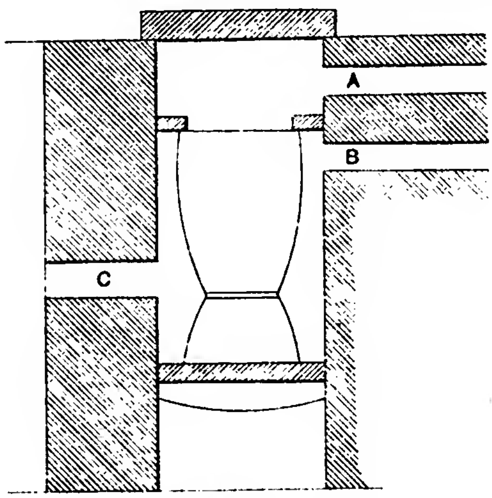


Fig. 36.—Oil Fuel Forge.

proved that spraying was the most practicable and applicable to marine boilers. Mr. Wallis also classed under three heads various methods of spraying. In deciding the class of sprayer, consideration must be given to the kind of oil to be used. Although for marine purposes the use of steam might be objected to, yet there was one great advantage in using high-pressure steam, and particularly when superheated, that compressed air did not offer. Steam under such conditions had the power of breaking up the oil—it literally pulverised it—to the greatest advantage and efficiency in combustion; and there was another important feature in connection with the use of steam, and that was that it very materially reduced the carbonised deposit, which, under ordinary circum-



A.—Flue for Fumes of Alloys.
B.—Flue for Products of Combustion.
C.—Opening for inserting Sprayer.

Fig. 37.-Crucible Furnace for Oil Fuel

stances, formed on the lips of the sprayer, choking it up. When air was used in the sprayer instead of steam, it was productive of greater local heating, certainly to be avoided. Many users of petroleum found it necessary to introduce heavy brickwork to prevent damage by intense local heating, but such brickwork, particularly in a marine boiler, was an objectionable feature, and to be avoided when possible. Some eight or nine years ago he fitted to a steamer having two single-ended boilers, an apparatus to supply vaporised petroleum through tubes in the back of the boilers direct into the combustion chambers, in conjunction with his system of forced draught. An illustration, showing a part of this arrangement, was given at the end of the paper on "Combustion,"

&c., which he read before the Institution, November, 1892. Petroleum oil passed from a closed reservoir in an elevated position through a coil in the uptake or funnel, where it was gasified or vaporised by the heat of the waste gases, and under its own pressure entered the combustion chamber at considerable velocity, in combination with air supplied under pressure. For this purpose refined petroleum had to be used, as refuse petroleum would have given a carbonised deposit in the vaporising pipes and soon have choked them up. Petroleum was a mechanical combination of several oils whose specific gravity varied considerably, and likewise their evaporative temperature: this had a strong bearing upon vaporising in pipes, and materially added to the danger in using such vapour. For instance, the slightest joint leak gave a gas which immediately fired, and it was extremely difficult to make and maintain tight joints under petroleum vapour under pressure. Scientifically and mechanically, petroleum as a fuel was a perfect success, but the whole question resolved itself into a commercial question, and he failed to see that it was possible to use petroleum instead of coals in the number of steamers trading from this country. Petroleum could not in this country be bought at a price that would compete with coal, and if there was any great demand for it the price would enormously increase, although there was abundance of oil in many parts of America and Russia.

Mr. J. DUCKITT (Secretary) explained that at the last meeting Mr. Weir was asked to submit a drawing of the furnace to which he alluded in the manufacture of iron, following upon a question by Mr. Seaman. Mr. Weir had not been able to prepare the drawing for that meeting, but a sketch of it would be found in a paper read by Harrison Aydon before the Institution of Civil Engineers in 1878, and included in Vol. 52 of the "Transactions" of that Society.

Mr. ROBERT WALLIS, in reply to the discussion, referred first of all to Mr. Weir's questions. The most striking one, he thought, was that where he compared the value or cost of running a ship with coal and with oil. Mr. Weir had taken the cost of bunker coals at 8s. 6d.—that was, of course, bunker coals at their own door—and had omitted to add to that anything for trimming or leading them. If they were to take the figure more like the average for bunker coals, say 12s. a ton, then the comparison altered in favour of oil. Mr. Weir's 600 tons, then, at 12s., would be £360; six men at £4 a month, though in a comparison with this they must add on to the wages the cost of the keep of those men, say six men at £5 per month, that would give them £30 in place of Mr. Weir's £24; the repair of fire tools, if it were worked out, would come out rather more than the £10—£15 per month would be more like the figure—a total of £405. Take Mr. Weir's price for oil, &c., £524; then they made on 300 tons of extra cargo at 10s. a ton, £150, which gave the comparative cost, £374—a difference of £31 per month in favour of oil burning. In further remarks,

Mr. WALLIS said they were dealing with things as they were; but the whole question of cost of oil and coal depended upon where the ship was trading. If the ship was trading to a port where oil could be obtained, then, undoubtedly, the oil was cheapest; if the vessel was trading from such a country as England, where coal was cheap, then, in the present state of supply and cost, coal would be the cheapest without any doubt. Mr. Weir mentioned the amount of steam required to drive the donkey for the service. He thought he would find if he tested one of these donkeys that the amount to drive it would be so small as to be practically neglected, for the donkey all through would exhaust to the condenser, and a very small quantity of steam would suffice to drive it—merely the vacuum in the cylinders. The matter of insurance was another question raised in connection with the carrying of petroleum in place of coal. He (Mr. Wallis) did not think, when the whole thing settled down, that would be greater than at present, for the fear of explosions from oil gas was not so much to be dreaded as might be imagined. The character of the oil which was used as a fuel was one with a very high flash point, and consequently the amount of gas generated from oil of this character was very small. Members would see the differences in the specimens on the platform. Wear and tear of the boilers was another question raised; but wear and tear with liquid fuel was less than when using coal, for, when using the sprayer, the heat generated in the furnace was a constant one, and the amount of air admitted was only slightly above that required for combustion, and there was no cooling down of any part of the furnace by the opening of fire doors as there was in the coal system. Then the wear and tear on the boiler would be less than that of coal. The arrangement of the brickwork was raised by Mr. Weir and several other gentlemen. Well, the arrangement of brickwork depended to a great extent upon the size of furnace they were using and also the character of the boiler. Mr. Urquhart, in his paper before the Institution of Mechanical Engineers, described several methods of brickwork as adopted in locomotives, and the Baldwin Company, of America, showed several forms of brickwork in locomotive work. He found the brickwork did not vary very much from that of the ordinary brick arch, with the exception that it had an additional wall. In the case of the ordinary marine boilers, what was required was to place the brickwork so as to baffle the flame and prevent it striking through to the combustion chamber. The exact pattern of that brickwork would vary under various circumstances and special requirements of any particular boiler. The lining of the bottom of the furnace enabled the circulation at the bottom of the boiler to be improved, and at the same time, if their burner was working badly, any drop of oil not sprayed fell quite finely on the bottom, it was at once burnt on the hot bricks, without which they would have an accumulation of coke on their furnace bottom. Mr. De Rusett asked if the oil could be carried in the ordinary double bottom of a vessel. He did not see any reason why it should not, and one vessel which they had fitted with oil-burning appliances went out to Peru and carried her bunkers in the double bottom. As far as he could learn they found no disadvantage or trouble in that arrangement. Mr. De Rusett also asked the question as to the flashing point of crude oil. It varied considerably. They might get it as low as 30° or 40°, or it might go up to 400° or 500°. It depended upon where the oil came from and the density of any particular well. He also asked about the power absorbed by the evaporator in making up the water lost in steam for the sprayers. The loss of water in the boilers was not a great deal if, as recommended by a great many people, the vapour from their evaporator was carried to the hot well and they used their evaporator practically as a feed-heater. Mr. Seaman also asked a question about the cost of repairs, that, as he had mentioned before, would be less with the oil firing. Mr. Fothergill raised a question about the tightness of bunkers. As far as he knew, and as far as he had seen with the ships they had fitted, they had no great difficulty with the bunkers. The greatest difficulty was, the ship was not a new one, and they had some trouble in getting the surface of the plate at the door smooth enough on which to make a joint; the difficulty was in making the joint tight owing to the plate being eaten away by corrosion. Mr. Fothergill mentioned about evaporating oil, and burning it as a gas. Using commercial petroleum would, he dared say, some day or other, cause an explosion. There would be some danger attached to it, but evaporating petroleum refuse would possibly work out all right as long as their appliances kept free from heavy tar deposit and carbon, which would inevitably follow, the apparatus would then get clogged up, and the trouble would be to clean it. In some experiments they tried evaporation—partial evaporation—sufficient to make gas to drive their burners in place of steam, and as far as their experiments went it was successful, but it was not a thing he should like to go to sea with; the whole thing got uncomfortably hot, there was the trouble with the tarry deposits, the oil they were using was a heavy oil to commence with, and there was always a tendency, with a tarry heavy deposit, to form coke in the furnace. The effect of high-pressure steam was mentioned by Mr. Fothergill, and was very clearly evidenced in their experiments. The cubic capacity of air required to spray a given quantity of oil they found very much greater than the cubical capacity of steam to do the same work. The steam seemed to pulverise the oil easier and more perfectly than air, and that was what led him to make the statement he did in the paper, that the amount of air required to spray oil was very much more than the amount of steam; consequently, when using compressed air, the air compressing plant, with a steamer of any dimensions or any number of boilers, would be considerable. Mr. Fothergill mentioned the brickwork in a furnace, and its bad effect. In an oil fire furnace the brickwork had a very good effect in that it retained a certain amount of heat in the furnace after the burners were extinguished, and so allowed the whole boiler cooling down gradually, and preventing any undue stress upon any part. The carbonising of the oil at the mouth of the burners was another point raised. That took place in all burners, more or less, less in the steam than in air burners; but still it took place, and that was the greatest difficulty in the cleaning. Where a burner or sprayer was not readily taken apart there they would have the most trouble. Consequently, it was essential, as pointed out, that burners or sprayers should be easily taken apart for cleaning, and then they could get over this difficulty of carbonised oil. It gave them little trouble if they could take their sprayer apart for half a minute, and put it together again at once, and in the one shown the furnace would not be stopped for more than four or five minutes. In concluding, he thanked those gentlemen who had said so many flattering things regarding the paper, and for the interest taken in regard to oil fuel.

The PRESIDENT thought the only thing that remained for them was to accord a very hearty vote of thanks to Mr. Wallis for his very able paper. He should have wished very much that there had been more speakers to deal with such an important subject as the burning or use of liquid fuel. It had now reached a stage beyond that of mere conjecture. There was not a doubt that if liquid fuel could be had at a reasonable price there was no difficulty whatever in burning it in a thoroughly efficient and economical manner. This was clearly demonstrated on the Caspian Sea, where there was not such a thing as a steamer burning anything else than the refuse of petroleum (astatki). Mr. Fothergill had referred to different kinds of oil, and the great danger attached to their use. There was a difference, of course, between the kinds of oil. There were three kinds. Firstly, refined petroleum, scarcely used at all, and that was the kind with which there was, perhaps, the greatest danger. Then they had the crude petroleum, just as it came out of the earth, which would be dangerous because it contained all the naphthas, benzenes, and so on, very light and highly inflammable; but the custom in hot countries, where the oil was usually found, was to expose the crude oil in open tanks and let the sun evaporate the lighter carbons, so that the resultant could be used with perfect safety. As regarded the third kind of fuel (astatki), exclusively used on the Caspian Sea, it was of a heavy, treacly description, and not at all dangerous. It could be carried in any part of the vessel, so to speak, either in cross bunkers or side bunkers, or in the double bottom; and it had been suggested in some cases, where there was a large compartment, to prevent the oil coursing about when half full, to allow the sea water to flow in and keep the tank always full. There was no difficulty about that if circumstances required it. Mr. Fothergill was somewhat sceptical about making bunkers tight enough. In new ships there was not the slightest difficulty; every tank in a steamer was subjected to a high pressure—more so than boilers were thirty or forty years ago—without any place or rivet leaking in the whole bunker. He thought he could only repeat that the use of oil fuel was reduced to a certainty, and it was only a question of cost. Where it could be had at anything like a reasonable price it could be used, for it presented such enormous advantages. They had a better flame, a more constant supply of heat; there was no opening and shutting of furnace doors, no difficulty in trimming the bunkers, as the oil found its own way into the holes and corners. There was, moreover, no difficulty in getting it out, and very often this was done by gravitation, but where the bunker was below the boiler it was necessary to have a pump and service tank: they had often put the bunkers above the level of the furnaces, and had no difficulty. Among other advantages, they eliminated the firemen, they minimised manual labour, and altogether there could not be a doubt that the use of liquid fuel was one that would surely come in wherever the supply of the oil could be had at a reasonable price. He now asked them to carry by acclamation a hearty vote of thanks to Mr. Wallis for his very able paper.

The resolution was passed accordingly.

THE application of electricity to the working of the Leeds tramcars has made such good progress that it is expected they will be ready for use in August. The route is between Roundhay and Kirkstall. The six miles of double lines are practically completed, the overhead wires have been put in position, and the cars are about ready. The engines and dynamos will be ready to supply the power necessary to propel the cars. The Hull Corporation are contemplating the reconstruction of their tramway system, and the laying down of wood pavement at an estimated cost of £272,000.

MORE CANDID CRITICISMS.

In the course of an article on the collapse of *The Engineer's* competition the *Electrical Review* says:—Now that *The Engineer* competition is over our contemporary's columns are being filled with the very natural protest consequent upon the remarks as to the absolute non-existence of a motor-car industry in England. The Daimler Company contradict this flatly, and state they are making three cars weekly, and have 200 men employed. *The Engineer* gibes at 200 men turning out but three cars per week, and the wage account can scarcely be termed moderate. But, perhaps, *The Engineer* never helped to start a new business? Those who have done so will easily understand that the wage account does total up in a most unaccountable manner. Even the people from whom you buy stores look on you as fair prey to be pillaged, and the difficulty in getting around one a suitable and satisfactory set of men is, at times, most disheartening. We by no means consider that *The Engineer* is fair, even though the motor-car industry be very small. *The Engineer* repeats its assertion that light oil vehicles were admitted, and upon very liberal lines. Mr. Moore, of the Motor-Car Club, however, quotes *The Engineer* itself:—"In the first instance we excluded vehicles propelled by light oil or petroleum spirit," and there seems to be little doubt that these vehicles were excluded from the competition. Mr. Moore also objects to the demand for six sets of drawings of each machine. There were only three judges, and six sets of drawings was obviously a big demand. For whose use were they required? Our contemporary finds fault with Mr. Sturney when he claims that the Daimler Company's working drawings have cost them thousands of pounds. They might soon cost that if many sets of six were required. Mr. Sturney distinctly states that the Daimler Company are full of orders, have vans working in London, several carriages in Scotland, a van in Manchester, and some 20 in all in the hands of the public, and all giving satisfaction. *The Engineer* continues to rail at the Daimler Company, especially as regards a turnover at the rate of £50,000 per annum. Now, is this fair? If the Daimler Company is turning over this much already it is not doing so very badly. There may be no motor-car industry, but to refuse cognisance to the at present biggest portion of the industry, and then deny the existence of the industry is not right. If the competition arranged by *The Engineer* had been more liberally framed, so as to have given no substantial peg on which to hang any complaint of unfairness, we think it would have been of far more use to the public. If light oil vehicles are not suitable, let this fact be plainly made evident. But to rule them out without a chance, and put them on only in a side show is to beg the whole question, and leave the door open for any Motor-Car Club man to complain. The spirit-driven car is not a sweet machine. It vibrates badly when not running, and, as made in France, is open to much criticism as to workmanship. It may, and sometimes does, blaze up, and make itself a nuisance, just as horses do when they fall down and kick and plunge on the ground. But the spirit-driven car can run miles and miles on end with a small quantity of fluid and a little fresh cooling water to replenish its tanks. In these respects it is a success. A commercial traveller in Surrey, Kent, and Sussex, who possessed a motor-car of this type could save many hours of valuable time as compared with South country railroads, both in actual time on the road and in weary hours of waiting for the slow trains at long intervals. We do not care two pins for the company promoters who have seriously damaged the motor-car industry, but we do wish to see the light oil car get a fair trial. Once get motor-cars of any type into commercial use and the way is paved for other cars. It would be satisfactory to see the spirit car helping the electric accumulator car to charge up at night, and there is no reason why it should not do so. We observe that *Engineering* follows *The Engineer* in all its criticisms, and denies equally the existence of a motor-car industry, and echoes its quondam bitter enemy to the tune that there is no thoroughly satisfactory self-propelled vehicle. If it comes to this, there is no thoroughly satisfactory horse, and the possession of a horse and the driving thereof are not unmixed blessings. To many people even the smell of a few hundred motor-cars would be less unpleasant and far less unhealthy than the effluvium due to horses, especially on wooden pavement in a hot city. Yet horses have been bred for man's use for thousands of years and have not been cured of their habits. The motor-car is ordered to be thoroughly satisfactory from the start. It has not yet had time to purge itself of the taint of the promoter, and the present poor condition of the industry has arisen because of the promoter and his burdens. Our contemporary, *The Engineer*, surely cannot forget that it was made to figure as supporting the most blatant of many very curious productions of the prospectus order. *Engineering* backs its opinion by reference to the competition at Crewe under the auspices of the Royal Agricultural Society. Here, again, only three entries were made, and but one vehicle turned up. We have no particulars of the conditions in this latter case, and cannot say whether there is as good an excuse in this as in *The Engineer* competition for non-competition. We repeat, however, that if the new industry is worth fostering there must be some liberal allowances made at the beginning. Instead, *Engineering* hints at tramcars carrying their own motive power without nuisance to passengers or to the public, as though at present horse-traction were of this type. Now we do not hesitate to say that the exhaust of a spirit engine, or even of a heavy oil engine, when in order, is preferable to the wastes of an animal. Moreover, the one is merely transitory, and dissipated with no further results; the other remains a nuisance, has to be removed at some expense, and what remains to be dried and scattered by the wind is a disgusting irritant to the eyes and lungs that no self-respecting community would tolerate if it could help doing so.

THE RESISTANCE OF VEHICLES ON COMMON ROADS.

The United States Department of Agriculture has recently carried out a series of traction experiments on roads of various descriptions, and an account of these appear in the *Engineering News*, to whom we are indebted for the accompanying abstract:—

"The first experiments were made on the roads of the United States Road Exhibit at the Cotton States and International Exposition in Atlanta, in 1895, consisting of a modern macadam, a sand and an ordinary dirt road. The manner of making these roads is described, and the traction experiments were made with a heavy farm wagon loaded with cotton bales. The amount of pull exerted at any time was indicated by a specially designed tractometer (*see* Fig. 1). In this device the amount of force exerted by the team was weighed by the spring, S, in compression, and was indicated on the arc, A, by means of the pointer, P. The smaller spring was sufficient for all forces below 600 lbs., and the larger spring came into play after this mark was reached. The arc shows above the backs of the horses and was marked in large figures. No precaution was taken to check or lessen the oscillations of the index arm beyond that of making the parts fit snugly. There was thus no lost motion, and all oscillations recorded the variation in the amount of pull. Though these conditions made it impossible to read the scale accurately, it indicated the true state of affairs, which was as follows:—

"On the smoothest possible macadam road surface the force of traction was not constant, but changed continually within a range of 50 lbs.

"On the ordinary dirt road the force varied from absolute zero to 700 lbs.—in a gross load of 3,000 lbs.—becoming in effect a rapid succession of violent jerks.

"On heavy grades in the case of the smooth road the force was more nearly constant. On a smooth road the force necessary to start a load was four times as great as the force required to draw the load at a uniformly slow pace when started, and was one-tenth the gross load. The force required to start a load on a dirt road was about one-fourth the gross load, or not greatly in excess of the upper limit of the tractive force when the wagon was in motion. From these observations the following conclusions were drawn :—

"A team harnessed in the ordinary way is subjected to a continuous jerking motion, which on even the smoothest country road is enough to greatly increase the fatigue. On a dirt road in bad condition this jerking motion becomes a succession of heavy blows transmitted to the animals by means of the collar. The fatiguing effect of these blows is probably double that of a steady pull equal to the maximum figure reached in the oscillations, and they further bruise the shoulders of the team. Starting a heavy load is also equivalent to a violent blow, as the driver ordinarily draws his team well back and then urges it suddenly forward against the collar held by rigid traces.

"The smoother the road the more nearly constant will be the tractive force and the less the fatigue for the same amount of work. And if a load four times as great can be drawn over a smooth road as over a rough one, by exerting the same amount of force, then a team can haul four times as much in the same time over the smooth road and suffer less fatigue in the

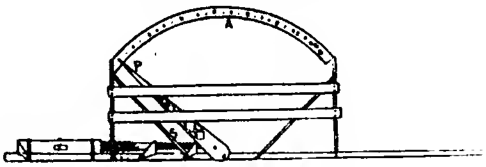


Fig 1.—Tractometer.

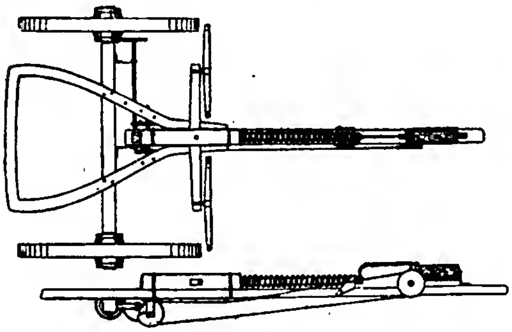


Fig. 2—Tractograph

operation. Mr. Neely, under whom the experiments were conducted, thinks that some method should be adopted for making an elastic connection between the wagon and the team, thus gradually transmitting the shocks at the wheel rims to the team. He says that at Atlanta a team of small mules readily drew 12 bales of 500 lbs. each, on a heavy Studebaker wagon up a 10 per cent. grade on the macadam road, with the tractometer indicating a pull of 1,000 lbs. The same team was completely stalled in going down the 6 per cent. grade on the sand road, with an indicated pull of 1,900 lbs. Nine bales of cotton were removed before the team could be again started. The driver refused to venture upon the dirt road with the 12-bale load.

"To demonstrate the practical advantage of wide over narrow tyres, the following test was made :—A piece of clay road was made thoroughly wet, and over one portion a heavily-loaded wagon with 2-inch tyres was rapidly drawn, and over the other portion an equally heavy wagon with 4-inch and 5-inch tyres was drawn the same number of times. In the latter case the front axle was shorter than the rear axle, so that the wheels did not run in the same track. The result was that the narrow tyre cut the road into ruts several inches deep, while the broad tyres rolled the road into a smooth surface. The tractometer showed that twice as much pull was necessary to draw the same load over the half-road cut by the narrow tyres.

"In order to obtain results which would be accurate and of scientific value, a tractograph was devised to record the pull automatically. This apparatus was similar in principle to that used in securing indicator diagrams, and is shown in Fig. 2. A long arm, holding a pencil at the end, was attached to the end of the piston which previously moved the pointer in the tractometer. The pencil point rested on a revolving cylinder extending along the wagon pole, and the cylinder was revolved by means of the gear, driven directly by one of the front wheels of the wagon. A single long spring was substituted for the two short springs previously used.

"Any pull exerted at the double-trees would compress the spring and cause the pencil to move forward along the cylinder, and as the cylinder revolved as the wagon moved forward, a continuous record of the force exerted was thus recorded on the paper. The tractograph was graduated in pounds by placing weights on a platform connected to the double-trees by a rope and pulley. The scale was made to 10,016 intervals up to 1,200 lbs. ; and from this data sheets were ruled and spaced to 1,016 pulls. As the cylinder revolved once in a forward movement of 1,316 feet, the sheet was ruled transversely into spaces corresponding to 100 feet.

"Experiments were made with this instrument, and diagrams are given for results obtained on a level asphalt street, on a level macadam, a level dirt road, and on a macadam road on a 10 per cent. up-grade. The two first show a generally even range of oscillations, with an average pull of about 50 lbs. in the first case and 100 lbs. in the second. The dirt road was dry, smooth, and firm ; but the pull runs up from 100 lbs. to 500 lbs. with rapid changes, and the general result is a draught of about two and a half times that required on a macadam road. In the case of the hill the record shows very wide oscillations caused by the fact that the team required constant urging. It required nearly seven times as much effort to draw the load up the 10 per cent. grade as on the level highway.

"The tractive force is taken as signifying the force required to draw one ton of 2,000 lbs. On this basis the following is the record for these four experiments :—

Road.	Tractive force.
Asphalt, level, poor condition	26 lbs.
Macadam, level, good condition	38 „
Dirt road, level, good condition	96 „
Macadam, 10 per cent. up-grade	236 „

"Mr. Neely, who carried out the experiment, compares these with the results for the best macadam roadways as tabulated by Mr. Rudolph Hering, M. Am. Soc. C.E. :—

Authority.	Tractive force.
Navier	45 lbs.
McNeill	46 „
Rumford	50 „
Gordon	37½ „
Morin	32 „
Office of Road Inquiry	38 „
Average	41 „

"The following general results are obtained from the experiments made by the engineers above mentioned :—

"The force of traction varies universally as the diameter of the wheel, and increases with the speed, upon hard roads, but is not in proportion with the velocity. The width of tyres is found to have no effect on the traction on hard roads ; but this width has a very decided effect upon the condition of the road surface and on the cost of maintenance. The effect of inclination of surface is a matter of mathematical computation, and can always be figured by the following formula :—

"$R = F + a\,W$ where

"F = Force required to draw the load on a level.

"a = The grade expressed by a fraction.

"W = The weight of the load in pounds.

"R = Force required to draw the load up the incline.

"An appendix to the bulletin contains various tables taken from Sir John McNeill, Morin, Mr. Rudolph Hering, and from experiments made by the Office of Road Inquiry."

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NOTICES.

Contributions and articles likely to prove of interest to our readers will receive due attention, but in all cases the name and address of the writer must be given, not necessarily for publication.

All matter intended for publication should reach us not later than the 10th of each month. Stamped envelope must be sent if the manuscript is required to be returned. The Journal is published the middle of each month.

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The Automotor and Horseless Vehicle Journal.

A RECORD AND REVIEW OF APPLIED AUTOMATIC LOCOMOTION.

JULY 15th, 1897.

ANSWERS TO CORRESPONDENTS.

Molas (South Tottenham).—A motor-tricycle, weighing under one ton unladen, is not subject to any special Inland Revenue duty under the new Locomotives on Highways Act, 1896. The only amount payable is the ordinary Inland Revenue carriage license of 15s. per annum, procurable at any post-office.

J. Herrmunn (Streatham).—You cannot do better than submit the whole of your invention to a first-class firm like Messrs. New and Mayne, Palace Chambers, Westminster, who would give it the very best attention, and, if suitable, take it up and work it.

R. M. S. (Fleet, Hants).—We hope later to inspect the car you mention, and can then give you advice you seek. At present, as our technical editor has not personally had an opportunity of judging the vehicle, we are not prepared to advise a purchase.

Motorenfabrik (Switzerland).—Your best plan is to apply to one of the first-class English engineers, who will no doubt be glad to make an arrangement with you if your patent is of commercial value. You will find several good names in our advertising columns.

R. A. F. (Wath en Dearne).—We know of no English translation of the "Manuel Practique du Conducteur d'Automobile."

THE AUTOMOTOR INDUSTRY AND HOW TO FOSTER IT.

WHEN the dynamo emerged from the laboratory and electric lighting became a commercial possibility, what should have been a perfectly legitimate industry was converted into a huge means of defrauding the public. The scandal was so great that not only was the development of electric lighting seriously hindered, but an Act of Parliament was passed for the protection of the public of such severity that it was found in many cases to absolutely prohibit practically the use of electricity. Even now the person or company who wishes to introduce electric lighting to any locality finds the various legal obstacles in the way by no means easy to surmount. There must in all cases be absolutely *boná fides* and the necessary capital. This, of course, is all with a view to prevent the operations of the Company promoter, Trust and Financial Corporations, who go about seeking what industry they may devour. With the introduction of the motor-car we have seen a somewhat similar financial phenomenon to that which attended the birth of the dynamo, and with somewhat similar results, although of less intensity. We do not gather that those who have invested in the numerous Motor Syndicates, Companies, and so forth, are rejoicing very much. Their money has been for the most part sunk in "master patents" of but doubtful and limited value, and the recent Competitions have not served to greatly impress the public with the future of the motor-car industry; in fact, there is a distinct "slump" in motor shares. For our own part, so long as the losses fall upon Company promoters and those who are like unto them, we are not sorry that events have not turned out so fortunately as was anticipated, and hence we regard the recent Competitions as a much-needed and salutary "eye-opener," if such a term is permissible. What we have to do now is to educate public opinion on the automotor question—to show that, apart from the fictional *ballons d'essai* of the prospectus writer, there is a legitimate field for investment in the motor-car industry, provided that the advantages and limitations for the employment of automotors as against horses are well appreciated and understood. For example, in Yorkshire, Derbyshire, Cumberland, and in many parts of Scotland the roads are atrocious and horseflesh and labour cheap. No commercial advantage at present would accrue from an attempt to place a motor-car in such districts in competition with horse coaches or wagons. In the South, around London, the roads are good, horseflesh and labour comparatively dearer. Such services as parcel distribution, omnibus and cab working could undoubtedly be successfully undertaken with one or two of existing types of motors. Again, both the investor and the person who uses a van or light cart in his business are inclined —not without reason—to fight shy of motor-vans, and this, of course, reacts against the manufacturer of automotors. With a view, then, of educating the public on this question, and removing prejudice, we make the following suggestion, and invite our readers to express their opinion on it.

We propose that in London and the large provincial cities, such as Liverpool, Glasgow, Manchester, Birmingham, &c., there should be formed Automotor Exchanges—that is, manufacturers and designers of automotors should form a parent Association, with branches in these towns. At each branch there would be a depôt, with examples of each type of motor. A would-be purchaser would thus be able to inspect the whole industry at a glance, and obtain the fullest technical information. Trials could be arranged, and purchases effected with the least trouble, and with the best possible guarantee that the purchaser had obtained what he required. A trial might well be made of this idea in London to start with. It is, of course, not intended to have anything in the nature of, or savouring of, an "Exhibition." Our idea is that of a purely business Exchange, where one could see samples of motors and obtain quotations exactly in the same way as one can go into the Corn or Wool Exchange and obtain samples and prices of these articles. The nucleus of such an Exchange as we have indicated already exists in the shape of the Self-Propelled Traffic Association. At present this body cannot be charged with having effected very much. It has certainly been the means of adding greatly to the literature of the automotor, and some very excellent papers have been produced under its auspices. We take it, however, that the literature is now fairly copious, and it remains with the members of the Association to effect something practical. True, the Association has offered prizes and encouraged designers, but this hardly meets the case. We would suggest to the Association whether it could not see its way to establish an Exchange on lines such as we have indicated. Manufacturers and engineers can hardly be expected to compete in the production of the "best" automotor, but they would, we think, support an Exchange where the purchaser could exercise his choice, because, after all, it is he who is the final judge.

TRAFFIC IN THE CITY.

IF there is one reason more cogent than another for the employment of automotors it is to be found in the congested traffic in London. From early morn till midnight, from Hyde Park corner in the West to Poplar in the East, and from Islington in the North to Brixton in the South, and even beyond these limits, there is a heavy stream of traffic which, approaching the City, becomes of such density that only by the most careful police regulation is it possible to conduct it at all. It is to foreigners one of the most wonderful sights—the regulation of the London traffic; but after all, the capacity for traffic of our streets is limited; in few streets is there room for more than two tracks, and an accident, such as a horse falling down, will create a block which may be felt half a mile away. Indeed, the congestion of the metropolitan traffic threatens to become in the near future a most difficult problem for solution at the hands of the County Council and the City Corporation. Spasmodically the Press draws attention to it through the complaint of some belated traveller losing his train in consequence of his cab or omnibus having to wait at a block. Sanguine and unsophisticated is he who at any time during the day thinks he can by "cabbing it" go from, say, the Mansion House to the Law Courts in 20 minutes. There is, in fact, but little saving of time effected, no matter how high spirited is the horse and how skilful is the Jehu. So heavy is the traffic at many points that unless it be stopped by a policeman it is exceedingly dangerous to attempt to cross the streets. As "Dagonet" well puts it in a recent number of the *Referee*, "the traffic of London ought to be completely reorganised. It has increased to such an extent that it is beyond control and is perpetually in a state of confusion." In the Strand or Cheapside we see cabs, omnibuses, heavy railway vans, mail carts, costers' barrows, all mixed up together, and for often considerable periods of time the pace of the whole will be regulated by some heavy, slow moving vehicle that heads the procession. To dilate upon this state of things is of little use; the facts are too apparent. The question is, how can they be remedied? In the first place the vehicles should be classified, and, as far as possible, should be obliged to traverse routes accordingly. As "Dagonet" points out there ought to be a means of limiting the number of buses running along a narrow thoroughfare, and of compelling the heavy van traffic to make use of roads off the main artery. Supposing, however, this was effected it would not greatly assist us because a heavy railway van delivering rolls of paper to a Fleet Street office would, as at present, create a more or less pronounced hindrance to traffic. If, however, we could reduce the length over all of the space occupied by a horse-drawn vehicle we should increase the capacity for traffic of a street by the same amount. Obviously this can only be accomplished by eliminating the horses. Of the length occupied by an omnibus fully one-half is used for propulsion, while in ordinary carts quite two-thirds of this length is so utilised. In very heavy vehicles such as brewers', coal, flour, and market wagons, drawn tandem, two horses abreast, the same proportion obtains. In tramcars the horses occupy about one-third of the length. It follows that our streets are so congested because the animals used for traction occupy such a large proportion of the space. To see how crude and unsatisfactory is horse traction we need only glance at the railways. In ordinary trains the locomotive will occupy but about one-tenth to one-fifth of the length.

Were horses largely eliminated from the principal thoroughfares the gain or saving would be enormous. The traffic could be largely increased without inconvenience. There would be less risk of life and limb, and less necessity for regulation. Also the cost of maintenance of the roadway would be less because (notwithstanding that a high authority has declared to the contrary), it is after all the hammer-like action of the horses' feet that in time wears out granite setts, a fact which is very palpable on London Bridge. From a hygienic point of view the gain would be incalculable. At present the street orderly bin is a necessity. An army of small boys finds constant occupation in gathering up the ordure of the horses, and a large number of carts and men are required to empty the bins and transfer their contents to barges. In fact, what to do with our street sweepings is an ever anxious subject to the municipal authorities. In warm weather, especially on windy days, the air in the streets is charged with fine particles of desiccated filth.

A reformation in the method of traction is the only possible solution. We must, at all costs, and for every reason, eliminate the horse from our crowded streets and substitute for it the automotor.

CONTRACT FOR MOTOR-CARS.

The Central Engineering Works Company (Limited), of York, have received a contract from Messrs. F. G. Von Hillenschmidt and Co., of Warsaw, for four of their patent motor vehicles, to be built for two, eight, ten, and twelve passengers respectively. the larger ones to have light luggage cars attached, suitable for touring purposes. These vehicles will be fitted with the patent cork and rubber tyres, invented by Mr. P. Appleyard, Grafton House, Halifax, director of the Company. The Central Engineering Works Company (Limited) is being reconstructed with a capital of £30,000, to enable it to cope with the nominal increase of business, the firm having had during the last few months to decline orders to the value of over £50,000.

CONTINENTAL NOTES.

The French Senate has doubled the "Octroi" tax on cycles, motors, &c., entering Paris. In vain does *Les Sports* proclaim the fact that "We live in France under a democratic *régime*." That may be so, but all the same the gay Parisians have now got to pay 20 francs per year instead of 10. *Les Sports* talks about petitions and what not; but is it not a cardinal principle of democracy to tax the luxuries of the rich?—and one must be at least removed from poverty by a good step in order to keep a "bike."

Really this tax reminds us of Harcourt's van and wheel tax, which our people would not have at any price *at that time*; but directly automotors were legalised our Chancellor of the Exchequer "taxed" our motor-cars to the tune of two guineas, or about 43 francs per year; so our French neighbours have got off rather well.

The petition in favour of a remission of the "Octroi" tax is being got up by L'Union Velocipedique de France and by our esteemed contemporary *Les Sports*. We do not, however, think that they will succeed in their object. Government are always in want of money, and so far as our Governments is concerned, so long as it does not touch the poor man's beer and 'baccy, it can tax anything.

In order to give due emphasis to the petition, our contemporary and L'Union Velocipedique will give two gold medals to the two cyclists who obtain the most signatures to the petition.

The Automobile Club de France has lately demanded the resignation of a member who brought into the club a lady who was neither his wife, nor his sister, nor his daughter. It seems that there is a rule forbidding the use of the club to members' "friends." We congratulate the club on its "respectability."

A movement is on foot to assimilate the French law regarding automotors to that already governing tramways so that enterprises of a commercial nature shall be entitled to State subvention as are tramways. Something like 1,100,000 francs is given to French Tramway Companies as subvention, and in many districts automotors could be employed where it would not pay to lay tram lines or railways.

At Longchamps a steam omnibus on the Dion-Bouton system and capable of carrying 23 passengers has commenced to run regularly.

The Peugeot motor has been so successful that a company has been formed to manufacture it on a large scale. Premises have been taken in the village of d'Audincourt and over 180 persons are continually employed in the manufacture of this type of automotor. Evidently there *is* a motor-car industry in France if not in England. Next month about 280 to 300 hands will be taken on.

M. Léon Bollée was the winner of the coupe de motor-cycles, gaining the prize offered by M. Le Baron de Zuylen.

The Paris Omnibus Company has adopted the Serpollet automotor upon the Cimetière de Saint Ouen-Bastille Line. The Bon Marché, of Paris, uses motor-cars as parcels' delivery vans.

Some Forthcoming Events.—July 24th: Paris to Dieppe race for carriages and motor-cycles; August 5th to 11th: Heavy weight competition at Versailles; August 22nd: Paris to Coburg race for motor-cycles.

President	SIR DAVID SALOMONS, Bart.
Secretary	ANDREW W. BARR, Esq.
President of the Liverpool Centre	The EARL OF DERBY, G.C.B.
Hon. Local Secretary	E. SHRAPNELL SMITH, Esq.

WE understand special arrangements are being concluded for members of the Self-Propelled Traffic Association to visit the forthcoming motor-car race from Paris to Dieppe on July 24th, and the Paris Heavy Vehicle Competition on August 5th, organised by the Automobile Club of France. Full particulars can be obtained from the Secretary, at 30, Moorgate Street, London, E.C.

AT a Special Meeting of the Liverpool Local Council of the Self-Propelled Traffic Association, held on Tuesday last, to discuss the forthcoming Motor Vehicle Exhibition and competitive trials being organised under the auspices of the Association, it was decided to postpone the issue of any particulars pending a report by a deputation of the Council then selected to attend the Heavy Vehicle trials at Paris, which are to be held on August 5th, 6th, and 7th next.

AUTOMOTORS AT THE ROYAL AGRICULTURAL SOCIETY'S SHOW, MANCHESTER.

[BY OUR SPECIAL COMMISSIONER.]

IN our last issue we dealt with the trials held under the auspices of the Royal Agricultural Society, or, in other words, the working side. We now have to deal with the exhibition side.

To sum up the exhibits, with one or two exceptions, notably the stands of the Anglo-French Motor Company and the Lancashire Steam Motor Company, they were little short of disappointing to the majority, but most people seemed to have expected perfection in the salad days of a youthful industry, and forgetting that "Blessed is he that expects little, for when he gets it he will not be disappointed," some of their disappointment was courted.

Although at several stands the cars were not on view, chiefly through not being ready to be shown, it was surprising to find how many exhibits had some bearing on the industry, and how many of the exhibitors in all branches of the implement section were at work directly or indirectly on the development of the motor-car. For this reason the show contained much of interest to the intelligent visitor, but would prove a disappointment to the catalogue-bound curiosity-monger. To the latter the stands of the two firms previously mentioned afforded all that was worth seeing, with perhaps an extra dash of spice afforded by the daily run in the show ground of the Leyland van.

To pass on to the exhibits themselves, only a short way down the Central Avenue the stand of the ANGLO-FRENCH MOTOR CARRIAGE COMPANY (LIMITED), of London, Birmingham, and

Paris, was to be met with, and the constant crowd of sight-seers and questioners did much to arrest attention, to say nothing of the attractiveness of the Company's show of vehicles. These were four in uumber, and comprised two motor-cars for two and four persons (one of which we illustrate, Fig. 1); a motor-van for parcels fitted with double-cylinder motor, and friction and spur-driving gear; and also a shallow-sided motor-lorry, likewise illustrated (Fig. 2). The motor-carriages were specimens of the latest productions in motor-car building, having been built to the order of a client in London, while the lorry is destined to be used for the transport of jute bales by a Scotch firm. In all the vehicles special attention has beeu paid to the isolation of the motive power for the bodies of the cars, and this has been achieved with success by the full aud judicious use of rubber buffers or accumulators and steel springs. The much-complained of vibration is thus reduced to a vanishing point, or something very hard to otherwise describe. As objections have been raised from time to time on account of the alleged trouble of attending to the working parts of motors, it should be pointed out that in these cars the supply of oil to the motor is automatic, while the lubrication of the wearing parts is practically the same. The amount of attention needed is thereby reduced to a minimum. As far as the carriage bodies are concerned they are splendidly finished, the appearance and upholstery being equal to the best specimeus of coach-building and fitting in adjoining stands devoted entirely to the time-honoured horse-drawn vehicles.

As will be seen, the lorry is specially suited for the conveyance of bulky loads, the inside dimensions of the body being 11 feet by 4 feet 6 inches. It is propelled by a double-cylinder benzoline vapour motor, developing 8 to 10 H.P. The power is transmitted direct from the motor to the back axle by friction and spur gearing, which enables two speeds of

r and eight miles an hour to attained in a forward direction, l gives one reversing speed. It l be noted that the wheels are of the same size, being shod h steel tyres, and fitted with improved rigged axle-sheering trivance. Underneath is the ling water circulating apparatus cylinders being jacketed. The rage tank carries a supply of l for 50 miles, and the ignition rk is obtained from a 60 ampère-ır secondary battery. For very g distances an extra battery is › provided. As these batteries carried under the front seat y can always be got at easily for ıging or charging.

'he Lancashire Steam Motor ıpany, of Leyland, were running ir motor-van (Figs. 3 and 4) ly in the ground, and had the ısure of carrying several of the ›ility attending the show. Their ı was awarded a silver medal in Implement Section, and it is ısing to note that the judges l no hesitation in making the award, but, on the contrary, expressed their pleasure and willingness, as they considered it had been fully merited. Concerning the criticism we made on the steering gear in reporting the trial at Crewe, its behaviour naturally arrested the attention of the judges, and it is therefore most satisfactory to be able to say that after a further investigation of the steering and compensating gear at the end of the run they expressed themselves quite satisfied with both, as regards mechanical construction, and agreed that the trick the latter played in the trial was not of a nature to reflect at all upon their principle or construction. The small but irritating evil wss cured after the run, and the difficulty has not recurred again since. At their stand the firm were also showing a portable 6 B.H.P. engine and boiler which was very much the same as the motor and boiler used on the van. A smart feature of the exhibit was also a steam lawn mower. One man can work it, a single handle controlling the machine. The weight is also so disposed as to bear on the roller, thus rolling and cutting at once. The motor can be used separately by slipping the driving chain out of gear. A fire pump attachment was also shown at work.

Fig. 2.—Anglo-French Motor Carriage Company's Motor-Lorry.

Messrs. J. Petter and Sons, better known in the motor world as the Yeovil Motor Company, were showing a collection of petroleum motors, but they did not show any cars. The same was the case with Messrs. E. Foden, Sons, and Co. (Limited), of Sandbach, who have given considerable attention to the construction of motor vans, and, we believe, have achieved considerable success, but they confined their attention at the show to their well-known traction engines and road locomotors.

Another firm of motor-car builders, the Wolseley Sheep Shearing Machine Company, whose "Wolseley" autocar has already been illustrated in these columns (February, 1897, p. 186), had a stand, but were not showing the car. They devoted the back page of their pamphlet, however, to a view of the car, these pamphlets being freely distributed. The car is driven by a benzoline motor, and has one regulating handle which gives two speeds and a reverse motion. Messrs. Tallent and Co., of Manchester, were to have shown a four-wheeled dogcart, but it was not ready in time to be exhibited. The cart is fitted with cushion tyres, spider wheels, and ball bearings. The steering system is Ackerman's with some improvements, and is provided with independent brakes to the axle and tyres. The motor, which is petroleum driven, is made by Messrs. Urquhart and Bollé, of Liverpool, and 57, Barton Arcade, Manchester. It is of a comparatively new type, of which we hope to be able to give some further particulars later on. It is double cylindered and develops 3 H.P. The gearing gives four speeds in the forward direction and one backward speed. Messrs. Windover, Turril and Sons, of London, carriage builders, were not showing the motor-car referred to in the catalogue, and declined to give our commissioner any information concerning it beyond that they had made some private runs of a satisfactory nature.

In connection with sundries Messrs. Binney and Son, of Birmingham, &c., in a large collection of belts and driving bands, were showing some specially suitable for autocar purposes, while Messrs. Royce and Co. (Limited), of Manchester, included switches for starting, stopping, and reversing electric motors. In the course of conversation with those interested in motor matters it was gathered that Messrs. J. Holdsworth, a Liverpool firm, expected to have a four-seated motor-carriage on the market soon at a price considerably lower than that at which most cars are now being sold. A four-seated Victoria, running at 4 up to 25 miles an hour, has done well on its trial trips. Another local firm, Messrs. Simpson and Bodman, of Didsbury, near Manchester, have decided to abandon liquid fuel in favour of coke for their steam-driven vehicles.

IT is said that the roller-ship, "Ernest Bazin," has, after several trial trips, attained a speed of six knots. This compares very indifferently with the 37-knot speed expected by the inventor, but is probably nearer the average anticipation.

FIG. 3.—THE LANCASHIRE (LEYLAND) STEAM MOTOR COMPANY'S VAN (p. 418).

THE YACHTING AND FISHERIES EXHIBITION.

A SMALL but well-arranged exhibition of appliances used in yachting and fishing has been opened at the Imperial Institute, London, and those interested in nautical automobilism will find much to interest them. Perhaps the most striking exhibit is that of the Liquid Fuel Company, of Cowes, best known to our readers as the designers and builders of the Lifu motor-van. This Company shows a varied collection of beautifully finished steam launches using petroleum as fuel. They also show a full-sized model of their water-tube boiler and oil-burner, together with some remarkably well-finished sets of compound and three-stage expansion engines. Messrs. Priestman, of Hull, show a fine specimen of their oil-motor for launches, barges, &c.; this motor has been used all over the world and has given great satisfaction. It is found in the "fly-boats" of the Black Country and on the rivers of West Africa and Burmah. It has thus proved its reliability even in the hands of those who cannot be said to know anything of oil-motors whatever. What we like about this motor is its strength and solidity; there is no sacrifice of metal in order to reduce weight, and all the working parts are simple and "get-at-able." They are made in all sizes from 2 to 90 B.H.P. Like all oil-motors, however, they are uni-direction engines, and this necessitates the use of propellers with reversible blades. A Priestman oil-motor has been fitted to a large trawler, 82 feet by 22 feet by 11 feet draught; the motor gave off 90 H.P. and produced a speed of 8 knots, a result in marked contrast with that of the much vaunted steam-lifeboats, which we discuss elsewhere. So highly are these motors thought of that they are rapidly superseding horses for canal traffic. For motor-car purposes it is, of course, necessary that the weight of the motor should be kept low; the same remark applies to motors intended for electric lighting on board torpedo and other small craft, such as yachts. Mr. Mills, of Sunderland, has for some time past undertaken the production of aluminium castings, and at his stand he shows some very beautiful specimens of bed plates, crank chambers, &c. Aluminium seems particularly well adapted for this purpose. Its strength is about 16–20 tons tensile, and its specific gravity about 3; practically it is about one-third the weight of gun-metal and iron, and except for bearings it can replace these metals for all purposes in machinery. It does not rust and is untarnishable. Mr. Mills informs us that he is supplying large numbers of castings for oil and steam motors. There is a very

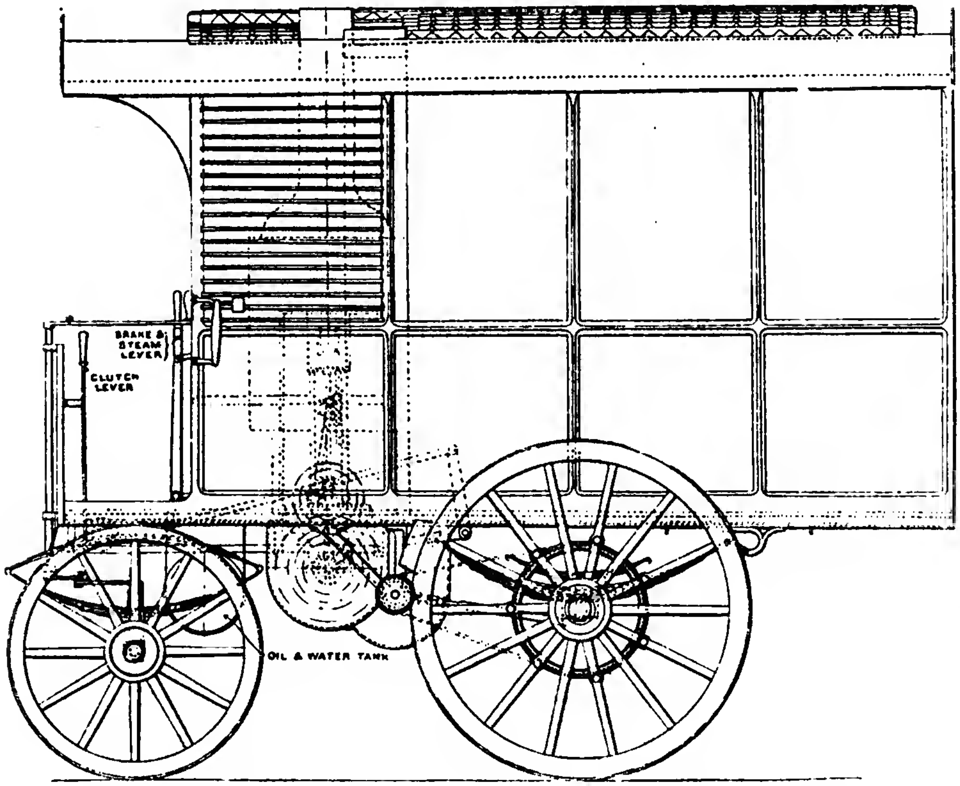


Fig. 4.—The Lancashire (Leyland) Steam Motor Company's Van (p. 418).

fine collection of yacht models, both steam and sail, and most of the launch builders are represented by full-sized vessels. The section relating to fishing is extremely interesting, especially to the pisciculturist.

Space forbids us to describe these things in detail, we can only say that the Yachting and Fisheries Exhibition at the Imperial Institute is one of the best shows now to be seen in London and well worth visiting.

THE ENGINEERS AND THE 8-HOURS DAY.

We have just entered upon one of those industrial wars with which we are so familiar in this country, and which periodically break out much to our own national loss, but very much to the advantage of the foreign manufacturer. The engineers demand an eight hours' day, and the employers refuse to concede it. As in all wars there is some ostensible ground for fighting, and in the present struggle this is the *casus belli* put before the public. As a matter of fact, both the engineers, or, more correctly, the Amalgamated Society of Engineers, and the employers, through their Federation, have long been spoiling for a fight, and war has at length been declared. To day the majority of our large engineering works are closed. Orders cannot be executed, and something like 75,000 men are idle. The men call the dispute a "lock-out," the masters say it is a "strike." It is not very material what it is called, but the principle involved is important. With the extension of the use of labour-saving machinery skilled hands are displaced, and boys and labourers can now do with the aid of a machine work which formerly required a skilled fitter. This replacement of manual skill and labour by automatic machine work is inevitable, and cannot possibly be resisted by any artificial means whatever. It is a noticeable and curious thing about this dispute that the boiler-makers are ostensibly not interested and are working. Those who are acquainted with the furious disputes between fitters—members of the Amalgamated Society of Engineers and boiler-makers—in the making of water-tube boilers, will have no difficulty in seeing why the boiler-makers are holding aloof. Both the employers and the engineers are well equipped for a fight, and any attempt at present on the part of anyone to arbitrate would be utterly useless and worse. We should deprecate any interference even from the Board of Trade. The probability is that in the large firms the strike or lockout of the engineers will have to be followed by a total stoppage. Moulders, boilermakers, pattern-makers, and other allied trades will be involved, as will platers, angle and other smiths, rivetters, &c., in the shipyards. It is, of course, very deplorable, but at the same time inevitable. So far no legislation and no law can, at any rate in this country, prevent these fights between capital and labour, and perhaps it is just as well that it should be so.

From experiments recently made on specimens of iron of different lengths, Mr. Henry Wilde, F.R.S., has found the magnetisation limit to be 422 lbs. per square inch, or 29·67 kilos. per square centimetre. In his communication to the Royal Society Mr. Wilde describes an experiment showing that the single-pole method of determining the magnetisation limit of magnetic substances compares favourably with the double-pole method, and that no higher degree of tractive force is to be expected from the latter than has been obtained from the former method.

THE I.E.S. ACCUMULATOR CELL.

ON the occasion of a recent visit to Woking, we made it our business to inspect the works and plant of the I. E. S. Accumulator Company. These are of a very extensive nature, and are

FIG. 1.

FIG. 2.

for the most part entirely new. Few people, except those concerned, know what a large number of operations and distinct trades are involved in the manufacture of a storage battery. The first essential is the manufacture of the glass cell; this is an industry which naturally is confined to Lancashire and Germany. We then come to the lead plates. Perhaps more ingenuity, time, and labour have been devoted to this item than to any other electrical detail. Ever since Faure and Planté showed how electricity could be, as it were, bottled up and carried about like any other kind of potential energy, inventors have unceasingly striven to increase the active surface, and to prevent the disintegrating action which takes place on rapid discharging. After innumerable trials the I. E. S. Company have succeeded in producing a cell which, for large extent of active surface, freedom from disintegration, and high capacity, will be found difficult to surpass. We say this with a full knowledge of the most recent tests conducted by independent observers. In order to obtain a large active surface, the lead grids were at first made as shown in Fig. 1.

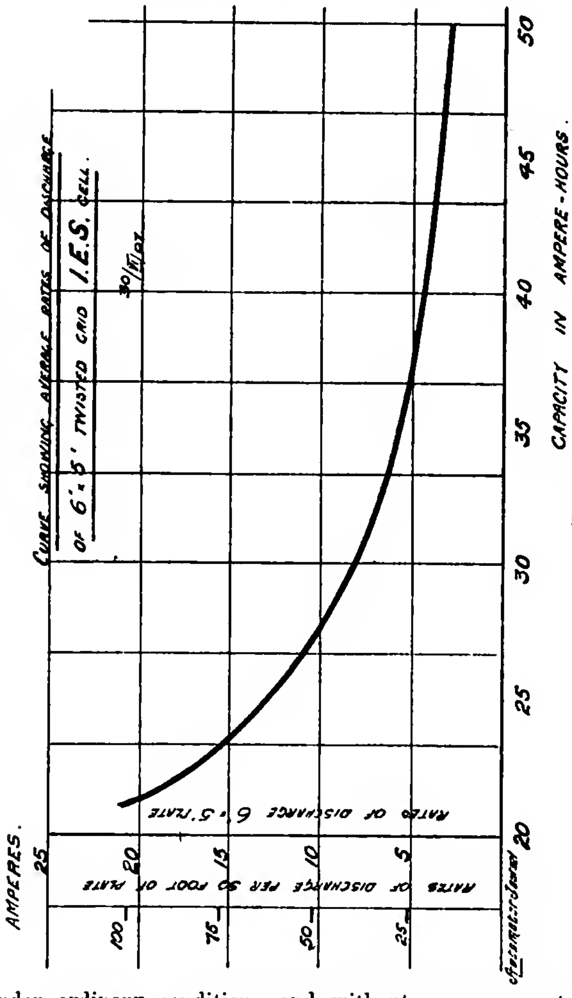


FIG. 3.

Under ordinary conditions, and without some support, this form of construction would be of little use, as surface would be gained at the sacrifice of rigidity and strength. In order to give the necessary support, each plate was enclosed in a perforated celluloid envelope; the celluloid, while giving support, is also an excellent insulator, and thus any accidental contact of adjoining plates prevents any short circuiting. The plate thus constructed was found to give excellent results, but it was further improved by making it in the form shown in Fig. 2. In this plate the lead takes the form of a number of lead wires, about 3 mm. diameter; these are corrugated and kept apart by strips of vulcanite; the plate is then pasted and enclosed in the perforated celluloid envelope.

Taking the "A 11" type as representing the cell most usually employed for traction purposes, each cell contains five positive and six negative plates, each plate being approximately 4¾ inches wide, 6¾ inches high, and ¼ inch thick. A rectangular jacket, about 5 inches wide, 7¼ inches high, and ⅜ inch deep, made out of perforated celluloid sheet about $\frac{1}{32}$ inch thick, surrounds each plate; and the plates are further kept apart by small narrow vertical strips of celluloid being inserted between the celluloid cases of adjacent plates. A plate is composed of 12 narrow vertical prongs of lead joined together at the top with a bar of lead, and at the bottom with a strip of celluloid. Thirteen thin strips of celluloid, each pierced at equal distances with holes corresponding with the 12 lead prongs, are strung on them, and these celluloid strips both serve to keep the lead prongs equally spaced all the way down, and to act as shelves to support the paste which is pressed in between them. The weight of the five positive plates is about 11½ lbs., and that of the six negatives 13 lbs.

From the results of numerous tests by electrical engineers of the most undoubted probity, these cells have extremely high rates of discharge, which make them admirably adapted for traction purposes. The following are the particulars relating to his cell:—

Number of plates, 11.
Weight, 55 lbs.
Charge ampères, 1—35.
Discharge „ 1—50.
Capacity in ampère hours at half list rate, 210.
„ „ „ full „ 150.
Size of box, 10½ × 9¾ × 7½.

As regards the weight of a battery of these cells in order to develop a given power for, say, 19 hours, the weight may be taken at ·67 ton per horse-power between 5 and 10 horse-power; but these cells would be quite capable of developing continuously a much higher power for a shorter period, or a normal rate of 5, 7, or 10 horse-power, with occasional increases to much higher powers, for nearly 19 hours. For instance, the 5 horse-power battery would give an average of 5 horse-power for nearly 19 hours, and up to 10 horse-power for short periods of a few minutes.

As regards the capacity of these cells the following curve will be of interest (*see* Fig. 3). It will be seen that at a rate of discharge of 5 ampères, the capacity in ampère hours is about 38 hours. If the discharge is increased to 15 ampères, or three times the rate, the capacity is about 22 ampère hours. It will be conceded that these results are extremely favourable for traction purposes. Among the latest orders received is one for a large battery for a large automotor barge for canal traffic in the Midlands. These cells were preferred as they stand rough usage so well—there being no possibility of short circuiting.

THE material known as "Pressspahn" is prepared from a specially selected wood fibre, treated with suitable material to enable it to be compressed through rollers into sheets of various thicknesses, ranging from 0·20 mm. to 4·00 mm. It is used for a variety of purposes, such as bookbinding, fancy articles, &c., and also for putting finish on cloth, velvet, or satin; but its chief employment is as an insulating material, capable of withstanding high temperatures, and in this direction it is stated to be invaluable to makers of electrical machinery and apparatus, being largely used in dynamo, alternator, and transformer construction, as well as for resistances. It is supplied by the International Trading Company, of 35, Queen Victoria Street, E.C.

The French Tax on Cycles, Motor-Cars, &c.—According to the latest French advices the Commission of the Chamber charged to examine the new octroi law voted by the Senate has adopted the recommendation intact. It thus would seem that the tax, in spite of the protests that have been made against it, will be doubled, viz., from 10 to 20 francs.

NOTES OF THE MONTH.

REFERRING to the article in our last number dealing with the show of obsolete fire-engines that the Queen was graciously pleased to inspect at Windsor recently, and in which the London County Council was the principal exhibitor, we communicated with the Chairman of the Fire Brigade Committee of the L.C.C. suggesting an interview between a member of our technical staff and the Chairman and Chief Officer of the Fire Brigade. We were rather desirous of ascertaining what was being done in the matter of automobilism by an "advanced" (*sic*) Municipality. Knowing that the Fire Brigade is hopelessly behind the age in every way, and that the L.C.C. has quite enough to contend with in its Works Department and other scandals, we were not at all surprised to receive the following letter:—

"Gentlemen,—In reply to your letter of the 5th instant, Colonel Rotton, the Chairman of the Fire Brigade Committee, desires me to say that he is so busy just now, and will be for some time to come, that he is unable to make an appointment with regard to the matter to which you allude.—I am, gentlemen, your obedient servant,

"C. J. STEWART, Clerk of the Council."

THE Laundry Machinery Exhibition will be held at the Agricultural Hall, Islington, from August 23rd to September 4th, when there will also be a show of motor-cars.

WRITING from Paris, "Free Lance" says in the *Irish Field*:—"In the morning I had a long ride in a motor-car in the Bois de Boulogne, and a very enjoyable and successful trip it was, the motor acting admirably, and the car being free from vibration and ill odours when in motion. It took four of us at a pace and a distance that no two horses in the world could have done without at least ruinous distress, but the motor-car never turned a bolt. Motor-cars and motor-cycles were everywhere; if we saw one we saw 50. They were under perfect control, and some looked quite handsome, it was a wonderful and rapid improvement over the little collection of cumbersome vehicles I saw hidden away in a dark corner of the first Paris cycle show."

WE had no idea the Russians had got so far ahead of the rest of the world in automobilism. According to the Hull *Eastern Morning News* an interesting trial was made a few days ago in Moscow with the motor-bicycle. Two hundred trained motorists mounted on their metal steeds were pitted against a body of Cossacks with picked horses. Their way led them over a clayey track, which recent rains had rendered most soft and slippery. The distance over which they had to ride was 200 versts, or about 120 miles. The Cossacks were allowed to change their mounts at different points on the road. The result of the experiment showed that the superiority of the horses on an unfavourable ground went without saying, while on a smooth hard track the balance was undeniably in favour of the wheelmen. But surely a mere 200 trained motorists would hardly enable the authorities to judge the capacity of motor-bicycles for practical work. Now if it had been 200,000 there might have been something in it.

IN their half-yearly report the Directors of the Burnley and District Tramways Company specially mention that the progress in construction of motor-cars is being carefully watched, and their use as auxiliaries to the tramway considered. This is significant from the fact that this Company is a successful one, and those controlling its affairs have always been ready to avail themselves of every new idea likely to be of permanent advantage to their shareholders and the inhabitants of their town.

AT a well-attended meeting recently of the National Cyclists' Union it was decided that no motor pacing be allowed in amateur races.

The following amusing description of an "incident" of the London streets is from the *Daily Telegraph*:—"Shortly after 7 o'clock a few nights back an exciting scene was witnessed in Holborn, when a terrific combat took place between an old-fashioned horse and a new fangled automobile velocipede, in which the latter was vanquished. On the automobile were a lady and gentleman, the former occupying the front seat. While they were passing the end of Fetter Lane a horse and van laden with chairs issued from the thoroughfare into Holborn, and then the fight began. Somehow or other the automobile, probably through a hitch in the steering apparatus, got among the horse's legs, and a smash promptly occurred. The lady leapt from her place and escaped without a scratch, but the gentleman fell on the roadway, and was within an ace of being stamped with the hoofs of the horse, which reared and plunged and kicked in a desperate manner. Fortunately, he rolled himself out of their reach and managed to regain his feet without much injury beyond a severe shaking. In the meanwhile the horse was prancing over the machine, which stood in danger of irretrievable damage. A number of men seized the animal's head and quieted it down, but it took them some time to convince it that the unwarranted attack on its legs by the horseless vehicle was an accident and not a premeditated insult. The automobile was carried away for repairs."

Two private members of the Paris Chamber of Deputies have given notice that they will bring forward a proposal to considerably increase the present customs duty on all cycles and cycle parts as well as automotors and parts imported into France. The proposal is to have a fixed duty on cycles of 600 francs per 100 kilo on the general tariff and 500 francs per 100 kilo on the minimum tariff. On automotors or detached parts it is proposed to put a tax of 200 francs on the ordinary tariff and 210 francs on the minimum tariff for automotors under 200 kilos; of 180 francs and 150 francs for automotors from 200 to 500 kilos; of 120 francs and 100 francs for automotors from 500 to 1,000 kilos, and of 60 francs and 50 francs on automotors over 1,000 kilos.

The undertaking of the Shoreditch Vestry in establishing combined electric lighting and dust destruction apparatus has proved a complete success, for within 10 days of the opening of the station the equivalent of 7,870 lamps (eight candle-power) has been ordered. The applications in hand already include one for charging electric-cab motors to the extent, it is said, of 200 horse-power. Under the new system, the destruction cells fed with parish refuse, are providing the whole of the steam required for the plant installed without the use of coal.

We hear that the original intention of utilising the Serpollet patents for tramway traction has been enlarged, and very shortly there is likely to be an extension in the scheme for utilising this special steam motor by the formation of a company to make and supply Serpollet carriages for use in England.

"No. 62," advertising in a contemporary, must either be extremely simple or must be looking for one of the proverbial fools, when he calmly advertises that he is prepared to sell 89 shares in the Great Horseless Carriage Company (Limited) for £250 the lot, or £3 per share for a less number. Probably "No. 62" is not aware that the nominal quotation of these shares in the open market is about 17*s.* 6*d.* per share, which no doubt is again open to "negotiation," as the market term it, which to those in the know has a very significant meaning.

"No. 38," immediately following, also seems to be dissatisfied with his investment in the London Motor Van and Wagon Company (Limited), as, although in his advertisement he holds out as an inducement that his shares in this Company are entitled to a preferential dividend of 6 per cent., as well as participating in surplus profit, he is fully prepared to accept £105 for 24 fully paid £5 shares, for an immediate sale.

An extensive fire occurred in Paris early last Monday morning in the Epinettes quarter, by which the workshops of the Co-operative Society of Carriage and Motor-Car Builders, situated in the Rue Pouchet, were completely destroyed. Besides this establishment, which belonged to one of the most important workers' associations of Paris, the conflagration also involved the adjacent Roger Motor Works, &c. The damage done is estimated at the sum of £20,000, and only part of the property destroyed is ensured. Two young workmen, who were arrested on account of their suspicious behaviour, declared first of all that they were both employed at Roger's Factory, but afterwards admitted that only one of them was a workman, the second having no employment. The genuine employé explained that he wished to give his comrade a ride on an autocar, and as the door of the works was open and the establishment was not watched at night, the two entered the building without difficulty. In looking for a lamp, however, they accidentally set the place on fire.

Recently a Mr. Guattari was gazetted bankrupt. Mr. Carlo Guattari, engineer to the New Motive Power Syndicate, is desirous that he should not be confused with his bankrupt namesake, and whilst confirming this, Mr. G. G. Belcher, the promoter of the N. M. P. Syndicate, we are glad to hear, states that the Syndicate not only obtained its capital, the shares being taken up by a large body of subscribers, but that it is proposed to invite the Press, in the course of two or three months, to a public demonstration of the advantages of the new motive power over any other hitherto introduced.

Replying to several enquiries, we understand that the action on behalf of some of the shareholders in the British Motor Syndicate is progressing as rapidly as the slowness of the law will permit, and that the case will in due course be set down for hearing.

The meetings of the Institute of British Carriage Manufacturers will be held at Southampton, at the Town Hall, on September 7th, 8th, and 9th.

We observe that *The Road* is indulging in self-congratulation upon the return of what it is pleased to call the "old coaching days." Then follows a good deal of gush about the "dear old coach," with its "four spanking tits." We have done some coaching in our time in Australia and New Zealand, but strictly as a traveller, and of all the experiences by land and water that we have had, a long coach drive over a dusty track with a southerly "buster" blowing is about the most unpleasant in the shape of travelling. Of course as a pastime coaching is to be encouraged, as it is a sensible one, in that it gives pleasure and employment to others, and, moreover, develops certain mental qualifications in the drivers of great use. Any sport which brings out nerve and pluck, coolness in danger, is to be commended, and so far we wish to encourage coaching, but as for sighing for the return of the "old coaching days" we emphatically do not.

It was hardly to be expected that the motor-car competition at the Crystal Palace could be an unqualified success under any circumstances as the industry is a new one. One would think, however, that a coaching competition could be arranged without the slightest difficulty, as coaches abound, and as for horses, do not our roads reek with their stench? According to *The Road* there has been a coaching competition at the Crystal Palace, but it was an awful frost. The public did not attend, and the person who got up the show acted as judge, with the result that envy, hatred, malice, and all uncharitableness prevailed among the coachees. So much for this attempt to revive the "good old coaching days."

DOINGS OF PUBLIC COMPANIES.

West's Patent Tyre-Setter Company (Limited) has been registered in Australia with a capital of £12,500 in £1 shares.

In a carefully-prepared summary of the half-year's new Companies which appears in the *Westminster Gazette*, out of a total of 77 millions sterling nominal capital, cycles are represented by 6½ millions, and Motor Companies by £550,000.

Referring to the Motor and Cycle Company of Ireland, recently launched under the auspices of Mr. Pennington, a correspondent in the *Dublin Herald* writes: "We were promised a very important addition to the few manufacturing industries in the possession of this old city of ours. Three months ago we were informed of the arrival at the North Wall of the tools, machinery, &c., and, of course, our hearts beat in high expectation at the prospect of seeing 2,000 "hands" employed in the gigantic concerns; but, alas! our hearts sank within us at the long delay, until about six weeks ago we noticed in the papers that a field of some 30 acres had been acquired in the vicinity of Ringsend, that a temporary steel structure was to be run up in the go-ahead American style while the permanent brick building was to be built outside it. I was looking at the field of the 30 acres a day or two ago, and could see neither a square yard of steel nor a brick on it." After the statements which appeared during the inception of the Company it behoves Mr. Pennington and the directors to see that no unnecessary delay arises in fulfilling the advantages then promised.

Great Horseless Carriage Company.

In regard to the resignation of the Earl of Winchilsea as chairman of the above Company, the following correspondence has been sent by the noble Earl for publication:—

To F. Crisp, Esq., Messrs. Ashurst, Morris, Crisp, and Co., 17, Throgmorton Avenue, E.C.

Dear Mr. Crisp,—I am very sorry to have to ask you to forward the enclosed letter, resigning my position as director of the Great Horseless Carriage Company, to the Board. I feel sure that it would be very desirable, if it could be arranged, that my brother, Stormont Finch Hatton, should take my place as chairman of the Board, and I think, if the Board agreed with me in wishing it, and he felt satisfied on looking into the matter that he could undertake it, that he would do so.

Will you, therefore, kindly place this letter, together with that containing my resignation, before the directors?—Yours very truly,

(Signed) Winchilsea.

57, Warwick Square, S.W.,
April 29th, 1897.

To the Board of Directors of the Great Horseless Carriage Company.

Gentlemen,—I believe you are aware that about three months ago, as the result of overwork, my health suddenly broke down, and Sir William Broadbent, who was summoned to Hastings to see me, ordered me at once to go to the Riviera. If I did not at that time send in my resignation it was partly because I was quite unable then and for many weeks afterwards to deal with matters of business in any way, and partly because, I indulged the reasonable hope that when I came back to England I should be able to resume my duties. But Sir William, who has now seen me again, is unfortunately of opinion that I am not in a fit state of health to undertake any responsible work. In fact, his orders are peremptory that I must at once and permanently very considerably reduce the number of my public duties, and refrain for a period of at least six months from work of any kind.

Under these circumstances, I have no option but to ask you to accept my resignation of the position I have the honour to hold as a director of the Company.—Yours very truly,

(Signed) Winchilsea.

Nuneham Park, Abingdon,
April 28th, 1897.

The Right Hon. Earl of Winchilsea, Nuneham Park, Abingdon.

My Lord,—Your letter, dated April 28th, received through Messrs. Ashurst, Morris, Crisp, and Co., was duly read at a Board meeting of this Company held on Friday last, and I am instructed to inform you that the directors exceedingly regret to receive your resignation as chairman and director of this Company, and they also deplore the cause that has necessitated you to do this.

The matter of a future chairman was discussed, and it was decided to defer same for the present.—I am, your Lordship's obedient servant.

(Signed) Chas. Osborn, Secretary.

40, Holborn Viaduct, London, E.C.,
May 17th, 1897.

The Electrical Power Storage Company (Limited).

Mr. J. Irving Courtenay presided at the meeting of this Company held last week, and said the free balance amounted to £4,485 5*s*., out of which the directors recommended a dividend of 5 per cent., carrying forward £242 0*s*. 2*d*. The buildings, plant, and tools generally were never in so good condition as they were to-day, and they had spent on their maintenance, renewal, and repair during the last year £2,048 15*s*. 2*d*., and in addition they had expended £526 11*s* 9*d*. on new plant. The number of plates sold during the year showed a marked advance on the sales of any previous year, thus indicating to some extent the importance of the goodwill of the Company's business. The new Faure-King accumulator was receiving the favourable consideration of a large number of buyers, and they had on hand, among numerous other orders, many important orders for these batteries for motor-car propulsion. This latter business, of which a good deal has been expected during the last two or three years, does not at present show much actual progress, but they would be interested to learn that the electrically-propelled dog-cart built by the Electric Construction Company, exhibited at the Crystal Palace, and which received the special commendation of the judges in *The Engineer* competition, was equipped with a Faure-King battery capable of running the vehicle 25 miles, a figure which represents working at twice the discharge rates given in their price list. This was a very hopeful departure, because the battery could be kept charged and properly maintained as new for a much less sum than it costs to fodder and attend to a horse.

After a few remarks, during which the chairman said the maintenance was paid out of revenue, the report was adopted and a dividend of 5 per cent. declared.

New Issues.

For the Month ending July 13th.

Tubes, American (Limited).—Capital £400,000 in £1 shares. Present issue 340,000 shares. Established to acquire the whole of the stock or share capital of the Ellwood Weldless Tube Company, of the city of Ellwood, Pennsylvania (who are entitled to Stiefel's United States patent), and of the American Weldless Steel Tube Company, of Toledo, Ohio. The assets of the Ellwood Weldless Tube Company include the whole of the stock or share capital of the Greenville Tube Company, of Greenville, Pennsylvania, which is thus brought within the combination. The prospectus states that the works are valued with freehold lands, railway sidings, stock, &c., at £166,741. The profits of the Ellwood Company are certified to have been at the rate of £41,550 per annum for 18 months to May 1st, and that the other concerns had been too recently established to provide any account of the Company's trading. Purchase price £289,675, of which the vendors take £144,837 in shares, and from the present issue about £40,000 will, it is estimated, be available for extensions and working capital.

New Companies Registered.

[Under this heading we give a full list of new Companies registered which take power to make, deal, or become interested in any manner in automotor vehicles. We shall be pleased to reply with detailed particulars to inquiries through the "Answers to Correspondents" column. All communications should be addressed to the Editor. The only stipulation which we make is that where the inquiry involves a search of the records at Somerset House—as in the case of information on the subject of the holdings of shareholders—a postal order must be enclosed to cover the Government stamp of one shilling which is charged before a search is allowed to be made.]

	Capital.
Adelong Consolidated Gold Mines, Ld. (6 & 7, Queen St. Place, E.C.)	£125,000
Anderson Electrical Traction Syndicate, Ld.	5,000
Bagshawes, Ld. (159, Queen Victoria St., E.C.)	120,000
Beard's Cycle Fittings, Ld. (Frederick St., Wolverhampton)	20,000
Broughton Copper Co., Ld. (Manchester)	238,000
Brown Bros., Ld. (26, &c., Gt. Eastern St., E.)	250,000
Cash Cycle Co, Ld. (18, New Cannon St., Manchester)	5,000
Cycles and Automobiles Michaux, Ld.	100,000
New Defiance Cycle Co., Ld.	5,000
New Eadie Manufacturing Co., Ld. (Redditch)	160,000
Peerless Metal and Martino, Ld. (38, Princip St., Birmingham)	150,000
Pure Acetylene Gas & Carbide Co., Ld.	120,000
Safety Motor Syndicate, Ld. (49A, Lincoln's Inn Fields, W.C.)	1,500
Tubes (America), Ld.	400,000
Waterson Machine Fittings Co., Ld. (55, New St., Aston, Birmingham)	2,000
William Forbes, Ld. (224, Byres Rd., Glasgow)	5,000
Woodward Electrical Storage Battery Co., Ld.	60,000

LITERATURE RELATING TO AUTOMOBILISM.

[*N.B.—Publishers will please state price of books sent for Review.*]

"The Law of Motor-Cars, Hackney, and other Carriages." By G. A. BONNER, Esq., B.A., Barrister-at-Law. (London: Stevens and Sons (Limited), 1897.) Price 7*s.* 6*d.*

IT is a noteworthy sign of our civilisation that the legal liability of every person is now easily determined. Much ingenious artifice is occasionally displayed to evade the law, but ultimately the latter proves too strong, and the elastic phrase, "within the meaning of the Act," or that other, "the evident intention of the Legislature," is made to cover every case that can arise. Another noteworthy sign too is the anticipatory character of much modern legislation. We not only deal with facts as they are, but as they may be modified by fresh discovery. The law relating to motor-cars well illustrates both these tendencies. It is also not less indicative of the age we live in that no one can really plead ignorance of the law, because no sooner is a new law placed upon the statute book than there is almost simultaneously produced a large quantity of literature, technical and popular, which expounds and explains the subject so that those concerned can ascertain their legal liability with little cost or trouble. Although the use of automotors has been sanctioned for but little more than half a year, the legal literature relating to automotors is already pretty extensive, ranging from the handbook which explains the Act in a popular manner to the professional text-book written for lawyers. Of the latter character is the work before us, which forms an epitome of the whole law relating to vehicles. It is rather too generally assumed that the Legislature has treated automotor vehicles in an exceptional manner, but, as the author points out, the bulk of the law applicable to them is equally applicable to vehicles of other classes. The law relating to vehicles, including locomotives and other automotors, is contained in nearly sixty statutes, without including regulations made by local authority, police, &c. Surely this mass of legal enactments could well be consolidated and simplified. The first chapter discusses "Light Locomotives on Highways," and the author's explanatory comments on the various clauses are of considerable interest and value; thus, while smoke or *visible* vapour are forbidden, the Act is silent as to the emission of noxious or offensive fumes or vapours, and the conclusion seems to be that it is illegal to emit smoke unless accidentally, but a perfectly legitimate thing to emit an offensive vapour; but here again, as the author explains in another place, an offensive smell may constitute a nuisance. The great difference between a light locomotive and an ordinary locomotive on a highway in a legal sense is that the former must be under three tons in weight unladen, and not used for the purpose of drawing more than one vehicle (such vehicle, with its locomotive, not to exceed in weight, unladen, four tons), and so constructed that no smoke or visible vapour is emitted therefrom except from any temporary or accidental cause. The three conditions as to power (mechanical), weight, and non-emission of smoke, constitute a light locomotive. If any one be unfulfilled the machine ceases to be a light locomotive, and comes within the Acts regulating ordinary locomotives. A light locomotive is also a "carriage" within the meaning of any Act of Parliament.

Although by Sec. 4 of the Act a speed of 14 miles is permitted, it is as well to remind our readers that by the Regulations of the Local Government Board the outside speed of any light locomotive is 12 miles per hour. The speed permitted to the various classes of vehicles upon highways is embodied in the following table:—

Light Locomotives Unladen—

Under $1\frac{1}{2}$ tons. Speed not to exceed 12 miles per hour.
" 2 " but over $1\frac{1}{2}$. Speed not to exceed 8 miles per hour.
" 3 " " 2. Speed not to exceed 5 miles per hour.

When Drawing a Vehicle—

Under any circumstances not to exceed 6 miles per hour.

Locomotives (other than Light)—

Under any circumstances not to exceed 4 miles per hour. Passing through any city, town, or village, not to exceed 2 miles per hour.

The Petroleum Acts are then fully discussed. It is perhaps not generally known that, for the purpose of a light locomotive, the owner must either store oil in accordance with the provisions of the Petroleum Acts (*i.e.*, in pursuance of a licence), or he may keep it without a licence in pursuance of Regulations made by the Home Office. Chapter II discusses the Law relating to Hackney Carriages; under which category are included bicycles, tricycles, &c. This is succeeded by an ably written chapter on Negligence, which will repay careful reading. A similar remark applies to the chapter on Nuisances. The work covers the whole law relating to vehicles of all descriptions. It is one that, while undoubtedly destined to rank as a leading work on the law of vehicles, may yet be consulted with advantage by the ordinary layman. Mr. Bonner writes well and explicitly, and we congratulate him on producing the best work on the subject that has so far appeared.

INTERVIEWS WITH LEADING AUTOMOTOR ENGINEERS.

Mr. Anthony G. New and Mr. E. Mann.

nected with horseless traction. His opinions, therefore, will be read with interest by the automotor community.

Mr. New is also a director of the I.E.S. and other electrical companies, and has the proud distinction of being among the first pioneers of the motor-car movement to be fined for running a motor vehicle without a licence.

All technical matters come before Mr. New, who usually is to be found at Woking. The commercial department is managed by Mr. E. Mann, who was born in 1855 and was educated at Paris and Rugby. He has had a large commercial training, having filled various important commercial positions in the Brazils, West Africa, &c., with conspicuous success. Returning to England in 1889 he "went in" for electrical engineering—that is in its commercial aspects, and several enterprises owe not a little of their success to his administrative ability. On the formation of the firm of New and Mayne he became the business director, a post he still holds, and so far the association of Mr. New and Mr. Mann has been satisfactory to themselves and their clients.

Ever since the Locomotives on Highways Act was projected the firm of New and Mayne have been carefully studying the possibilities of horseless traction. Wisely, they have not attempted to proceed without seeing how far purely theoretical design would have to be modified by practical experience, and

oking for a long time past. in that town, "something a very small second-class ark: "Oh, it's only one of New and Mayne's experiments."

Messrs. New and Mayne's London offices are situated in Bridge Street, Westminster, London, opposite the House of Commons. From the windows of the first floor is obtained

of the identi- with - pro- other The works and factories of the firm are, however, at Woking, and they have branches in the principal provincial cities. Central station work is their special industry, and in this connection Woking furnishes a good example of successful lighting. Woking depends upon two great industries—the creation and disposal of motors. The one is the final disposal in the earth of human motors from which all the energy has been exhausted, and the other is the production of mechanical motors which derive their energy, whether in the form of coal or petroleum, also from the earth. Woking is not, however, proud as might be thought, but is merely, in a modest way, a very up-to-date town. It will not only literally "undertake" one according to the most approved methods, but it will also undertake to show you the latest thing in automobilism. Mr. New, who resides in Woking among his workpeople, has not, we believe, any connection with the "other" industry, but is very much concerned with the decidedly more vital question of automobilism. Unlike so many people who, because they own a gee-gee or can drive a trap, think themselves competent to express an opinion—usually of no value—upon horseless traction, Mr. New has taken up the subject in a purely scientific manner, with of course an intention of obtaining commercial advantage.

Knowing what is being at present done in the automotor industry, and knowing what Messrs. New and Mayne were doing, we solicited permission to subject the members of the firm to a species of inquisition. Not only did we visit Woking

Mr. Anthony G. New.

and saw what work was being carried on, but a representative of the AUTOMOTOR lay in wait at the London offices of the firm and seized his victims as they were emerging from a board meeting, and refused to release them until they had answered the following questions:—

"About how many hands are employed by you in the actual manufacture of motors, storage cells, and other appliances strictly intended for motor-cars?"

"We are at the present time employing about 80 hands in the manufacture of motors, electric accumulators, and other appliances for motor-cars."

"What is the average amount of weekly wages paid these hands?"

"We are paying £140 per week in wages for motor-car work alone."

"Have you completed any orders for automotors?"

"We have not yet completed any orders."

"Have you any orders on hand?"

"We have orders on hand and have had to refuse many, as we could not guarantee delivery soon enough for the requirements of the present season. There will be no difficulty, however, in picking up these orders again for next season."

"You have spent a good deal of money in experimenting, have you not?"

"We have spent large sums of money in experimenting?"

"Do you, as the result of your costly experiments, think that the automotor industry is worth following up? For instance, do you think that it would pay firms of established repute to go into the manufacture of automotor cars?"

"We are absolutely of the opinion that the automotor industry has come to stay, and we think it will be not only to the interest of established firms of repute to go into the busi necessary for them to do s have spent a good deal of out commercially successfu

"What special points a differentiate the applicatio say, road locomotives, la &c.?"

"There is a difference b horseless vehicles and for l propulsion, inasmuch as in necessary to provide mean to be done by suspension s much as possible from the

"At present a horse-dra

to persons with etence to mechanical knowledge, would no cle require a skilled driver?"

"We have no able to turn out automotor vehicles which any mechanical knowledge whatever in th at any man can pick up in a week."

"What would be the weekly wage of a competent driver of an automotor?"

"There is no reason why competent drivers for horseless vehicles should not be obtained at the same rates as are paid to ordinary carmen, cab drivers, &c."

"Suppose I want a motor-car to ; say, for a draper purpose for which it is intended. We deprecate the use of light oil at all, on account of its volatile and inflammable properties and the consequent danger of explosions, and also as light oils, such as benzoline or petrol, cost considerably more than petroleum and are not readily obtainable, on account of the restriction against storage of same and the small quantities in which they are allowed to be sold retail, besides which the power obtainable is less in a given quantity. Heavy oil or petroleum for use, either as fuel for an oil-engine or as fuel for the boiler of the steam system, should be the most useful fuel in conjunction with the new industry. The new high-speed oil-engines, by reason of their light weight and the small space they occupy, are very well adapted for road traction, but as, to work economically, it is advisable to have a constant load, and as also there are inconveniences attended with the stopping of a carriage driven by an oil-motor without stopping the motor, we suggest that in conjunction with the oil-motor there should be used a small dynamo and a light battery of electric accumulators. The accumulators when charged serve to drive the dynamo as a motor to start the oil-engine, and when its proper speed is attained the motor overcomes the resistance of the batteries and puts a small current into them while the engine is running. If the full power of the motor is being used, say, for going up a hill, no current would be going into the batteries, but running down hill, or when the carriage is stationary, the available power would be charging the accumulators ready for when they were wanted, either for starting or assisting the motor again, or for lighting the lamps of the vehicle. The steam system mentioned above using petroleum for fuel for the boiler can be made absolutely automatic, so that the steam pressure in the boiler regulates not only the amount of fuel used, but also the feed of water to the boiler, and of course in a steam system the varying power required is provided for by more or less steam being used, as the case may be. With regard to the electric propulsion of vehicles, there is a large field for this, using electric motor and accumulators, but these should be used only in paved streets, or where the roads are thoroughly well macadamized and the gradients small; and as accumulators require careful attention to keep them in good condition, we only recommend their use where there are a number of vehicles used by one firm, as the wages of a man capable of looking after a set of accumulators used for traction would be excessive, whereas the same man would look after 20 or 30 sets, and his wages distributed over these would be a small item in the total maintenance."

"Suppose I own an electric motor-car for trade purposes, say, as before a grocer; I occupy large premises in, say, Oxford Street or Whitechapel. I supply customers within a radius of four miles. What facilities should I have for re-charging?"

"A tradesman owning an electric motor-car for trade purposes would have to consider the question of where he could get his accumulators re-charged. In those parts of London, for instance, covered by companies who supply direct current, he would have no difficulty in charging his accumulators in his own yard, and by having a duplicate set of accumulators, so that one set could be on charge while the others were in use, he could arrange very reasonable terms with the Supply Company for charging in the day time. In those areas which are supplied by the Alternating Current Companies, there would be the difficulty of having to send his accumulators to the supply station to be charged. This, of course, applies to other large towns which have only the alternating current available. They have direct current in use at their generating stations for exciting their alternators but do not transmit direct current to their customers, therefore, anyone having batteries to charge must send them to the station."

"What is the least cost of E. energy per unit = 1 kilowatt?"

"With regard to cost of supplying energy for charging the accumulators for motor-car work, we understand that arrangements have been made with some of the large Supply Companies in London to supply current to the London Electrical Cab Company for their vehicles at rates which average out at not exceeding $1\frac{1}{2}d.$ per unit."

"Can you compare the relative weight and efficiencies of, say, a two-horse van carrying $1\frac{1}{2}$ tons, and an electric motor-van carrying the same weight? (N.B.—In all cases the weight of the horses is to be added to the weight of the van.)"

"Although it is an extremely difficult matter to give a general idea of the comparative weights and efficiencies of automatically-propelled vehicles of different kinds, our opinion is that considering a van for carrying $1\frac{1}{2}$ tons of goods, such as is now drawn by two horses, the weight of the van itself if motor driven would be about 30 per cent. heavier than the horse-drawn one, and the weight of machinery would be approximately as follows:—Steam or oil, 5 cwt.; oil and electric combined, 10 cwt.; and electric (accumulator for short journeys), 20 cwt. We do not consider that the weight of the horses should be considered in this comparison."

"You have no doubt seen the statement of *The Engineer* to the effect that at present there is no 'really satisfactory motor.' Is there in your opinion a 'really satisfactory' mangle, sewing machine, battleship, lifeboat; or do you know of anything, any machine, institution, or anything human at all which *is* 'really satisfactory'; because, if you do, I don't, and our readers, like me, simply pine after anything 'really satisfactory'?"

"We do not think that the statement made by *The Engineer* 'that there is at present no really satisfactory motor for horseless vehicle traction' is fair. It is very difficult to say what is a really satisfactory anything. Constant improvements are being made in steam-engines, sewing machines, laundry machinery, in the management of institutions, and, in fact, in everything you can think of, and if the public is to wait to use an article until it is so satisfactory that no improvements can be made, all industries would soon be at a standstill."

"Having so far disposed of the automotor car, I would like you to tell me something about another branch of automobilism in which I believe you are interested—I refer to your rudder-motor. So far, I have seen this applied with advantage to small river boats. Can it be used for canal propulsion? Say, for instance, I have a lighter that will lift 60 tons D.W., can I employ your rudder-motor?"

"Our rudder-motor has so far only been used for propelling small craft, the largest being two horse-power machines, and these are suitable for propelling ships' pinnaces capable of holding about 20 people, and will propel them from five to six miles an hour, but there is no reason why they should not be used of larger size for purposes of canal or river work. Lightermen, who practically control the river and canal transport, would save a large sum in wages if their barges were electrically propelled by means of the rudder-motor and batteries, as they would dispense with the necessity for tugs, which means not only the outlay for the tug, but also the constant expense of engine-room hands."

"What do you think is the future of canal traffic? Will horses be superseded by automotors?"

"There is no doubt that the time is coming very near when the use of horses for canal traffic will be abandoned and mechanically-propelled canal boats will supersede them."

"One more question, and this infliction ceases. Is there an automotor industry in this country? *The Engineer* says there is not, and our readers want to know. We also want to know, because we can't very well continue to enlighten the public about an industry which does not exist. I myself am under the impression that there is a large number of firms, including your own, who manufacture motors as a relaxation, or from a philanthropic desire to keep the hands on, or even as earnest seekers after engineering truth?"

"That there is an automotor industry in this country is undoubted. Large sums of money have been spent in acquiring patents. A great deal of experimental work has been done and costly machinery put down for the production of motor vehicles. There has, however, not been time since the law which prevented the use of motor-cars in the United Kingdom was repealed to show anything substantial in the way of results. Several well-known and old-established firms are working on steam carriages; others on oil motor vehicles. Quite a number again are working on electrically-propelled vehicles, and we expect shortly to see 40 or 50 electric cabs running in London."

"I need hardly say that our readers will be deeply interested in your replies. This interview will do much to restore public confidence in the future of the automotor vehicle."

CORRESPONDENCE.

_ *We do not hold ourselves responsible for opinions expressed by our Correspondents.*

_ *The name and address of the writer (not necessarily for publication)* MUST *in all cases accompany letters intended for insertion or containing queries.*

A MOTOR-CAR DESIGN.

To the Editor of The Automotor and Horseless Vehicle Journal.

Sir,—I have designed a steam motor-cycle, which I purpose constructing for experimental purposes. I should esteem it a favour if you will give me your opinion as to the relative proportions I have decided on for the engine and boiler. The cycle has three wheels, and is to carry two persons, to attain a speed of 12 miles per hour, and to use petroleum as fuel; the weight, with fuel and water, approximately 2½ to 3 cwt.

(1) The engine I propose to have 2 horse-power; cylinders, 2¼ inches bore, by 2¼ inches stroke; steam pressure, 150 lbs.; revolutions, 500 per minute. Is this engine powerful enough?

(2) The boiler I propose to be of the flash type, the tubes to be ⅜ inch bore by ⅞ inch outside diameter. Is this proportion of bore to outside diameter suitable for this class of boiler?

(3) The boiler has been designed to give a total heating surface of 5 square feet, and a grate area of ¾ square foot. Are these sufficient for the duty required?

If you consider any of the points of the design faulty, I shall be much obliged if you would suggest where they should be altered.—Yours faithfully, R. F.

[(1) The power, about 4·8 B.H.P., would be ample. (2) To obtain the full advantage of the principle of the flashing steam boiler your tubes should be very much thicker. (3) Heating surface is too small; we suggest at least 2 square feet per I.H.P. We could hardly criticise the design without seeing the plans. In the Automotor Diary you will see a list of firms who supply motor-car accessories, or see the letter in this number from the London Motor-Car Works.—Ed.]

"HORSELESS CARRIAGES"—SOMETHING DIFFERENT WANTED.

To the Editor of The Automotor and Horseless Vehicle Journal.

Sir,—Pending the production of an engine suitable for road locomotion (is it to be the steam turbine?), a few remarks as to the general form of self-propelled vehicles may not be out of place. The designer of such a vehicle appears to imagine that all that he has to do is to take an ordinary carriage, remove the horse and shafts, and attach his more or less impracticable engine to the rear wheels. The result, in almost every case so far, has been a vehicle of grotesque appearance, and this not only from the absence of the accustomed horse, but from its obvious unsuitableness to the new conditions. In a horse-drawn carriage the small steering wheels are, to a certain extent, lifted over obstructions by the horse, and the jolting due to their small size moderated somewhat, but when the force is applied from behind, and the steering wheels driven dead against every obstruction, the effect is very different. It seems to me, therefore, that our plan should be to make the steering wheels *large*, as in the American buggy, or the more familiar coal-cart, designs adapted respectively for rough roads and heavy weights. It is not of much use to have large driving wheels if the steering wheels are small, and for the new conditions these latter should be enlarged even if this involves raising that portion of the floor of the vehicle that is over them. Another point:—Under the new and horseless conditions, should the steering wheels be leading or trailing, in front or in rear? Here, again, we must not be prejudiced by custom, but should consider whether the driving wheels should *push* or *pull* the steerers. My own opinion is that they should *pull*, as they do in Mr. Thornycroft's steam van, the chief reason, perhaps, being that the more lightly-weighted steering wheels, by *following* the drivers, will find the way prepared for them, so to speak. In many cases it might be advantageous to place the driver's seat over the steering wheels at the back, but where this cannot be done the steering may be readily effected from the front by means of rods. For very heavy traffic it would probably be advantageous to have *two* pairs of driving wheels in front coupled together as in a locomotive, the tendency to sink in soft ground being diminished by distribution of the weight. This well-known principle does not seem so far to have been applied to road traffic at all.—I am, &c., A. J. Allen.

London Institution, Finsbury Circus, E.C., *June 27th.*

[We hope to discuss the technical point raised by our correspondent in a future number. In the meantime we may say that in our opinion designers will not greatly err in imitating advanced locomotive practice.—Ed.]

THE ARNOLD CAR.

To the Editor of The Automotor and Horseless Vehicle Journal.

Dear Sir,—In looking through the June number of Automotor, on p. 350, you say: "The next motor (Fig. 15, p. 356) is entered by Mr. Cornell. Owing to our inability to obtain drawings, or even much information concerning it, we must be content with the briefest description. We understand that light oil is employed in an ordinary Otto cycle engine having electric spark ignition. Neither this motor nor its performance call for any special notice."

As the above is likely to convey a false impression, may I ask you, in fairness, to say that this little carriage was running at Margate a year ago for three weeks? I then drove it (with my wife) from Margate to Southampton and back in August last. It was then driven in Southampton in September. I also drove it from Tonbridge to London, November 13th, and thence to Brighton on the memorable 14th, arriving at Hotel Métropole at 6 o'clock.

I have driven the little Arnold "Sociable" nearly 3,000 miles, and have been delayed only once, through exhaust-valve choking; that is now corrected by substituting non-corrosive metal. With regard to drawings, I have them now before me, and also a letter to the following effect:—

"*The Engineer*,
"33, Norfolk Street, Strand,
"June 17, 1897.

"Dear Sir,—In reply to your letter of yesterday's date I shall have much pleasure in returning your drawings, and also your entrance fee of £1, to which you are entitled as actually competing.

"I need not tell you how much I regret the circumstances which left you alone in your class.—Yours faithfully,
"S. White."

I was at *The Engineer* competition, quite prepared to start on the journey to Birmingham, having driven the car over the same ground three weeks previously, and could have done the distance comfortably in 32, instead of the 52 hours' time allowed.

Since then Mr. Coles (its present owner) has driven it in London and other places continuously with perfect success.

I should have been too pleased to have furnished any information, but it has already been well described in *English*

Mechanic, *Scientific American*, &c., of which I enclose reprints. It is surprising how the motor-car proper has been misrepresented. As it has taken 60 years to evolutionise the perambulator, why should we look for showers of motor-cars?—Yours faithfully,
A. Cornell.
Tonbridge.

[We willingly publish the above letter, but do not see our way to modify the statement complained of as we are still without any technical knowledge of the Arnold Car. We gave a photograph of it in our last number, this, however, merely conveys an impression of its external appearance. The reprints mentioned do not furnish the information we want. If our correspondent will supply us with working drawings, official tests, &c., we shall be glad to publish them. Exact technical information is what we desire to supply our readers with.—Ed.]

WANTED—A MOTOR-OF-ALL-WORK.

To the Editor of The Automotor and Horseless Vehicle Journal.

Sir,—I intend to take up an agency for motor-cars for this district as I am in the same line myself here on a small scale. I think for all that has been said against them there is some in the market that would do—but I want your advice as to what you think is the best oil-motor in the market. What I want is a motor-car to carry five cwt. and to carry two persons beside, and the oil-engine to be used when at home for driving purposes, such as a small dynamo for electric lighting. By inserting answer in your next issue I will feel obliged. Do you consider the Pennington motor up to date? I see they are making a lot of it in Dublin.—Yours respectfully,
Motor.

[We could not undertake to advise as to the "best" oil-motor. Your better plan would be to state your requirements to a consulting engineer who makes motor-cars a speciality (*see* the Automotor Diary). We do not think it would be feasible to employ the oil-motor to drive a dynamo in the way suggested, as a heavy fly-wheel would be necessary, besides the base of a van would hardly make a sufficiently rigid foundation. You would find the light so produced very unsteady. At the same time it would be quite possible to design a motor-car so that when idle the motor could be used to drive those machines in which a regular turning moment is not important. The Pennington motor is unquestionably "up to date" in the sense that it develops a relatively large power on a small weight of engine. It is successfully employed in driving very light vehicles, but we have not heard of its application to ordinary tradesmen's vans.—Ed.]

PARTS FOR AUTOMOTORS.

To the Editor of The Automotor and Horseless Vehicle Journal.

Dear Sir,—We should like to mention that we have laid down a plant of the highest order for the especial purpose of manufacturing all the ball-bearings, axles, hubs, and controlling gears for motor-cars, and should be pleased to receive correspondence relating to this work.—Yours faithfully,
The London Motor-Car Works Co. (Ltd.).
Albert Mills, Beavor Lane,
Hammersmith, London, W.

[The above letter no doubt is in reply to "Pateutee's" letter in our June issue.—Ed.]

THE PETROLEUM CAR.

To the Editor of The Automotor and Horseless Vehicle Journal.

Sir,—The Select Committee of the House of Commons meets to-day at 3 p.m. to consider further proceedings in respect of the dangers of petroleum and lamps. The fiasco of *The Engineer* Exhibition and of the automotor-car in general, as I read in your last issue, leads me to suggest the possibility of developing the petroleum car without danger and odour—through the medium of your publication. In this matter of safety in the use of petroleum as fuel, and paraffin as an illuminant, my researches encourage me to say that such is absolutely possible.—Yours faithfully,
C. E. Parker Rhodes.
July 8th.

[We shall be glad to have particulars of our correspondent's plans. We quite agree that it is possible to eliminate all danger from the use of petroleum.—Ed.]

THE LATE MR. LAVINGTON E. FLETCHER.

We regret to record the decease of one of the early pioneers of the automotor in Great Britain, and who in his later years was one of the most advanced and scientific engineers of the day. Mr. Fletcher was best known to the present generation as the engineer-in-chief of the Manchester Steam Users' Association. Indeed, the extraordinarily high position and authority that this body — a private corporation — occupies and wields is due almost entirely to the engineering skill of Mr. Fletcher. For anyone to question the dicta or practice of the Manchester Steam Users' Association is to say that the person is a greater authority than Mr. Fletcher, or that he has much to learn. Mr. Fletcher was perhaps the greatest authority in his time on boiler construction and management, and Lancashire, especially, owes much to him. Mr. Fletcher was born in 1821, so he had lived beyond the usual three score and ten, and to few of us is it given to lead a life more full of usefulness to our fellow men than that led by Mr. Fletcher. He commenced life as a railway engineer, but obtained a successful practice as a consulting engineer in other industries, notably paper and biscuit making. He at this time, *circa* 1842, investigated the problems of horseless traction, and designed and had built in Reading, at a cost of between £300 and £400, a road locomotive, weighing complete with fuel and water, about 18 cwt., maintaining a speed of 12 to 20 miles an hour, and taking 8 to 10 passengers up a hill of 1 in 12 at 12 miles an hour, working pressure 360 lbs. per square inch. This information is furnished by Mr. J. Spencer, of Manchester, who steered the carriage for a long period, and assisted as an engineer apprentice in its construction. From 1846 to 1850 he was engaged under Mr. J. K. Brunel, C.E., chief engineer to the South Wales Railway.

In January, 1861, Mr. Fletcher was appointed chief engineer to the Association for the Prevention of Steam Boiler Explosions, now known as the Manchester Steam Users' Association. With this organisation he was engaged up till the date of his death, so that he had been connected with it for the long period of 36 years. It is almost impossible to over-estimate, says *Engineering*, the great influence he, as the chief organiser, exerted on legislation relating to steam boilers and machinery. At the time of his death he was engaged in furthering the Bill introduced into the House of Commons by Sir William Houldsworth, which seeks to secure the periodical inspection and certification of practically every steam boiler in the kingdom. Mr. Fletcher was a member of the Institution of Civil Engineers and of the Institution of Mechanical Engineers. Before the latter Institution he read, in May, 1876, a valuable paper on "The Lancashire Boiler: Its Construction, Equipment, and Setting."

Motor-Car Exhibition at Harrogate.—On Saturday last the Yorkshire Motor-Car Company, of Bradford, opened, at the Spa, Harrogate, a seven days' exhibition of motor-cars and motettes, which proved of considerable interest. The horseless carriages were shown under the direction of Mr. J. E. Tuke and an assistant, and trial runs are being made each afternoon and evening.

NAUTICAL AUTOMOBILISM.

The Hydraulic Steam Lifeboat "Queen."

IN this jubilee year when we are all metaphorically patting each other on the back and congratulating ourselves on our wonderful "progress" it probably occurs to very few to consider how very slow that progress is. Take, for instance, lifeboats. Practical steam navigation is about 70 years old, and the first steam lifeboat was built seven years ago. Some very hard things have been said about the Royal National Lifeboat Institution recently, and one of the most damaging indictments against it is that it has done absolutely nothing to solve the problem of small craft automobilism but has clung to the archaic system of rowing, and even in its adoption of steam the system of propulsion selected is the least efficient known. The reason for the preference of the hydraulic system of propulsion to ordinary screw propulsion is that in the former there are no external propellers to be fouled or damaged by wreckage. This advantage is, however, very far fetched. In the days of the old wooden sailing ship, masts, spars, &c., were of wood. Rigging was of rope, and hence when the vessel was stranded she quickly broke up and became a mass of floating wreckage. Nowadays the majority of vessels are of iron or steel as are their masts, yards, &c., and even when the latter are of wood the rigging is of iron wire and chain, and when these vessels get ashore they rarely break up but have to be blown to pieces by explosives, and if their masts do carry away the amount of metal attached makes the wreckage sink alongside and hence the risk to vessels of fouling their propeller when going alongside is extremely remote. Indeed, small screw tugs and trawlers habitually are on the look out for wrecks with an eye to possible salvage, and it is very rarely that they receive damage to their propellers either from wreckage or fishing nets. There is thus then no valid reason for the retention of such an inefficient system of propulsion as the hydraulic system. On the other hand, this system is particularly liable to break down from causes which would be absolutely harmless to a screw propeller. Thus small pieces of wood which would be brushed aside by a screw are drawn into the hydraulic turbine and break the impeller. Several instances of this have occurred with these hydraulic lifeboats. Moreover, if there is one class of operation in which fouling would be attended with the gravest consequences it is in submarine mining, but neither the War Office nor Admiralty will entertain the idea of hydraulic propulsion. In fact, very high authority has condemned it for lifeboats. Notwithstanding the many objections to the hydraulic system, the Royal National Lifeboat Institution adheres to it—why, it would be difficult to say—and hence gives occasion for critics of the Institution to complain that the money of the charitable is not laid out in the best and most efficient manner.

FIG. 1.—THORNYCROFT'S HYDRAULIC STEAM LIFEBOAT (Longitudinal Section).

FIG. 2.—THORNYCROFT'S HYDRAULIC STEAM LIFEBOAT (Deck Plan).

The vessel we are about to describe and illustrate is named the "Queen." She has been built by the eminent firm of Messrs. Thornycroft and Co., of Chiswick, whose name is sufficient guarantee to the public that materials and workmanship are of the highest possible quality. Messrs. Thornycroft are, however, not responsible for the design and system of propulsion, this emanating from the Royal National Lifeboat Institution. In view of our remarks this point must be carefully borne in mind. Indeed, we may go so far as to say that Messrs. Thornycroft favour the turbine propeller system of propulsion—a very different thing to the hydraulic system, and which they successfully designed and applied to a torpedo-boat some years ago.

The "Queen" is 55 feet long, beam at water-line, 13 feet 6 inches; beam on deck, 16 feet; depth moulded, 5 feet 6 inches. Load draught with all stores, 4 tons of coal, water tanks full, and 39 passengers and crew, 3 feet 3 inches, at which draught the displacement is 31 tons. The hull and framing are of the best mild steel. In the arrangement of the plating and framing everything has been done to obtain the greatest longitudinal strength. In view of the short steep seas through which the "Queen" will have to steam this is very necessary. Thus the frames are connected by diagonal braces, and the butts of the steel plating are double, and in some places treble riveted, even the longitudinal seams being double riveted. The hull is further tied and strengthened by numerous transverse bulkheads. The system of construction is, indeed, in some respects superior to that followed in the first-class torpedo catchers. The subdivision is very perfect, there being 18 separate compartments. Above the water-line the hull is sponsoned out increasing the beam on deck to 16 feet, including a belt of American elm carried right round, and which is 6 inches in depth. The general design and arrangement will be seen by the accompanying drawings. The upper extremities of the vessel are plated over so as to form turtle backs. Midships the deck is raised about a foot leaving a gangway at the sides, this gives good consist of a pair of compound surface condensing engines, having cylinders $8\frac{1}{2}$ inches by 14 inches diameter, by 12 inches stroke. As will be seen, the cylinders are placed on their sides, the L.P. below and inclined to each other; the piston rods are coupled direct to the pump spindle by connecting rods. Ordinary link reversing and valve gear is fitted. The weight of the impeller and any downward thrust is supported by a thrust bearing on the upper end of the pump spindle, to which is also attached a pair of feed and bilge pumps. The machinery is characterised by simplicity and strength; there is nothing complicated. All bearing surfaces are large and great attention has been paid to the lubrication. There is a somewhat lavish use made of gun-metal, the pump-chamber and eduction pipes being entirely of this metal. The discharge valves are actuated by rods and bevel gearing, which terminate in two hand-wheels placed outside and abaft the engine-room after bulkhead in the cockpit, immediately facing the coxswain, who thus can manipulate them and steer at the same time.

Steam is supplied from a Thornycroft water-tube boiler placed in a separate stokehole, and which can be made air and water tight. The boiler has $11\frac{1}{2}$ square feet of grate area, and 610 square feet of heating surface. The normal steam pressure is 140 lbs. per square inch. Under ordinary conditions natural draught will be used, but when steaming in heavy weather or when towing forced draught will be employed, a small steam fan in

FIG. 3.—THORNYCROFT'S HYDRAULIC STEAM LIFEBOAT (Hold Plan).

head room in the boiler and engine rooms. Abaft the engine room is a large cockpit, the deck of which being above the mean water-line, any water which may be shipped easily runs out through the self-freeing valves. The end compartments form buoyancy chambers. In the matters of stability and reserve buoyancy the "Queen" is all that can be desired and is practically unsinkable and uncapsizable.

The hydraulic system of propulsion may not be known to all our readers, and a few words describing it will not be out of place. About the centre of the boat, and close to the bottom, is a centrifugal pump, 2 feet 6 inches in diameter, placed on its side. An inlet scoop in the bottom of the boat is formed by recessing the hull, as shown in Fig. 1, so as to permit a free flow of water to the pump. To the pump casing on each side (*see* Fig. 3) are two eduction pipes fitted with valves and leading to the side of the vessel. By changing the direction of the discharge by means of these valves the water pumped in is discharged either ahead or astern on each side, and it is the reaction which forms the propulsive energy. Thus, to go ahead the water is discharged aft, and *vice versâ*. Similarly, by discharging aft on one side and discharging forward on the other the boat is turned. The ease of manipulation is, perhaps, the only really good feature of the hydraulic system. It is not necessary to reverse the engine, which always runs in one direction, and the valves are under the control of the coxswain. As will be seen, the spindle of pump is inclined so as to rake aft; this is for the purpose of permitting a more uninterrupted flow of water to the impeller. The engines driving this pump the engine-room easily maintaining 3 inches of water pressure. The fuel will be coal, there being a bunker capacity of four tons, but Holden's Liquid Fuel Burner has also been fitted. Believers as we are in petroleum, we nevertheless question the advisability of using liquid fuel for lifeboats. The reason for its employment is, we understand, the difficulty of firing with coal in a heavy seaway.

Feed water and oil are carried in tanks. The condenser is of brass and of the ordinary torpedo boat type, and is worked by air and circulating pumps, driven off the L.P. tail piston rod. There is also a steam motor driving a small warping capstan on the forecastle head.

In every respect, save that of the system of propulsion, the "Queen" is a beautiful vessel. The workmanship is of the best possible description, and all the details have been most carefully and ably worked out. Indeed, we cannot but ask, Is it really necessary to adopt such high-class and costly workmanship, when the same end could be attained by a cheaper system of construction?

The cost of this vessel cannot be less than £5,000, or £170 per ton of displacement, or, assuming her gross tonnage to be 21 tons, her cost is £250 per ton, a price absolutely unprecedented in all our experience even of palatial yachts for millionaires.

The "Queen" has not yet been under steam, but as she is an almost exact duplicate in every respect of the "President Van Heel," a lifeboat built by Messrs. Thornycroft for the Dutch Government, the results obtained in the latter will be approximately those that may be anticipated for the former. With a steam pressure of 140 lbs. the engines made 450 revs. per minute, giving a mean speed of 9·3 knots with 250 I.H.P., this gives the Admiralty coefficient of performance as being 32. In boats of this size it should be not less than 100, or in other words the efficiency of the steam hydraulic lifeboat is only about one-third of what it should be.

A POEM.

THE motor-car has a beauty of its own, "indefinite, unspeakable, and distinctly precious," as Bunthorne would say. That prosaic and practical paper, the *Hardware Trade Journal*, has recognised this, and publishes the following effusion, which, at any rate, is just as good as the best of the late Jubilee odes, not forgetting that of the Poet Laureate :—

My bicycle, my bicycle,
That standest idly by,
With silvered spokes, and plated hubs,
And gear extremely high,
No more shall I a-scorching bend
Above thy handle-bar,
Farewell, farewell, my bicycle,—
I've got a motor-car.

My bicycle, my bicycle,
By light of sun or lamp
We've covered many thousand miles,
We've sped through dry and damp;
But never more at dawn or eve
Shall I thy tyres inflate:
The times are changed, my bicycle,—
Thou art not up-to-date.

They tempted me, my bicycle,
My swift and silent steed,
With tales about a new machine
That goes at lightning speed;
And still serenely shall I go
Careering through the land,
Though thou art sold, my bicycle,
A bargain, second-hand.

My bicycle, my bicycle,
'Twill be no longer mine
To chase the flying pedals round,
No more I'll curve my spine;
But sitting idly at my ease,
I'll travel with the best,
For I shall turn a handle, and
The car will do the rest.

My bicycle, my bicycle,
It makes me smile with glee
To think how often we have made
The slow pedestrian flee.
With sudden sw-op we've come full [speed
Upon him from afar;
I'll do the same, my bicycle,
Aboard my motor-car.

Farewell, farewell, my bicycle;
Where flies the wayside dust
I'll haply chance to pass thee by
(Unless my boilers bust);
For wheresoever on the road
I journey, near or far,
It's my intent to make things hum
With my new motor-car.

ON A MOTOR-CAR.

Northampton to London—Experiences of Two Ladies.

THE first long-distance motor-car trip undertaken by ladies was accomplished last week by two women journalists—Mrs. Sutherland Morris, a writer, and Miss Amy Stewart, an artist, members of the staff of the *Gentlewoman*. Accompanied by Mr. Hawtrey, an expert on motor matters, they left Northampton at half-past twelve on a rather nicely-designed Daimler car, and, with a rest of an hour and a half at Dunstable for refreshments, reached the *Gentlewoman* offices in Arundel Street, Strand, at eight o'clock, having covered the 76 miles with only six hours' actual travelling.

Neither of the ladies had ridden upon a motor-car before, and both were extremely nervous at starting, Mrs. Sutherland Morris so much so that she made her will and left it at home with General Morris lest she might never return! But after they had travelled a little distance and discovered how easy the machine was to steer they became enthusiastic, and they reached town so fresh that it was evident they had thoroughly enjoyed their experience. At the offices they were welcomed back by Mr. J. T. Wood, the editor, and Mr. A. J. Warden, the manager, and also by a *Morning Leader* reporter. Our representative learned from Mrs. Sutherland Morris that down to Baker Street they came along splendidly. There had never been any appearance of a mishap, and the machinery had given no trouble. As their time made an average of nearly 13 miles an hour they must have sped along some whiles, for in Baker Street, Park Lane, Piccadilly, Charing Cross, and the Strand, they could get along but slowly, and had several stoppages in the dense traffic among the decorations.

INCIDENTS WERE NUMEROUS.

One of the first things they did was to break up a cricket match. As the car passed the whole of the players left the wicket and rushed to the hedge to watch them. Several drivers paid them much attention in the form of such requests for information as "Where have you left yer blooming horses ?" or by recommendations to them to "Hang on to your horses' tail, miss." At the hotel at Dunstable the ostler caused them much amusement by his surprise at receiving the customary tip, just as if he had "baited and brushed down." But one of the oddest incidents of all was caused by a man who had been sleeping on the grass beside the road. Suddenly waking up and catching sight of a smart carriage dashing along without horses, he began to gesticulate wildly, and cry out as if in danger, apparently being under the impression that he "had got 'em again."—*Morning Leader.*

THE DAIMLER MOTOR COMPANY'S "WAYZEGOOSE."

THE Daimler Motor Company, who are the first motor-car firm to inaugurate a periodical outing, have just held their first annual "wayzegoose," the place selected being Stratford-on-Avon. Over 180 of the employees took part in the excursion, which was conveyed to its destination by 20 vehicles, including three motor-cars of the Company's manufacture, whilst a neat launch, driven by a four H.P. Daimler motor, was available for trips on the river. The management of the affair was in the hands of a committee, consisting of Messrs. C. Bennyworth, C. Hatfield, R. Potter, W. Perkins, G. Needle, J. Simpson J. Blot, H. Needham, and P. J. Buddery, the latter making an excellent and most efficient hon. sec. and treasurer. After a substantial dinner a series of races were run off, the prizes in the evening being distributed by Mr. H. Sturmey, the acting chairman of the Company, after which he made a brief address to the men, calling their attention to the fact that they were engaged in the establishment of a new industry, and impressing upon all the fact that much of the future both of the industry and of the Company depended upon the good work done by each individual member of the staff. He assured them they had the finest factory and plant of machine tools for the manufacture of automotors not only in this country, but the world, and he hoped each one would make it a personal matter to see that his work was worthy of the machinery, the firm, and himself. Up to now, he told them, the Company had spent over £50,000 upon the fitting up of the factory, and the payment of their wages up to the point, and had as yet only received a few hundreds of it back, so they would see that up to the present they had had very much the best end of the stick. Of course, in the end the Company were hoping they, too, would get some of the good end, and he hoped all who were now enjoying the sweets would do their level best to the end that the Company got its share when the proper time came. If all worked with a will, and with one object in view, viz., the credit of the Company and its productions, he had no doubt that ere another wayzegoose came round there would be a very much larger number of workers to participate, and he assured the men it would not be the fault of the directors if there were not 500 men employed instead of 250 as now. After the usual vote of thanks, &c., the company returned home in every way satisfied with their day's enjoyment.

THE ROOTS OIL MOTOR AND MOTOR-CAR (LIMITED).

UNDER the above title a Company has been registered with a capital of £30,000 in £1 shares, for the purpose of manufacturing all kinds of carriages, cabs, omnibuses, and other vehicles for private and public traffic, propelled by oil-motors, and to purchase and carry on the business of Messrs. Roots and Venables, of 100, Westminster Bridge Road, London, and also deal with the valuable inventions of Mr. J. D. Roots and his firm, together with 12 patents for the United Kingdom for oil-engines, motors, &c., and 10 foreign patents connected therewith. According to the prospectus the Company also acquire all the licenses which have so far been granted under the Roots patents, lease and goodwill of the business and premises, plant, tools, machinery, &c., connected with the business now carried on by Messrs. Roots and Venables. Amongst those who are already manufacturing, or hold licenses to manufacture from the firm, are Messrs. Vosper and Co., of Portsmouth; Clark's Crank and Forge Company (Limited), of Lincoln; Bryan, Donkin, and Co. (Limited), of Bermondsey, S.E.; and amongst those who have applied for licenses to manufacture may be mentioned Mr. Walter, of the *Times;* the Central Engineering Works (Limited), of York; Mr. James Davis, Queen Street Iron Foundry, Wednesbury; and Messrs. Michael Tod and Son, of Devon Engine Works, Dunfermline. The estimated profits are moderately put down at £11,200 gross, giving a nett income of £9,210. Messrs. Roots and Venables' work has now stood the test of long trials, and they are at the present moment contractors to Her Majesty's Government, and have received numerous orders from the Indian and Colonial Governments, London, Brighton, and South Coast Railway Company, Liverpool Corporation Waterworks, &c. It is claimed that the Roots patents are master or pioneer patents for the system of vaporisation and feeding of oil, the essential points in an oil-motor, and the vendors believe that theirs is the only practical vehicle motor which runs with ordinary petroleum or paraffin. A very important point is that Messrs. Roots and Venables are in communication with the North Metropolitan Tramways Company regarding the fitting of a motor to their tramcars, which, if successful, would be fitted to all their tramcars.

The prospectus sets out very fully all the patents, trade marks, &c., which the new Company acquires, and a strong certificate as to the validity of the Roots patents is given by Mr. Lewis Edmunds, Q.C. The Board of Directors consists of practical men, who have earned an enviable notoriety for good business methods, and applicants for shares should note that no promotion money has or will be paid, and that there will be £12,500 available for working capital. The list of applications for the present issue (which is at 1*s.* per share premium) will open on Tuesday, the 20th July, and will close on or before Friday, 23rd July. Prospectuses can be obtained by addressing the Secretary, at the offices of the Company, 100, Westminster Bridge Road, London. Fuller particulars will be found in our advertisement columns.

The Paris-Dieppe Automotor Race.—This event, which is attracting considerable attention, comes off on the 24th inst., too late for detailed notice in our present number. It is being conducted under the auspices of the Automobile Club of France, which is equivalent to saying that the most distinguished French engineers are taking part in it. The municipality of Dieppe is doing everything to ensure success, and the proceedings will be further enlivened by a banquet and ball. Special trains will convey visitors from distant points. There will be four classes of vehicles—motor-cycles, weighing less than 200 kilos, automotor cars for two persons, automotor cars for more than two persons, and automotor cars carrying not less than six persons. The conditions of the contest seem to us to be very fair and equable, while the prizes are numerous, ranging from gold medals and 1,000 francs to 250 francs and objets d'art.

NEW INVENTIONS.

Claiming particularly to apply directly or indirectly to Motor Vehicles, &c.

Compiled for "THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL" by HERBERT HADDAN and Co., Registered Patent Agents, of 18, Buckingham Street, Strand, W.C., London.

*** *At the request of a number of subscribers we are pleased to announce that for the future we have arranged to more thoroughly cover the field of completed Patents referring to the Motor-Car Industry, by reproducing the latest Specifications and Diagrams.*

Patents Applied For.

Abbreviations: Impts., Improvements in; Relg., Relating to.

1897.			
June 1.	13,476.	G. SCATTERGOOD.	Chains for motor-cars and cycles.
„ 1.	13,590.	F. H. GRIFFITHS.	Impts. manufacture of handles.
„ 2.	13,610.	H. H. LAKE (La Société Miari, Guisti, and Co.).	Motor-car for propelling vehicles.
„ 3.	13,734.	W. H. LAKE (La Société Miari, Guisti, and Co.).	Explosion engine for propulsion of vehicles.
„ 4.	13,791.	D. CLARK.	Impts. driving gear.
„ 8.	13,942.	SIMPSON, BODMAN, and SIMPSON.	Steam generators for motor vehicles.
„ 8.	13,998.	G. E. WHITNEY.	Impts. gear cases.
„ 8.	14,039.	W. PATTERSON.	Impts. trolley and motor-car fenders.
„ 9.	14,055.	G. STOESSER.	Impts. in driving gear.
„ 11.	14,204.	J. GRAY.	Securing tyre inflators to motor-cars, &c.
„ 11.	14,255.	AD. COMMON.	Impts. relg. power-driven vehicles.
„ 12.	14,300.	LORD KER and J. H. GOWER.	Locking devices. (H. M. Hart, U.S.A.)
„ 15.	14,520.	H. H. LEIGH.	Impts. electric and other autocars.
„ 17.	14,730.	F. H. SEDDON.	Speed, time and distance indicators.
„ 19.	14,873.	T. FITZPATRICK.	Seats for road vehicles, &c.
„ 19.	14,910.	H. W. HEADLAND.	Impts. electric motors.
„ 21.	14,963.	E. HOEGERSTAAT.	Impts. trolleys for electrically-propelled cars.
„ 26.	15,337.	TURRELL and THE COVENTRY MOTOR (LTD.).	Speed controlling governors for motors.
„ 26.	15,341.	E. WILLIAMS.	Impts. motors for road vehicles.
„ 26.	15,360.	D. MARTYN.	Locomotor-car.
„ 28.	15,403.	J. EDE.	Internal combustion engine.
„ 29.	15,450.	E. TAYLOR.	Impts. driving chains.
„ 29.	15,471.	A. P. DODGE.	Impts. steam motive power engines.
„ 30.	15,600.	J. HERBERT.	Impts. driving mechanism.
„ 30.	15,626.	J. CLEMENTS.	Signalling apparatus for motor-cars, &c.

Specifications Published.

9,151. Motor-Driven Vehicles. John Bradley Carse, 64 and 66, Wabash Avenue, Chicago, Illinois. April 30th, 1896.

Relates to the construction of the engine cylinders, two of which are made out of one piece of cylindrical tubing by splitting said tubing longitudinally for a suitable distance at the centre, and then opening out the split part until it is more or less flat. An opening is cut in the flattened part of the tubing and in it is a suitable bearing to receive the crank-shaft. The two ends of the tubing which remain intact form the cylinders proper, which are rigidly connected by the flattened part of the tubing, which flattened part may also serve conveniently for attaching the cylinders to the vehicle frame. The two connecting-rods of these cylinders work on the same crank-pin.

As applied to a tramcar or similar vehicle, four cylinders are formed in two pairs in the manner above described, and attached to the under frame of the vehicle between the axles and coupled to the same crank shaft, which is arranged centrally between the cylinders. From this shaft motion is imparted to either or both of the axles of the vehicle by chain gearing for example. Suitable clutches are provided for connecting and disconnecting the engine from the axles of the vehicle, so that it is not necessary to stop the engine in order to stop the vehicle. Also two speed gears, one for high speeds and one for slow speeds. One of these may be conveniently connected to the front axle and the other to the rear axle of the vehicle.

Another improvement relates to the connecting rods arranged to drive on to the same crank-pin. The outer end of one of the said rods is provided with a long bush that projects laterally for a sufficient distance to receive and form a bearing for the outer end of the other connecting rod. In this way the wear on the crank-pin is evenly distributed.

6,035. Gas and Oil Engines. Michael Carmichael Dunsmore, 4, Glebe Crescent, Stirling. March 8th, 1897.

This invention has reference to and comprises improvements in the construction or arrangement and combination of the parts of gas-engines, and in the construction or arrangement of the firing appliances, some of the essentials of which improvements are also applicable to oil-engines of the same class, whereby a motor stroke will be delivered at every revolution of the crank, with a rapid motion of the piston at the point of greatest expansion and a steady working of the engine be effected.

Figs. 1 and 2 are respectively a sectional elevation, and a plan of a horizontal gas-engine constructed in accordance with these improvements without showing the firing appliance.

Referring to these figures:—The cylinder, A, is formed as shown with the front part, A^1, of a less diameter and having the ordinary jacketting space all round fitted with inlet, A^3, and outlet, A^5, shown in the drawings for circulation of water therein to keep it cool. As shown the piston, B, is close ended and is formed with a trunk, B^1, of a diameter to fit the reduced front part, A^1, of cylinder, A, and fitted with packing rings, B^2, within which is joined the connecting rod, E, to the crank, E^1, A^4 being an orifice for lubricating the trunk.

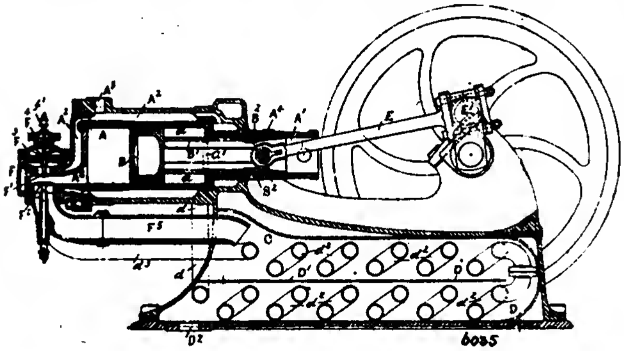
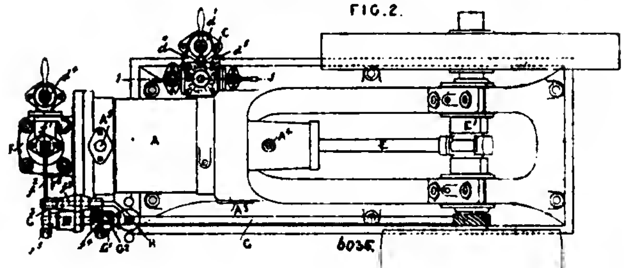


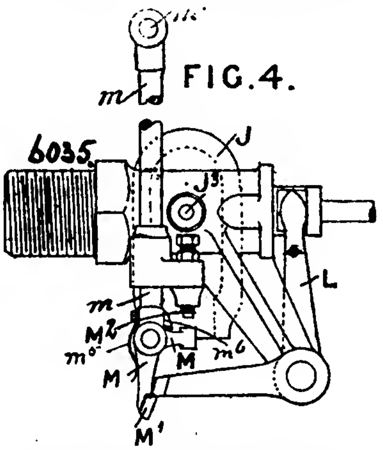
FIG. 2.



By this construction an annular space, a, is formed around the trunk, B^1, into which mixed air and gas is drawn during the instroke of the piston from the duplex inlet valve, C, through the port indicated at a^1 to be compressed during the outstroke of the piston. During the instroke the piston, B, the suction within the annular space, a, causes the valve to rise so as to allow gas from the gas-pipe fitted with a stop-cock or valve to pass through ports, and air from openings in calculated proportions to be drawn within the annular compressing space, a, through a passage and port. On the outstroke of the piston the mixture is compressed, and passing back by the port and passage shuts the valve and raising another valve passes to the storing chamber by the pipe, d. As danger of overpressure within the storing chamber, D, might arise, a check or governing piston valve is provided, regulated by a spring or a corrugated diaphragm may be used instead, which moves when the pressure rises to a predetermined amount and by its spindle acting on one arm of a bell crank lever causes its other arm to press upon a link and so prevent the valve from rising to admit gas and air. Instead of being allowed to work automatically the valve may be opened and closed by a lever placed transversely under the cylinder, A, and operated by a cam on the shaft, G, acting on one end, the other end being connected to the valve spindle by a link. The gas and air passes from the annular compressing space, a, by the pipe, d, fitted with a two-way cock or valve, d^1, to the storing chamber, D, which is preferably as shown formed in the base of the engine frame divided by a partition, D^1, and fitted with an undulating series of tubes, d^2, through which the compressed mixed gases circulate on their way to the cylinder by the continuation of the undulating tubes, d^2, and this pipe is provided with a non-return valve and stop-cock. Though this storage chamber is shown formed in the base of the engine it may be located otherwise and may have more than one series of tubes, or compartments, or other arrangements may be used instead of tubes, or where it is not desired to use the exhaust for heating a single storing vessel may be used.

A valve chest, F, is fitted on the cylinder and within which work the gas inlet valve, F^1, as shown, or which may be double ported, and the exhaust valve, F^2, actuated as to be described from the shaft, G, which receives its motion direct from the crank shaft of engine and makes one revolution for each revolution of same. The duration of opening of the valve, F^1, being regulated by the breadth of the kicker, G^2, at the point brought into contact with the antifriction roller on the lever, f^4, the sleeve, G^1, being acted on by the governor, H, by means of any ordinary forked lever arrangement not shown in the drawings. The end of the sleeve is left plain so that in the event of the load going suddenly off the engine the sleeve would be moved so far that the lever roller would run freely on this plain part and the valve, F^1, would remain shut. A piston valve, F^4, of larger area than the valve, F^1, or it might be a corrugated diaphragm, is fitted on the valve spindle, f^1, to close the valve, F^1, when the pressure of the lever, f^3, is removed. A flap valve may be employed either in front or behind the concentric rings to prevent the back flow of burnt gases,

FIG. 4.



or the concentric rings if made in two divisions, the lower one loose on the spindle, may act as a valve, one set of rings being made to coincide with the openings between the others so that when forced together by an explosion the passage of gas would be stopped.

Instead of concentric rings a series of flat bars packed or bolted together and resting in a square seat within the valve chest and kept at a small distance apart by projections may be used, or a series of flat rings may be used packed one above the other and separated by small pins or projections to allow the mixed gases to pass through from the outer annular space to the interior of the valve chest above the valve, F^1, otherwise the gas may be led to the interior of the rings, and through them to the exterior and down through the valve, which may be double ported.

The spent gases or exhaust pass from the cylinder by the port, A^6, through the valve, F^2, and pipe, F^5, to the interior of the storing chamber, D, to heat the mixed gases in the pipes, d^2, finally passing out at D^2. The exhaust valve, F^2, is opened at the proper time by the forked end of the bell crank lever, f^5, pressing the valve spindle upwards when its other end, furnished with an antifriction roller, is acted upon by the cam, G^3, on the shaft, G. When so desired the exhaust pipe may have an outlet to atmosphere fitted with stop cock or valve, so that the whole or part of the exhaust may be discharged without entering the storing chamber to heat the gases. If desired air only may be compressed and stored, and a separate gas pump be used to supply compressed gas to mix with compressed and heated air behind the piston.

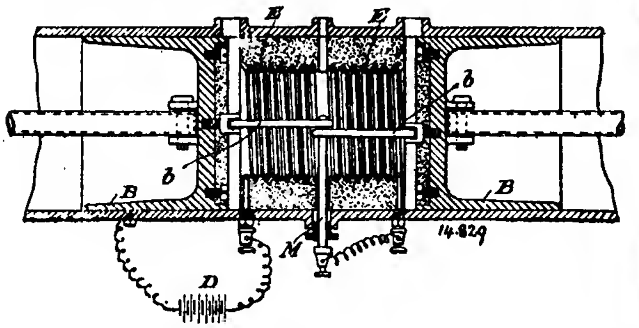
Fig. 4 is an elevation of a gas igniting appliance which may be used with the engine; this igniting appliance may be screwed into the valve chest, F. In this arrangement the ignitor, J, is formed as a close chamber and is supplied through the pipe, J¹, fitted with a stop cock with the compressed mixture of gas and air from the storage tubes, d^2, which passes into the interior through a fine orifice, a small ball acting as a valve to prevent the gases at explosion passing down the pipe, J¹. A plunger, formed at its inner end as a valve, working gas tight within a cylinder formed on side of the igniting chamber, J, when moved outwards by the action of the forked end of the bell crank lever, L, on the spindle against the power of the spring, opens the communication between the cylinder and the igniting flame by ports, while at the same moment communication with the atmosphere by the port, J³, is closed. Within the igniter, J, mantles of wire gauze may be fitted to retain heat sufficient to relight the gas jet after such explosion if necessary, or a small jet may be kept burning at mouth of port, J³. The movement of the plunger is effected by means of the angled projection, M¹, on the lower arm of the bell crank lever, M, jointed to the end of the rod, m, and fitted with reaction spring, m^5, and stop, m^6. This rod is jointed to the lever, f^2, and on this lever being released to allow the gas valve, F¹, Fig. 1, to close it draws up the rod, m, and bell crank lever, M, which engages with the bell crank lever, L, and moves the plunger outwards. When the arm of the lever, M, comes against the stop, M², it is oscillated to release the lever, L, when the plunger is driven inwards by the force of a spring to close communication with the cylinder.

14,829. Vaporising Arrangements for Oil or Inflammable Vapour Engines. Walter Rowbotham, 27, Vittoria Street, Birmingham. July 4th, 1896.

This invention relates to oil or inflammable vapour engines in which the engine is started when cold by means of a vaporiser, which vaporiser is electrically heated as described in the Specification of Letters Patent No. 22,793 of 1895.

In the use of such vaporisers it is found that if a current sufficient to heat when the engine is cold is kept on during the succeeding explosion, then the electrically-heated body is liable to become incandescent, and the oil, instead of being vaporised, is ignited at once, and even in some cases the wire may become so highly heated as to fuse.

The object of my present invention is to so regulate the electrical current applied to the vaporisers as to supply sufficient heat for the required purpose when the engine is cold, while automatically varying to reduce the current passed when the engine becomes hot.



Referring to the figure, to the ends of the pistons, B, B, are attached projecting fingers or rods, b, b, which rods, at or about the end of each piston's stroke (as in the position shown in the figure), make contact with a centrally-situated insulated rod, M, such contact completing the circuit through the battery, D (or other source of electrical supply), and the wires, E, E, of the vaporising body, and, by heating up the wires and surfaces, puts that body in a state fit for vaporising. When the engine starts, the movement of the pistons, B, B, make and break contact with the insulated rod, M, at each reciprocation, and thus as the speed increases the time during which the current flows through the vaporising wires, E, E, diminishes. As the speed of the engine increases the current passing thus decreases, and the heat added by the explosions succeeding each other takes the place of the heat at first generated by a powerful electric current. By this device the temperature of the vaporiser wires or vaporisor body is kept sufficiently low to avoid ignition of the oil when it is injected on the vaporiser, and also, of course, sufficiently low to secure the wires from any danger of fusion.

When starting the engine, the maximum current is needed to electrically heat the vaporising body, but the said current is in no case to be strong enough to render the vaporising body or any part of it incandescent.

It is obvious that after the first few explosions the heat generated will be such that if the current is not reduced the electrical vaporising body will become incandescent, and cause the hydrocarbon or spirit to fire before it is vaporised.

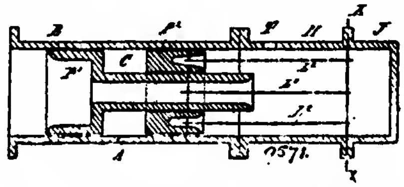
A modified form is also described.

9,571. Steam, Gas, and Other Engines. Count Charles Francois Gaston Louis Prosper de Chasseloup-Laubat, 51, Avenue Kléber, Paris, France. Date claimed October 31st, 1895. Date of Application (in United Kingdom), May 5th, 1896.

This invention relates to an engine or motor in which on the one hand the stresses and reactions upon the frame and the driving shaft, and on the other hand the inertia of the moving parts are balanced.

The improved engine or motor comprises:—

A cylinder, B, open at its two ends and containing two pistons, P¹, P²; one of which, P², is of annular shape and slides between the cylinder, B, and the sleeve or trunk carried by the other piston, P¹.



The pressure is exerted in the chamber or space, C, between the two pistons, P¹, P², which are thus driven in opposite directions.

For this purpose an opening, A, which serves both for the admission and for the exhaust, is provided in that part of the cylinder, B, which corresponds to the chamber, C.

The piston, P¹, with sleeve carries one connecting rod, L¹, and the annular piston, P², carries two connecting rods, L_2, L_3, coupled to cranks arranged at opposite centres to the crank of the other piston. The connecting rods are enclosed in a cylindrical box, H, which is fixed to the extremity of the cylinder, B, and closed at its free extremity by the bottom, J.

This box, H, is provided with an orifice, T, placing the interior of the box in constant communication with the atmosphere.

The total weights of each system (piston and connecting rods) are the same. It is evident that, under these conditions, the cylinder and frame do not undergo any reaction.

The bearings of the crank shaft are subject to a slight reaction only resulting from the non-parallelism of the connecting rods.

A modification is also described and illustrated.

11,058. Motor-cars, Autocars, &c. Ernest John Clubbe and Alfred William Southey, 16, Elm Street, Gray's Inn Road, London, and The Electric Motive Power Company (Limited), of 3, Salters' Hall Court, Cannon Street, London. May 21st, 1896.

This invention has reference to motor-cars or automotors and launches, and it consists in the combination in such cars or motors or launches of an oil or other internal combustion engine, a dynamo electric machine which acts alternatively as a motor and as a generator of electricity, a set of secondary or storage cells, and a switch, or switches preferably, actuated automatically by a governor or governors. The secondary or storage cells, which have been initially charged, are adapted to supply a current for the ignition of the explosive charge, and also for vaporising the oil where such is used, and also to supply the current to start the dynamo machine as a motor, together with the oil or other internal combustion engine. The carriage may be started simultaneously with the engine, or as soon as the latter has attained a certain speed. When the engine begins to run at full speed, a centrifugal or other suitable governor actuates a reversing switch, so that the dynamo machine, instead of acting as a motor, generates a current which recharges the storage cells. The lever used to start the carriage operates, in the first instance, to switch the current from the storage cells to the motor, the current being subsequently automatically changed in direction, so that the cells may be recharged. The same lever may be used, if required, to cut the dynamo machine out of circuit altogether.

The dynamo machine is geared with the shaft of the engine by spur or other gearing which allows for the difference in speed of the dynamo machine and the engine.

12,446. Improvements in Explosion-engines. James Carter and others, Billingshurst, Sussex. March 6th, 1897.

This invention relates to improvements in the explosion engine for which Letters Patent No. 9,889 of 1894 were granted.

According to the present improvements, instead of passing the oil inlet tube directly into the vaporiser as in the former patent, the oil is delivered in quantities sufficient for one explosion only into the open funnel or cup-shaped end of a tube in communication with the vaporiser and having a suitable valve. The petroleum is then sucked from the cup into the vaporiser and thence into the combustion chamber during the out-stroke or suction of the piston.

Instead of the valve regulating the admission of air to the vapour before its entry into the combustion chamber, the air inlet pipe is provided with a plate having a central hole, the diameter of which is made of the required size.

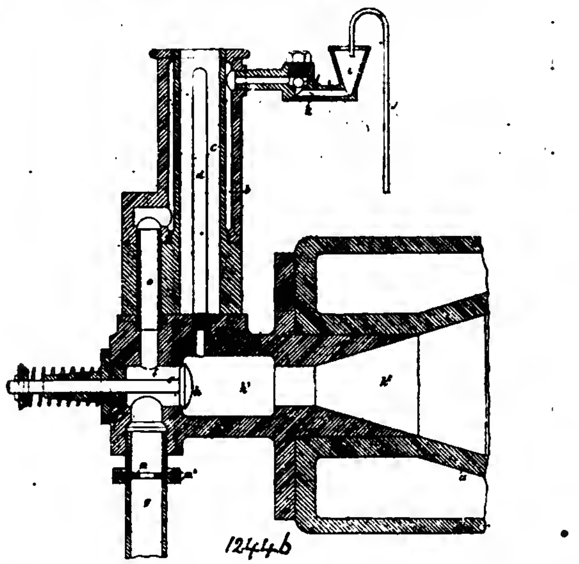
There is also a separate external combustion chamber in communication with the cylinder portion of the combustion chamber instead of the annular chamber through which the vaporiser passes, as described in the specification of the former patent.

a is the engine cylinder, *b* is the vaporising chamber which is formed around the tube, *c*, which serves as the chimney of the heating lamp as described in the said former patent, and *d* is the igniter arranged within the said tube.

e is the passage through which the vapour passes from the vaporiser to the chamber, *f*, and *g* is the air inlet pipe which also extends into the chamber, so that the air and vapour mix together as they flow past the valve, *h*, on the suction stroke of the engine, into the combustion chamber, h^1, which is the separate external combustion chamber hereinbefore referred to, h^2 being the cylinder portion of the combustion chamber.

i is the cup into which the oil is injected by the pump through a pipe, *j*, the cup communicating with the vaporising space, *b*, through the passage, *k*, in which a valve, *l*, is seated in such a manner that it will open automatically on the suction stroke of the engine to allow the oil injected into the cup to be drawn into the vaporising chamber and then again close on its seat.

m is the plate in the form of a disc, having a central hole arranged in the air inlet pipe, *g*, and serving to regulate the quantity of air


12446

drawn into the combustion chamber on the suction stroke, the plate being arranged between two flanges, m^1, on the pipe, so that it can be readily removed to alter the size of the hole or to introduce a plate having a larger or smaller hole, as required.

The List of Applications will open Tuesday, the 20th July, 1897, and will close on or before Friday, the 23rd July, 1897.

Messrs. Roots & Venables' Car was the only Petroleum Motor Car, of those collected for the *Engineer* Competition on June 1st, that did the run to Birmingham from the Crystal Palace, an account of which run is given in the *Engineer* of June 18th, 1897.

The *Times* of December 7th, 1896, speaking of previous motor carriages, says: . . . . "All these carriages used benzoline as fuel . . . . In England there is already in use a carriage of 'Victoria' form driven by ordinary lighting oil. It is the first carriage yet made which undoubtedly accomplishes this object, and is the invention of Messrs. Roots & Venables."

The Vendors believe that theirs is the only practicable vehicle motor which runs with Petroleum oil or ordinary Paraffin—a safe fuel—and that other practicable so-called oil motor vehicles use benzoline spirit—a dangerous fuel.

THE ROOTS OIL MOTOR & MOTOR CAR, LTD.

(ROOTS PATENTS.) **(Parent Syndicate)**

Incorporated under the Companies Acts, 1862 *to* 1893.

CAPITAL, £30,000, IN £1 SHARES,

OF WHICH £12,500 WILL BE AVAILABLE TO PROVIDE WORKING CAPITAL.

Payable, 5/- on Application; 6/- (including premium) on Allotment; and the balance (10/-) as and when required.

THE PRESENT ISSUE IS AT A PREMIUM OF 1/- PER SHARE.

No promotion money has or will be paid, and the Capital is not underwritten.

DIRECTORS—ALEXANDER McDONNELL, Esq., M.I.C.E. (formerly President, I.C.E., of Ireland; Locomotive Superintendent to North Eastern Railway and to the Great Southern and Western Railway of Ireland), The Rydens, Walton-on-Thames.
FREDERICK DAVID CHARLES SHAW-KENNEDY, Esq., Dyroch House, Kirkmichael, Ayrshire.
*JAMES D. ROOTS (Messrs. Roots and Venables), 100, Westminster Bridge Road, London, *Managing Director.*
*C. E. VENABLES (Messrs. Roots and Venables), 100, Westminster Bridge Road, London.
* Will join the Board after Allotment.

BANKERS—The NATIONAL PROVINCIAL BANK OF ENGLAND, Ltd., Lincoln's Inn Branch, Carey Street, W.C.

SOLICITORS—Messrs. DIXON, WELD & DIXONS, 1, Lancaster Place, Strand.

AUDITORS—Messrs. JACKSON, PIXLEY, BROWNING, HUSEY & Co., 58, Coleman Street, E.C.

REGISTERED OFFICES—100, Westminster Bridge Road, London.

ABRIDGED PROSPECTUS.

This Syndicate has been formed for manufacturing all kinds of Carriages, Cabs, Omnibuses, and other vehicles for private and public traffic propelled by oil motors, and to purchase and carry on the business of Messrs. Roots & Venables, of 100, Westminster Bridge Road, London, and also deal with the valuable inventions of Mr. J. D. Roots and his firm the aforesaid Messrs. Roots & Venables, together with the twelve patents for the United Kingdom for Oil Engines, Oil Motors, and for oil-motor vehicles of all kinds, and ten foreign patents in connection therewith.

To acquire the patent rights and business connected with the sale by Messrs. Roots & Venables of all oil, fixed and stationary engines, locomotive and portable engines, in addition to oil motors for all kinds of road vehicles.

To acquire all the Licences which have been granted to manufacture under the Roots' Patents.

To acquire the Lease and Goodwill of the business and premises at 100, Westminster Bridge Road, the plant, tools, machinery, engines, motors, and vehicles in stock and the drawings, patterns, etc., connected with the business now carried on by them as Engineers.

The following Licences have been granted by Mr. Roots:—

To Messrs. Vosper & Co., of Portsmouth, for marine and launch and boat engines, under which they pay a minimum royalty of £125 per annum, or £2 per indicated horse-power of each engine sold.

To the Clarke's Crank and Forge Company, Limited, of Lincoln, for portable and locomotive engines, the minimum royalty being £125 per annum, or £2 per indicated horse-power of each engine sold.

Messrs. Bryan Donkin & Co., Limited, of Bermondsey, S.E. (the well-known Engineers), have taken a licence for fixed or stationary engines, under which they pay a royalty of 10 per cent. on all Engines they sell. The Vendors also have the right to sell, and the Licencees are under contract to supply all Engines required on most advantageous terms.

There has been a total of nearly 300 Roots Oil Engines and Motors sold, and they are doing work in most parts of the world.

The Estimated Profits are £11,200, *see* Prospectus.

The Estimated Outgoings are £1,990, which leaves an Income to pay dividend of £9,210.

The Vendors have had many hundreds of enquiries for motor vehicles, not only from Great Britain, but from most parts of the world. The Vendors are Contractors to H.M. Government.

The Vendors have had applications from other English firms and from France for a Licence to make vehicle motors, but have now refused to treat or grant any further Licences at present.

The following are those who have applied for Licences to manufacture Engines or Motors under the Roots Patents:—Mr. Walter, of *The Times*, Queen Victoria Street, E.C.; The Central Engineering Works, Limited, York; Mr. James Davies, Queen Street Iron Foundry, Wednesbury; Messrs. Michael Tod & Sons, Devon Engine Works Dunfermline.

The Roots Engines have already, among others, been supplied to the Indian and Colonial Government, and also to the L. B. & S. C. Railway Company, the Liverpool Corporation Water Works, and the Sultan of Zanzibar. They are also in negotiation with the South Australian Government for small oil locomotives.

Engineers have on two occasions apologised for infringement of the Roots Patents, and it is fully believed that the Roots Patents are master or pioneer patents for the system of vaporisation and feeding of oil, the *essential points* in an oil motor.

The Vendors are in communication with the North Metropolitan Tramways Company regarding the fitting of a Motor to one of their tram cars, which, if successful, would be fitted to all their tram cars.

For light Railways the Vendors believe no other oil engine in the market can compete with theirs in the chief points required in a locomotive for this purpose, viz. (1) Lightness and small size for the power developed; (2) Completeness of combustion and freedom from smoke; (3) Complete automacity.

The Vendors believe they possess the only practical Oil Motor for vehicles in existence. The safety of the oil as fuel and the danger of the spirit will be obvious to everyone. Messrs. Roots and Venables therefore believe that for some time to come the Syndicate will have the monopoly, or almost the monopoly, of petroleum motor carriages, for it is believed that restrictions must presently be placed upon the use of benzoline spirit as to limit its use. Messrs. Roots and Venables, in short, claim that their Motor is the only safe Motor, and the only one at present in the market which will survive the test of daily and public use.

The running costs of the different kinds of Road Vehicle Motors compare as follows:—**The Roots Oil Motor, 1; Benzoline Spirit Motor, 3; Steam, 3½ to 4; Gasoline, 4 to 4; Electricity, 5 to ·.**

A Motor is in progress for Bicycles and Tricycles which it is believed will have almost a monopoly for the before-mentioned reasons, it being the only safe Motor. Carrier Cycles, for trade purposes, offer a large opening for the application of this Motor.

The following Trade Marks (with designs), belonging to Messrs. Roots & Venables, also become the property of the Syndicate:—"Petrocar" and "Petrocycle."

The Patents for the United Kingdom are numbered as follows:—

Improvements in Petroleum Engines	15,682	Nov. 3, 1888	Improvements in Internal Combustion Engines	17,308	Sept. 11, 1894
Ditto ditto	19,275	Nov. 7, 1891	Ditto ditto	2,138	Jan. 30, 1896
Improvements in Internal Combustion Engines for Vehicles	23,786	Dec. 24, 1892	Improvements in Self-propelling Carriages	9,677	May 7, 1896
Improvements in Internal Combustion Engines	22,181	Nov. 20, 1893	Improvements in Internal Combustion Engines	10,829	May 19, 1895
Ditto ditto	23,571	Dec. 7, 1893	Improvements in Internal Combustion Engines for Vehicles	14,756	July 3, 1896
Improvements in Oil Engines	7,538	April 16, 1894	Improvements in Petrocars or Motor Cars	17,270	Aug. 5, 1896

Several Provisional Specifications have also been filed.

Foreign Patents have been obtained or are in course of being obtained in the following countries:—
France. Belgium. Italy. Spain. Canada. India. Austria Hungary. United States. Russia.

Lease dated August 8th, 1895, of the premises 100, Westminster Bridge Road, not yet received.

The purchase price agreed to be paid to the Vendors for the acquirement of the above rights has been fixed at £17,500, payable as to £5,000 in cash, £5,000 in cash or fully-paid Shares, at the option of the Directors, and the balance of £7,500 in fully-paid Shares in the Company.

Re ROOTS' PATENTS.

Copy of Opinion by Lewis Edmunds, Q.C.

I have considered the Specifications of the following Patents of James Roots, viz.:—
No. 15,882 of the year 1888; No. 19,275, 1881; No. 23,786, 1892; No. 22,181, 1893; No. 23,571, 1893; No. 7,538, 1894; No. 17,306, 1894.
and I have also considered the Specifications of the prior patents set forth in the case.

I find that the inventions of Roots are adequately described and claimed, that they are useful and proper subject matter for the grant of Letters Patent, and that no one of the said Patents of Roots is anticipated by any of the said prior patents.

Temple, 11 *June*, 1896. (Signed) Lewis Edmunds.

A Contract has been entered into between the Vendors of the one part and John Lever of the other part on behalf of the Syndicate, dated 14th July, 1897.

There are numerous trade contracts relating to purchases of material, etc., and also contracts for orders, etc. Other agreements and arrangements have been and may be entered into with third parties as to the formation of the Company, and the Subscription of its Capital, to none of which the Company is a party. Applicants for Shares will be deemed to have had notice of the contents of all such agreements and contracts, and to have waived their right, if any, to particulars thereof, whether under Section 38 of the Companies Act, 1867, or otherwise.

Prospectuses and Forms of Application may be obtained from the Bankers, Solicitors, and at the Offices of the Company.

RAPIDITY. EFFICIENCY. ECONOMY.

"The greatest Labour-saving Invention ever offered to the Trade."

They will set any Section of Hoop, or Patent Channel Iron, on any sort or description of Wheel COLD, by Hydraulic pressure.

WEST'S PATENT TYRE SETTERS.

SAVE YOUR TIME. IMPROVE YOUR WHEELS.

Make a BETTER AND MORE LASTING job than any other known process AT LESS THAN ONE-THIRD THE COST.

These machines are now in use throughout—

ENGLAND, THE CONTINENT OF EUROPE, THE UNITED STATES OF AMERICA, SOUTH AFRICA, AND THE AUSTRALIAN COLONIES.

Wherever they are used they give universal satisfaction.

FOR FULL PARTICULARS APPLY—

WEST'S PATENT POWER TYRE SETTER SYNDICATE,

23, College Hill, Cannon Street, E.C., or The Works, 140, Thornton Road, Bradford.

THE "IC ." TYRE.

PERFECTION RUBBER TYRE.
FOR LIGHT AND HEAVY VEHICLES.
NOT TO ROLL OUT.

This is no experiment, see opposite.

Over 36,000 pairs in use in the United States.

We compress the rubber so that, if it is cut, it closes up and no material injury is inflicted, and consequently wears smooth

An examination of the Principle of our Tyre convinces you of its superiority over all others.

SOLE MANUFACTURERS FOR THE UNITED KINGDOM:

J. W. & T. CONNOLLY, 65 & 67, WHARFDALE ROAD, & ALBION WORKS, KING'S CROSS, LONDON, N.

2 G

THE LAMINA ACCUMULATOR.

BRAM

. FOR .

Horseless

Carriages

OLIVER STREET WORKS, BIRMINGHAM.

AWARDED
SILVER MEDAL
AT
HORSE AND
HORSELESS
CARRIAGE AND
ROADS
LOCOMOTION
EXHIBITION,
Crystal Palace, 1896.

SIMPSON, STRICKLAND & Co., Limited,
DARTMOUTH AND TEDDINGTON.

Steam Machinery for Vans, Drays and Passenger Carriages.

STRICKLAND'S PATENT WHEELS FOR MOTOR CARS.

Machinery built to Owner's designs or from our Standard Patterns.

WRITE FOR LIST. SIMPSON, STRICKLAND & Co., Ltd.

PETROL.

CARLESS, CAPEL & LEONARD, of Hope Chemical Works, and Pharos Works, Hackney Wick, London, N.E., specially distil Petrol, the Spirit best adapted for Motors, Motor Carriages, Launches, etc., etc.

Maximum of efficiency and perfect combustion; therefore great economy, and no deposit in cylinders.

NO SMELL. NO DIRT. NO TROUBLE.

CARLESS, CAPEL & LEONARD have supplied the above for the Daimler Motors for over five years, and hold the highest testimonials.

THEY ALSO SUPPLY LUBRICATING OILS AND GREASES.

SAMPLES AND PRICES ON APPLICATION.

TELEGRAMS "CARLESS, HACKNEY WICK."

PETROL.

THE AUTOMOTOR
AND
HORSELESS VEHICLE JOURNAL

A RECORD AND REVIEW OF APPLIED AUTOMATIC LOCOMOTION.

Circulates amongst Makers and Users of Motor-Cars, Cycles, etc., in the United Kingdom, the Colonies and the Continent.

VOL. I. No. 11. AUGUST 18TH, 1897. PRICE SIXPENCE.

CONTENTS.

FRENCH MOTOR-CAR COMPETITIONS.

The Paris-Dieppe Race.

IN Great Britain the Press has with few exceptions adopted a distinctly unfriendly attitude towards automobilism, with the result that the industry of motor-car manufacture has been much hampered in its natural development. Even in those few cases where some attempt has been made to encourage the use of motor-cars, as in that unhappy *Engineer* competition, the effort has failed because the conditions demanded a degree of excellence attained in no existing automotor, whether this be a railway express engine or a light-oil tricycle. The British Press has indeed been woefully misinformed and has in its turn misled the public not a little over the automotor question. In France the Press has taken a much broader and more liberal view. French engineers and writers are quite aware of the defects of the various types of road motors and quite understand the limiting conditions of their employment. Instead of crying aloud on the housetops: "There is no really satisfactory motor," and abandoning the attempt to make one, they have very sensibly grasped the fact that, notwithstanding various defects in design and working, motor-cars can in nearly all cases economically replace horses. The French have, indeed, with the true spirit of progress, adapted themselves to the motor, and their efforts have been rewarded with a really astonishing amount of success. Take, for instance, tram-car propulsion; in Paris there are two systems of automobilism in use, both of which are, from the mechanical, economical, hygienic, and humane points of view, an absolute success. As we intend to describe the Paris tramways on a future occasion we need not now further refer to them. We may, however, remark that, as regards tram-car propulsion, Paris sets an example, which London, Liverpool, and Manchester, and other towns might well imitate. Indeed, on this question as on so many, many others, the average British town or county councillor is usually a hopeless ignoramus, and about as competent to discuss questions of traction as he is to decipher the Hittite inscriptions in the British Museum.

Few people in England except those concerned have an accurate idea of the extent of the motor-car industry in France. Not only are automotors used in tramways but also in vehicles used for social, professional, and business purposes. Indeed, the horse is being gradually but surely eliminated from the streets of the larger French towns. To the French Press as a whole must be given a large share of the credit for the achievement of this very desirable consummation. Under the auspices of various French newspapers several automotor competitions have taken place from time to time. The effect of these competitions has been to familiarise the public with automotors and also to remove prejudices against them.

The latest competition of this description was inaugurated by the proprietors of the two well-known Paris newspapers *Le Figaro* and *Les Sports* in conjunction with the Automobile Club de France, and consisted of a race from St. Germains to Dieppe, a distance of 171 kilometres, or 106 statute miles. It was held on July 24th. The motor-cars were arranged in four classes:—Class A included moto-cycles, that is to say, vehicles which weighed less than 200 kilos. = 440·8 lbs. tare without driver and stores; Class B comprised motor-cars carrying two persons side by side; Class C, motor-cars carrying more than two persons of which two are side by side; Class D, motor-cars carrying not less than six persons. Vehicles entered in the three latter classes paid an entrance fee of 50 francs, while those in Class A paid 20 francs.

As regards the conditions or articles of the competition these were simple and fair, bearing in mind that the object in view was merely to get over a stated distance in the shortest time

There were no restrictions except those indicated in the classes. It was, in fact, a go-as-you-please contest.

Of course such a competition has after all but little interest or value to the purely technical expert who wants data—in the present case unattainable. To the general public, however, who does not care a bit whether the engine of the train which conveys them to the seaside is a "simple" or "compound," or how it is propelled, the Paris-Dieppe competition is of great interest as it shows that really high speeds can be attained in practice, and that is all the public wants to know. We shall not then attempt to do more on this occasion than simply describe the proceedings, leaving our readers to form their own opinions as to the relative merits of the competing motors.

The prizes offered for competition were both numerous and costly. They were as follows:—

For the vehicle which accomplished the distance in the shortest time, irrespective of class, and quite independent of the prize attaching to its class, a gold medal given by the Automobile Club of France.

For the second vehicle, a silver medal given by the Automobile Club of France.

For the third vehicle, a bronze medal given by the Automobile Club of France.

For the first voiture built before January 1st, 1896, a prize given by the President of the French Republic.

For the first arrival in Class A an Objet d'Art of the value of 1,000 francs, in addition to an Objet d'Art of the value of the entrance money.

For the second arrival in Class A an Objet d'Art valued at 500 francs, in addition to another Objet d'Art valued at a quarter of the entrance money.

For the third of this class an Objet d'Art worth a quarter of the entrance money.

For the first arrival in Class B an Objet d'Art valued at 2,000 francs, in addition to another Objet d'Art worth half the entrance money.

For the second arrival in this class prizes the same as the second in Class A.

For the third arrival in Class B the same as the third arrival in Class A.

For the first arrival in Class C an Objet d'Art worth 1,000 francs, and another worth half the entrance money.

For the second arrival an Objet d'Art worth 250 francs, and another worth a quarter of the entrance money.

For the third arrival an Objet d'Art worth a quarter of the entrance money.

For the first arrival in Class D an Objet d'Art worth 500 francs and half the entrance money.

For the second arrival an Objet d'Art worth 250 francs, and another worth a quarter of the entrance money.

For the third arrival in Class D an Objet d'Art worth a quarter of the entrance money.

In addition to these prizes there was one, a silver gilt medal, offered by the Chamber of Commerce de Beauvais, which was given to the vehicle first passing through that town.

The following table gives the particulars of the entries:—

Number.	Owner.	Type of Motor.	Places for.	Horse-power. (Rated.)	Date of Building.
1*	Girardot	Moto-cycle de Dion-Bouton	1	3	1897
2†	Buisson	Duc Panhard et Levassor ...	2	—	1897
3	Diez	Voiturette Bollée	1	3	1897
4	Fougera	Voiture Panhard et Levassor	2	—	1897
5	Rivierre	Bicyclette Rivierre	1	—	—
6	F. Richard	Duc	2	2	—
7	Péhan de la Forest ...	Tricycle à moteur de Dion-Bouton.	1	1¼	—
8	G. Richard	Buggy à pétrole	2	2	—
9	Daunot	Voiturette Bollée	1	2¼	—

* Did not start. † Prize winners.

Number.	Owner.	Type of Motor.	Places for.	Horse-power. (Rated.)	Date of Building.
10	De Bertier	Voiture Bollée	2	6	—
11	Morin	Bicyclette Rupalley	1	—	—
12†	Charron	Voiture Panhard	2	6	—
13	X. Y.	Tricycle de Dion-Bouton ...	1	—	—
14	Schmidt...	Voiture Rupalley	2	—	—
15	Comte de la Barre de Nanteuil.	Voiturette Bollée	1	—	—
16	Stoffel	Voiture Richard à pétrole ...	2	2¼	—
17	De Dion-Bouton ...	Tricycle à pétrole	[illegible]	—	—
18†	Archdeacon	Voiture Delahaye à pétrole	6	6	—
19	De Dion-Bouton ...	Tricycle à pétrole	1	—	—
20†	Amédée Bollée	Voiture à pétrole	2	—	—
21*	De Dion-Bouton ...	Tricycle à pétrole	1	—	—
22†	Prévost	Voiture à pétrole	2	—	—
23	De Dion-Bouton ...	Tricycle de Dion-Bouton ...	1	—	—
24	Wiart	Voiture Mors	2	—	—
25	De Dion-Bouton ...	Tricycle...	1	—	—
26	Ch. Périgoret	Charrette Panhard	3	6	1897
27	De Dion-Bouton ...	Tricycle à pétrole	1	—	—
28†	G. Lays	Wagonette Panhard... ...	4	4	—
29	De Dion-Bouton ...	Tricycle à pétrole	1	—	—
30*	De Grodzki	Vis-à-vis Peugeot	4	3½	1897
31	Vicomte du Souller ...	Voiturette Bollée	1	—	—
32	Labouré	Maison Parisienne, moteur Benz.	4	—	—
33*	Boivin	Bicyclette à pétrole	—	—	—
34*	Sereix	Maison Parisienne, moteur Benz.	—	—	—
35	Gans de Fabrice ...	Bicyclette Wolfmuller (transformée).	1	—	—
36	Serin	Maison Parisienne, moteur Benz.	—	—	—
37	Bertrand	Tricycle à moteur de Dion-Bouton.	1	1½	—
38	Guyennet	Maison Parisienne, moteur Benz.	4	—	—
39	Ernest Gras	Tricycle de Dion-Bouton ...	1	4	1897
40†	De Dion-Bouton ...	Brake à vapeur	4	6	1897
41	Mouter	Moto-cycle	1	4	1897
42†	Gilles Hourgière ...	Voiture Panhard	2	6	1897
43†	Pellier	Voiturette Bollée	1	3	1897
44	H. Tentling	Phaéton	4	4	1895
45†	Jamin	Voiturette Bollée	1	3	1897
46†	E. Mors	Voiture Mors	2	5	1897
47	De Bertier	Voiturette Bollée	1	3	1897
48	L. Mors	Voiture Mors	2	5	1897
49	Comiot	Tricycle Comiot, moteur de Dion-Bouton.	1	3	1897
50*	Albert Cadier	Voiture Mors	3	5	1897
51*	Dalifol	Quadricycle	2	2	1897
52†	Courtois	Brake Delahaye	6	6	1896
53†	Lemoine	Phaéton Panhard	2	6	1897
54	Hiverge	Boggy Landry et Beyroux...	4	4	1897
55	A. Delmas	Phaeton Landry et Beyroux	4	6	1897
56	Fisson	Victoria...	2	4	1897
57†	Doriot	Voiture Peugeot	6	6	1896
58†	A. Lemaitre	Duc Peugeot	2	6	1896
59†	Chev. René de Knyff...	Voiture Panhard	2	6	1897
60*	Léon Lefebre	Voiture Léo	4	6	1897
61	Brunessaux	Dogcart Mors	4	5	1897
62	Roch Brault	Phaéton	2	4½	1897
63	Mouter	Voiture...	4	6	1897
64*	Comiot	Voiture Panhard et Levassor	4	4	1897
65†	Etienne Giraud ...	Panhard	4	6	1897
66*	Damas	Voiture...	2	4	1897
67*	Carosserie industrielle	Voiture Panhard	2	3	1897
68*	Lucas	Voiture Lucas...	2	6	1897
69†	Girardot	Voiture Panhard	2	6	1897

* Did not start. † Prize winners.

As will be seen, no less than 69 automotor vehicles were entered for the competition—a most gratifying testimony of the healthy state of automobilism in France, and a significant refutation of the absurd theory entertained in so many quarters in England to the effect that horseless traction cannot be effected by motors as at present in use.

On examining the list of entries it will be seen that there was but one steam motor, all the others being various types of oil motors; there was not a single electric motor-car, a fact which is to be regretted considering the liberal provision that had been made for obtaining fresh batteries if necessary on the way. It will be noticed, too, that no English firms competed, which is also a matter for regret. This absence of English motors is, we think, to be explained by the fact that for purposes of speed alone it is difficult to compete against the light spirit motors which are encouraged in France and barely tolerated in England, and which are not likely to be much used here.

The competition was made the occasion for a special *fête* throughout the district traversed by the motor-cars. Special trains were run from all adjacent towns to Dieppe. At the latter place the preparations were on a most extensive scale, the principal streets were decorated with flags and banners, while the municipality, under M. Roger, the Mayor, had arranged a series of festivities at the Casino. Nothing, in short, was left undone to secure the celebration of the competition with becoming *éclat*.

As showing the importance with which the competition was regarded in France, we may say that the Dieppe Municipality despatched one of its Councillors, M. Jubault, who was accompanied by M. Aubry, the editor of *Les Sports*, to London to personally invite Sir David Salomons and the members of the Self-Propelled Traffic Association to be the guests of the municipality. Unfortunately, Sir David was unable to attend, but the S.P.T.A. was ably represented by Mr. Worby Beaumont, M.I.C.E., &c., Mr. A. Barr (secretary), the Hon. C. S. Rolls, Mr. Stanley Spooner, Mr. Redwood (son of the distinguished Professor of that name), Mr. G. H. Little (technical editor of the Automotor, &c.). Most of these had travelled from London the night previous, and were met on arrival at Dieppe by members of the local committee, and escorted to the Hotel Royal and the Métropole, where they were the guests of the municipality, and furnished with a free pass for everything.

A very pleasing feature of the competition was the support and encouragement given to it by the authorities. Everyone from the prefect to the local gendarme did their utmost to make the thing a success. Nothing could exceed the courtesy and kindness of the various officials, especially to the foreign guests. The municipality of St. Germains and of the other towns passed *en route*, the Direction of Le Chemin de Fer de l'Ouest, and the municipality of Dieppe, under M. Roger, the Mayor, assisted by M. De la Rue, who was especially charged with the care and comfort of the English official visitors, did everything with the utmost tact and consideration. The arrangements were generally in the hands of a committee composed of members of the Automobile Club and others, but the actual executive duties were entrusted to M. J. H. Aubry, the editor of *Les Sports* and to M. Paul Meyan, of the *Figaro*. These gentlemen most ably discharged their by no means light duties, and were indefatigable in their efforts to promote the success of the competition. The former gentleman showed himself an expert starter and timer, and marshalled the motors like a general; while the latter acted as inspector-general, and saw that all arrangements were properly carried out *en route*.

At St. Germains M. L. Desoyer, the Mayor, made equally excellent arrangements, stationing policemen at the various points and level crossings so as to warn the drivers of the automotors of the approach of trains and in other ways to render assistance. In this task he was ably seconded by the principal residents, among whom we must not omit to mention M. Ledoray, an enthusiastic automobilist. A graceful act on the part of the inhabitants of St. Germains was the presenting to each driver of an automotor a bouquet ornamented with the national ribbons.

At the various road-junctions officials were stationed to indicate the route and to afford assistance, while at convenient intervals were stores of petroleum, coal, water, &c.; also at the level crossings on the railways the station-masters had special orders to facilitate the passage of the motors. Just fancy an English official of any kind whatever, whether a railway director, a local magistrate, a policeman, or beadle, facilitating in any way whatever the passage of a motor-car!

Baron de Zuylen de Nyevelt (President of the Automobile Club of France).

Soon after seven o'clock on the 24th ult. the motor-cars assembled at L'Avenue de la Grande Armée at St. Germains. The weather was beautiful, a nice westerly breeze was blowing, and the sky was cloudless. A large and fashionable crowd had assembled at the point of departure, and lined each side of the avenue. The motor-cars were not arranged in the order of their numbers, and this occasioned some little delay. One or two minor mishaps occurred, but among so many vehicles this could hardly be avoided. As nine o'clock approached, the various motors were mostly running light, and they were nearly all literally vibrating with suppressed energy.

As may be imagined, the noise made by so many machines, the excited words of direction from drivers to their attendants, the loudly-expressed comments of friends, the cheers of the crowd, made it impossible to hear oneself speak. Added to this were the heat and the dust, and one can picture the scene: it was like a Derby day at Epson, but without the vulgarity of the latter.

On the next page will be found a sectional chart showing the gradients, &c., on the route, together with the bridges, level crossings, &c.

At nine precisely the signal to start was given, and No. 2, a moto-cycle (A. Buisson), crossed the line; this was followed by others at intervals of 30 seconds. The scene was uow one of great animation and excitement, and soon the avenue was seen to contain a long line of rapidly-moving vehicles, the whole lot being despatched by M. Aubry in less than half an hour. As far as possible the cars were sent off in numerical order, but some did not arrive in time, and hence had to wait.

A special train had been chartered to convey the members of the Automobile Club and their guests from Paris to St. Germains, and from thence to Dieppe. Soon, after Rouen was reached it became a question whether it would arrive at Dieppe before the motor-cars, and the driver, to ensure this, put his lever another notch forward; the poor old automotor—she was 30 years of age—could not stand this very unusual proceeding, and something gave out. A long delay ensued, till a mail train

THE PARIS-DIEPPE GRADIENTS.

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appeared and gently pushed the benighted "special" to its destination nearly an hour late, and fully half an hour after the first motor-car, a Bollée, had arrived. This unfortunate delay marred somewhat the reception of the vehicles, and much vigorous protest was indulged in against the directors of the Western Railway Company, more especially from those who, having been unable to catch the special, had to take the ordinary train, which occupied only six hours in traversing some 95 miles. A truly remarkable performance which we understand is repeated daily at intervals on that happy railroad.

The following table gives the times of departures, and arrivals of the motors at Dieppe :—

No.	Time of departure.			Time of arrival.			Time occupied (corrected).		
	h.	m.	s.	h.	m.	s.	h.	m.	s.
45	9	11	30	1	25	3	4	13	33
40	9	10	30	1	30	4	4	19	34
12	9	8	0	1	46	31	4	38	31
42	9	11	0	1	47	0	4	36	0
29	9	6	30	1	52	4	4	45	34
37	9	7	45	1	38	0	4	45	15
43	9	11	15	1	53	10	4	41	55
22	9	6	15	1	54	0	4	48	12
27	9	6	15	1	55	36	4	49	48
65	9	19	30	2	9	39	4	50	9
25	9	6	0	2	10	56	5	4	56
17	9	5	15	2	16	46	5	11	31
19	9	5	30	2	17	26	5	11	56
20	9	5	45	2	23	7	5	17	22
7	9	2	0	2	29	9	5	27	9
49	9	5	0	2	30	36	5	25	26
59	9	16	33	2	33	56	5	27	26
46	9	12	0	2	37	48	5	25	48
69	9	19	0	2	37	56	5	18	56
58	9	16	0	2	43	46	5	27	46
18	9	5	15	2	46	30	5	41	15
15	9	5	30	2	49	57	5	44	27
3	9	0	30	2	50	14	5	49	44
2	9	0	0	3	3	11	6	3	11
52	9	14	0	3	12	13	5	58	13
47	9	6	30	3	19	27	6	12	57
26	9	6	30	3	19	29	6	12	59
28	9	10	0	3	32	11	6	22	11
13	9	4	0	3	35	36	6	31	36
57	9	15	30	3	42	43	6	27	13
53	(not taken)			3	48	42			
6	"	"		4	53	13			
54	"	"		5	55	34			
63	"	"		5	59	4			
24	"	"		5	59	11			
55	"	"		6	31	0			

Just at the entrance of the Port of Dieppe, and close to the Western Crucifix which, with the eastern one, forms such a quaint and picturesque feature of the port, a large tent about 100 feet long by 50 broad had been erected and gaily decorated with flags and lit by arc lamps. This tent was for the accommodation of the motor-cars on their arrival. Men were here placed by the municipality to assist as cleaners and helpers. A large mound of sand and the local fire appliances were provided for possible contingencies, and it says very much for the intelligence displayed in the handling and use of such large quantities of motor-naphtha as was involved in running so many vehicles, that no accident whatever occurred. We attribute this largely to the superior technical education given in France to the artisan classes.

On arrival at Dieppe the motor-cars, escorted, or rather followed, by a most enthusiastic crowd, proceeded to the tent and were subjected to a very necessary cleaning process, all of them being covered in dust.

The run to Dieppe was uneventful as regards accidents, the most serious being the capsizing of a Bollée voiturette, which was owing to bad steering. There were a few minor mishaps arising from slack joints, but, speaking generally, all the motors

Fig. 1.

ran splendidly. At one time the race seemed to have resolved itself into a contest between a Bollée and a Panhard carriage, but at Arcques-le-Bataille the former broke down owing to a defect in the ignition tube, and it had to abandon the contest.

Fig. 2.

The honour of victory nevertheless remained with another Bollée, viz., No. 45, driven by M. Jamin, who rode with remarkable *verve* and skill. This gentleman arrived in 4 hours 13 minutes 33 seconds, being followed a few minutes later by the

De Dion steam brake. The next arrival was M. Charron on

Comte Albert de Dion (Vice-President of the Automobile Club of France).

minutes 34 seconds on the journey, or at the rate of 24·5 miles per hour, while in Class D, the winner was M. Courtois, who drove a Delahaye wagonette, which did the distance in 5 hours 58 minutes 13 seconds, or at the rate of 17·7 miles per hour. It will thus be seen that the performances are remarkably good. To analyse them and appreciate them fully we require to know the horse-power developed, weights, and other particulars, of which it is extremely difficult to obtain reliable information, and what is available is not too reliable. Thus the steam wagonette of Count de Dion is officially quoted as being of 6½ horse-power, but it is easily seen that the actual horse-power must be nearer 26. In view of this absence of accurate data we have not thought it necessary to describe the vehicles at length, more especially as most of them have already been described, and in most cases illustrated, in our columns.

The prizes were awarded as follows:—In the moto-cycle

section. Class A. the first and second prizes went to MM.

opinion of those conversant with the art of carriage building this brougham is the best example of the application of an oil motor to a private visiting carriage that has yet been produced.

In the evening there was a banquet given by the Baron de Zuylen at the Casino, the English delegates being specially invited, and which was attended by several of the leading inhabitants and most of the *chauffeurs* who had taken part in the race. On the following day, Sunday, the 25th, there was an exhibition of the motor-cars, the various prize winners each received a silk banner which was attached to the respective cars, and thus adorned they careered round the Marine Promenade and paraded the entire town at a speed which would deeply shock some of our provincial Bumbles. Notwithstanding the crowds, no accident occurred, the motors being under perfect control. It was a very fine sight to see so many motors so well handled and for the most part presenting a very smart appearance. In the evening there was another banquet at the Casino, followed by a concert and ball. At the banquet 150 guests were present, including M. Roger, the Mayor of Dieppe; M. Hendlé, Prefect of

FIG. 3.

the Seine-Inférieure; the Baron Zuylen de Nyevelt, President of the Automobile Club of France; Comte Albert de Dion, Vice-President of the Automobile Club of France; MM. Breton (Deputé), Lee-Jortin (Dieppe English Consul), Jubault, de

FIG. 4.

Lucenski, Aubry, the delegates from the Self-Propelled Traffic Association, De Bouton, Avigdor, Bollée, &c., &c.

There were the usual speeches of an enthusiastic description in favour of automobilism, M. J. H. Aubry proposing the health of Sir David Salomons and the members of the Self-Propelled Traffic Association, in which he asked the *chauffeurs* to drink to the health of their English colleagues. He then added, in English:—"Gentlemen, we are very happy to driuk in your presence to Sir David Salomons's health, to yours, to the members of the Self-Propelled Traffic Association, and to the spreading of our common ideas and feelings all over the United Kingdom."

As will be gathered, the Paris-Dieppe competition was a huge success, reflecting credit on all participating in it, and it was fittingly concluded by festivities which were, if anything, on a rather too extensive scale. The greatest courtesy and cordiality were manifested towards the English visitors, who one and all came away with the impression of having had a most instructive and pleasant visit. It only remains for us to congratulate the municipality of Dieppe, the Automobile Club, and our contemporaries *Les Sports* and *Le Figaro* upon the success which has deservedly attended the competition. We do not, however, congratulate La Compagnie de l'Ouest. When so many have facilitated our task and rendered it pleasant, it were perhaps invidious to mention names, but we cannot conclude without expressing our sense of the services rendered us by MM. Aubry, Jubault, and De la Rue. For ourselves we are glad to have assisted in doing some little thing towards building up *l'entente cordiale* between France and Great Britain which we trust may never be disturbed.

The illustrations which appear in connection with the Paris Race are:—

Fig. 1. The carriages in the early morning at St. Germains taking up their positions opposite their numbers fixed on the trees.

Figs. 2 and 3. The vehicles being started by M. Aubry.

Fig. 4. Breakdown of the special train carrying the members of the Automobile Club, &c.

The Manchester Steam Users' Association.—At a special meeting of the Committee of Management of the Manchester Steam Users' Association, Mr. C. E. Stromeyer, Graduate of the Royal Technical College at Aix-la-Chapelle, Member of the Institution of Naval Architects, Associate Member of the Institution of Civil Engineers, Member of the Institution of Mechanical Engineers, Member of the Institution of Engineers and Shipbuilders in Scotland, and Engineer Surveyor to Lloyd's Register, Glasgow, was appointed Chief Engineer in succession to the late Mr. Lavington E. Fletcher.

Water required for Condensation.—The amount of water required thoroughly to condense the steam from an engine is dependent upon two conditions, the total heat and weight of the steam and the temperature of the injection water. Generally stated, with 26 inches vacuum and injection water at ordinary temperature—not exceeding 70° F.—from 20 to 30 times the quantity of water evaporated in the boilers will be required for the complete liquefaction of the exhaust steam from an engine. Our American contemporary, *Power*, gives the following formula to estimate the value of water for condensing purposes under any specific conditions:—Given, I = temperature of injection water; D = temperature of discharge water; S = total heat—sum of sensible and latent heat—of the steam at the pressure at which it leaves the engine. This varies from 1140 to 1158 units, as the terminal pressure is 10 lbs. or 30 lbs. absolute; it may, however, be taken as 1150 for ordinary purposes. Then $\frac{S - D}{D - I}$ = unit weight of injection water required per unit weight of steam. Example, I = 70° F.; D = 110° F., with a vacuum of 26 inches; S = 1150 units of heat. Hence $\frac{1150 - 110}{110 - 70} = 26$. That is, the weight of the injection water required will be 26 times the weight of the steam exhausted.

COMPRESSED AIR LOCOMOTIVES IN NEW YORK.

Two compressed air cars are at work experimentally in New York. The air is first compressed by a steam-actuated air compressor, which is compounded in three stages, from which the air passes through a cooler and dryer, and is accumulated in a nest of Manuesmann steel flasks, which are all connected in multiple by a series of headers or manifolds, in which stop valves are placed for controlling and confining the air to be stored at a maximum pressure of 2,500 lbs. per square inch. A pipe leads from this air storage to the car house charging stand, placed alongside the track, which consists of a copper pipe in three sections, having a controlling valve and flexible joints and a charging nozzle at the end. After the car has been connected by inserting the nozzle in a pipe at the side of the car track, the charging valve is opened, and contents of the station storage flasks admitted until the desired pressure—2,000 lbs. per square inch—is registered by the car storage gauge. At the same time the car is being charged with air, another nozzle is introduced to the heater connection, and live steam from the boilers is admitted, until the temperature registered is about 300° F. The air storage reservoirs on these cars have a capacity of 51 cubic feet, sufficient to run the car 18 to 20 miles continuously, or from 14 to 17 miles, making the stops incident to ordinary street railway service. Between the flasks and the motor is placed a small tank containing 6 cubic feet of water, which is heated as before described. In operation, the compressed air, after passing through a reducing valve and being lowered to 150 lbs. to the square inch – the working pressure —circulates freely through the hot water, and a mixture of heated air and vaporised water passes to the motors, working expansively, the terminal pressure being so low as to cause no sound in exhausting the air. The motor mechanism consists of two simple link-motion reciprocating engines having cylinders 7 inches in diameter and 14 inches stroke, with valves cutting off at from $\frac{1}{10}$ to $\frac{1}{6}$, and applying the power by connecting and parallel rods direct to the crank pins of the driving-wheels, which are four in number, 26 inches in diameter, running on a wheel base of 7½ feet.—*The Engineer.*

M. J. H. Aubry.

(Organiser of the Paris-Dieppe race, editor of *Les Sports*, and great grandson of Cugnot, the inventor of the first steam carriage, which is now in the Paris Museum of "Arts et Metiers.")

["England and France look to the future of automobilism as through an opera-glass. France looks through the big end and sees carriages little, and light, and speedy; England through the small end and sees heavy, and strong, and steady. We complete each other: business and pleasure resume life."—J. H. A.]

THE SUPPLY OF PETROLEUM TO MANCHESTER.

An important business, entirely new to Manchester, but common to nearly all other large seaports, will shortly spring up on the banks of the Ship Canal below Mode Wheel Locks—namely, the importation and storage of cargoes of oil in bulk, says the *Chemical Trades Journal.* Since the opening of the canal, consignments of mineral lubricating oil, petroleum, &c., have been imported to the Manchester docks in steadily-increasing volume, but owing to the absence of accommodation for dealing with oil carried in tank steamers, all such consignments have arrived in barrels. Notwithstanding this drawback, last year's shipment of oil to Manchester, by way of the canal, amounted to 17,449 tons, as compared with 8,155 tons in 1895, and there is no doubt that if storage tanks had been available the importation would have been much larger. There are already two large oil tanks which have been erected by the Manchester Corporation Gas Committee on a piece of ground adjoining the Foreign Animals Wharf at Old Trafford. They will be used exclusively by the committee for their own purposes, and it is expected that about 20,000 tons of oil will pass through them every year. This will, of course, be imported in tank steamers from America or Russia. A development of even greater commercial importance is, however, the establishment of similar depôts for oil imported for general use. Two large tanks for the Liverpool Oil Storage Company are now in course of erection on the Old Trafford side of the canal, and it is said that this Company is making preparations for dealing with a trade of 60,000 tons per annum. It is stated, also, that several acres of land on the opposite side of the canal have been purchased by a Russian oil syndicate, which intends to construct similar tanks, and expects to do an equally large business. A local firm has already established an oil manufactory near Mode Wheel Locks, and the Canal Company is to construct suitable wharves on both sides of the waterway.

THE AUTOMOBILE CLUB OF GREAT BRITAIN.

UPON the invitation of Mr. Frederick R. Simms the first official meeting of the above-proposed club was held on Tuesday, the 10th inst., at the suggested club premises, No. 4, Whitehall Court, Thames Embankment. Although the original purpose of the meeting was to appoint officers of the club, pass the regulations, &c., the Hon. Evelyn Ellis (Chairman) stated that for the moment it was premature to go into details, either financial or otherwise, or to discuss other matters in regard to the proposed club. The only question that need then be entered upon was the securing the premises for 12 months, whilst the club itself was being formed. Mr. Simms, he was glad to announce, was prepared to guarantee the rent and expenses for the first year, and also the preliminary expenses in regard to the formation of a Company for carrying on the club. Mr. J. B. Purchase was appointed solicitor, and was instructed to register by October next the Automobile Club of Great Britain, either as a Limited Liability Company, or preferably as a Company limited by guarantee to £1 each subscriber, and it was arranged to adjourn the meeting to some time in October, when all the details, &c., would be fully laid before those attending. Among those present were Earl Galloway, Gen. Sir Arthur Ellis, Hon. Evelyn Ellis, Col. Lea, Messrs. E. Elieson, C. Heyermans, Hiram S. Maxim, Walter Arnold, A. Cornell, A. Fairlie Allingham, Robert Beadon (on behalf of P. E. Singer), J. H. H. Berkeley, J. D. Roots, Arthur E. Heming, E. E. Sherwin Holt, J. B. Purchase, &c.

The Noise Made by Petroleum Burners.—Mr. J. S. Bickford, of Camborne, Cornwall, in writing to a contemporary, says:—"This noise has been certainly a great obstacle to the use of petroleum for steam raising, but it is an objection which can no longer be urged with justice. I am willing to supply on approval to anyone of good financial standing petroleum burners capable of consuming any quantity of oil per hour with comparative silence. No doubt some of your readers will smile at 'comparative silence,' but I cannot claim absolute silence. The burner makes very much the same noise as a gas fire, only slightly more so. Degrees of noise are very difficult to express in writing, but some idea can be gathered of what is intended by 'comparative silence' when it is said that a conversation can be carried on in an ordinary voice across one of these burners whilst it is consuming more than one gallon of oil per hour."

The Storage of Carbide of Calcium.—Since the Order in Council of February 26th, 1897, in virtue of which certain parts of the Petroleum Acts, 1871 to 1881, were applied to carbide of calcium, the question of the expediency of exempting small quantities of this substance from the operation of the order has occupied the attention of the Home Office, and the Secretary of State, having been advised that such exemption might be safely extended to quantities of carbide of calcium not exceeding 5 lbs., when kept in separate, substantial, hermetically-closed metal vessels containing not more than 1 lb. each, an Order in Council was made on July 7th, authorising the keeping of not more than 5 lbs. of carbide of calcium in vessels as above described without a licence, and the orginal order of February 26th has been amended accordingly. The amending order appeared in the *London Gazette* of July 9th. It is to be observed that where the carbide of calcium is not kept in vessels as above described, no quantity may be kept without a licence.

CONTINENTAL NOTES.

THE Messageries Maritimes Company have lately acquired an electric launch built by an English firm for service in the East.

WE understand that M. Hospitalier, the well-known French electrical engineer, is preparing a work on electrical automobilism.

THE petition against the proposed tax upon automotors which has been lying at the office of *Les Sports* has so far received 18,300 signatures.

WE regret to learn that the motor-car factory of M. Roger et Cie., of Paris, has been partially destroyed by fire. The loss is, however, covered by insurance.

THE Northern Railway of France is trying various systems of automotors. It has for its postal and local services steam motor-cars on the Serpollet system and Petro motors on the Panhard and Levassor systems.

THERE is being constructed in France an automotor carriage which will be 24 feet 6 inches long by 8 feet by 8 feet. It will comprise three separate apartments—a dining-room, kitchen, and conveniences; it will be hauled by a De Dion and Bouton tractor of 30 H.P.

THE new Berlin Omnibus Company, says the *Elektrotechnische Zeitschrift*, intends to run a trial accumulator vehicle, and the order for its manufacture has already been placed. It is to be of the same size as an ordinary omnibus, with seats on the roof, and the cells will be placed both under the inside and outside seats. The cells will be charged after every two journeys.

A FRENCH contemporary devoted to automobilism has been quoting rapturously about a certain Mlle. Christiane, who, we are pleased to hear, rejoices in being a "blue-eyed blonde with carnation cheeks" and a "Parisienne of Paris," who has, to employ the English vernacular, "chucked the bike" for a motor-car, because the latter is more fashionable. We rejoice to hear it.

THE directors of the Compagnie Générale des Voitures à Paris state in their report that it is their intention to transform a number of their cabs into auto-cabs, and that they prefer the use of electricity to petroleum for propulsion. According to the *Eclair*, 500 electrically-driven cabs of different types were to have been on the streets of Paris on July 1st; a fortnight after one type was to be chosen as most suitable, and the work of transformation of all the cabs will be begun immediately, and completed in less than a year.

AMONG recent additions to the membership of the Automobile Club of France we notice the names of W. Worby Beaumont, Esq., M.I.C.E., &c., Mr. Boveton Redwood, jun., and the Hon. C. S. Rolls. This latter gentleman is an ardent automobilist and is one of our most experienced amateurs. He is at present entered as an "undergrad." of Cambridge, and has wisely gone in for the engineering course. He will thus in time become an authority upon automobilism. Mr. Rolls has lately purchased the four-seated Panhard and Levassor voiture, of 8 H.P., which was the winner of the Paris-Marseilles race, it having covered the distance of 1,077 miles in 67 hours 42 minutes, or an average speed of 15·5 miles per hour.

LES POIDS LOURDS

OR

THE HEAVY-WEIGHT MOTOR-CAR COMPETITION.

While it has been very generally recognised that under certain elastic and easily-fulfilled conditions, light vehicles could be moved by other than animal power with a considerable measure of success and economy, it has been doubted whether it would ever be a commercial possibility to replace horses for the traction of heavily laden wagons. Indeed, not a few people have loudly proclaimed that in vehicles of the usual dimensions, it would not be possible to include the motive machinery and the usual load, especially if the latter was at all bulky. It has been forgotten that, as we pointed out in a recent issue, the effective length of any horse-drawn vehicle or the length of the space occupied must logically include that space occupied by the horses, because, if these be removed, the motive power departs. All doubts on the question may now be said to have been removed by the heavy motor-car trials that have lately taken place in France under the auspices of the French Automobile Club. These trials were, in fact, the outcome of much uninformed and crude opinion expressed in various ways by various persons and journals both in this country and abroad; and at one time it seemed not improbable that, owing to such uninstructed opinion, automobilism would be relegated to the background as a harmless relaxation of the leisured classes. On the other hand, there was the accomplished facts of the early English pioneers in heavy horseless traction, and it was rightly urged that with modern material and the use of higher steam pressures, space and weight taken up by the motive machinery could be reduced to a relatively small proportion of the total capacity and weight. In order to ascertain the actual possibilities of heavy motor-cars, the French Automobile Club inaugurated a series of trials to take place early in the present month at Versailles. These trials were of a purely technical and practical character, and although, of course, speed was an important element there was no premium placed on it, or, in other words, there was no racing; hence the competition did not attract that notice on the part of the general public as did the Dieppe and Trouville contests, but was followed very attentively by those who are more seriously interested in heavy motor traffic. Thus the French Minister of War appointed Lieut.-Col. Laval and several officers to attend and report, while the German military officers attached to the German Embassy evinced great interest in the trials. It is no secret that the military authorities entertain a high opinion of the possible utility of a well-designed and powerful tractor for operations in the open country. Steam, however, is not favoured for the motive power but petroleum is preferred. The Self-Propelled Traffic Association sent over a delegation consisting of Mr. W. Worby Beaumont, M.I.C.E., Cantor Lecturer on Horseless Traction; Mr. H. Hartley West, M.I.N.A., M.I.C.E., Naval Architect and Consulting Engineer; Mr. A. W. Barr, Secretary; Mr. Shrapnell Smith, Honorary Secretary Liverpool Branch. There were also present, though unofficially, Sir David Salomons, Bart., and Professor Boverton Redwood, F.I.C., &c., President and member of Council respectively of the S. P. T. A. Among others present were Mr. Sydney Lawson (of Birmingham), the Hon. C. S. Rolls (of Cambridge), Mr. Redwood, jun., Mr. A. Hopkins, Mr. H. Pope (representing Colonel Pope, of the Pope Manufacturing Company, U.S.A.), and Mr. G. H. Little (technical editor of the Automotor). The place selected for the trials was Versailles, near Paris, and as will be seen a better one could hardly have been chosen, as the gradients are many and steep, and the country roads much as country roads usually are.

M. Forestier.

(Commandeur Legion d'Honneur, Engineer-in-Chief Les Ponts et Chaussées, President of the Poids Lourds Technical Commission.)

M. Paris Singer manifested his interest in the competition by depositing the sum of 5,000 francs with the Automobile Club of France for the purchase of medals, &c., for distribution among the competitors.

The trials took place on August 5th, 6th, 7th, 9th, 10th, and 11th, and were conducted by a Technical Commission appointed by the Automobile Club, under the presidency of M. Forestier, Commander of the Legion of Honour, and Engineer-in-Chief of that admirable branch of the French Service, Les Ponts et Chaussées. The members of the Commission were MM. Franck, Courtois, Pilon, Audibert, Boyer-Guillon, Méry Picard, David, Dalifol, Daniel Augé, Frontin, Despinois, Longuemare, Ferns. Several gentlemen voluntarily undertook the office of technical observer. They were MM. Vinet, Rueff, Vedovelli, Raymond, Victor Popp, Gastyne, De Rouvre, Drion, Pigornet.

The principal points to which the Commissioners were to direct their attention and to which they were to give due appreciation were:—

- Smell and noise of exhaust;
- Visibility of exhaust vapour, particularly in the case of steam;
- Vibrations;
- Ease of suspension;

Noise made by the machire in motion;
Degree of comfort of the vehicle;
Dust and dirt made by working the motor;
Power of the motor, facility of steering;
Change of speeds, whether easily accomplished or not;
Ability to stop and start on inclines;
Necessity or otherwise of going backwards in order to obtain momentum in mounting an obstacle;
Necessity or otherwise of lightening the vehicle when starting;
Efficiency of brakes for stopping on and descending gradients;
Lubrication:
Proper capacity of bunkers and feed tanks;
Seizing of the machinery;
Breakage of any part;
Leakage of steam, feed water, or fuel;
Condition of feed pump;
Pressure gauge, and in oil-motors condition of ignition apparatus;
Regularity of explosions and feed;
Proper circulation of cooling water;
Supply of oil, how carried.

It will be seen that the Commissioners had to report upon every detail, and hence the trials may be regarded as the most searching that have yet taken place. It is, however, to be regretted that the Commission did not cause to be issued with each entry a small dimensioned sketch giving full particulars as to weights, power, speed, &c.

Description of the Vehicles.

We regret that, owing to the extreme disinclination on the part of the builders of the various motor-cars to furnish us with working drawings and details our description of the motor-cars is necessarily imperfect and incomplete. This reticence to impart information is hardly calculated to impress possible purchasers, and we fail to see that any useful object is gained thereby; there is nothing secret about motor-car design as there is, or was, about torpedoes, and a good design appearing in the technical Press would most likely, as it often does, lead to business. However, we must content ourselves with such particulars as we have been able to obtain. As will be seen from the following table, 15 vehicles were entered for the trials:—

The first three are trains on the Scotte system, the distinctive feature of which is a motor-car, itself conveying goods or passengers, hauling another car. There is nothing at all remarkable about this system either in the general design or the application of the motive power. The motor-car is a 4-wheeled one carried on a channel iron frame and supported on the axles by ordinary plate springs. The wheels are very heavy and massive, but notwithstanding this they show evident signs of stress. We may as well here remark that we observed this in the wooden wheels of all the heavy tractors. To transmit some 25 to 40 H.P. through a built-up wooden structure, such as a wheel, passing over rough roads, is in our opinion a mistake, and shows a lack of appreciation of the intensity and direction of the stresses transmitted and the strains produced. The front part of the motor-car consists of tanks which form the bunkers and feed tanks; behind these are placed the boiler on the left and the engines on the right. The boiler is a modified "Field," working at about 10 atmospheres, or 142 lbs. per square inch, and has, we should say, about 120 square feet of heating surface. The motor is a two-cylinder vertical non-condensing engine, on the shaft is a sprocket wheel and chain which drives a second motion shaft, which, in its turn, drives by similar means the rear wheels. Steering is effected by worm-gearing actuating the front axle through a toothed wheel. No. 1, Fig. 1, is a train for passengers, and consisted of a motor-van and a trailing passenger van. In the motor-van there is seating accommodation for 14 persons. The trailing van has three compartments: the one in front being for baggage, &c., the middle one for 12 passengers, and on the rear platform there is room for six more. The motor gives off about 16 H.P. when running at 400 revs., the steam pressure being as before stated, the speed attained on a good road being 12 to 14 kilometres, or from 7½ to 8½ miles per hour.

Train No. 2 is a goods train, composed of a motor-van, which carries 2,500 kilos. = 5,500 lbs., and a wagon which can carry 9 tons, the total weight carried is thus nearly 12 tons. The boiler and engine are similar to the foregoing, the bunkers have a capacity for 440 lbs. of coke, and the feed tank holds 176 gallons of water. This train can go from 10 to 18 miles without replenishing, at a speed of from 4 to 6½ miles per hour, depending upon the road.

Train No. 3 consists of a motor-car and passenger omnibus with seating capacity for 24, and a baggage capacity on the roof of 800 lbs.

No. 4, Figs. 2 and 3, is a steam omnibus by Weidknecht, of

Official No.	Builder.	Description.	Type of Motor and Rated Power.	Number of Passengers.	Weight said to be Carried.	Routes traversed on Aug. 5th and 9th.	Aug. 6th and 10th.	Aug. 7th and 11th.
1	Scotte	Motor-car and trailing-car for passengers.	Steam, 16 h.p.	32	2,112 lbs.	B	C	A
2	,, ...	Motor-car and trailing-car for goods.	,, 16 ,,	—	10–12 tons	B	C	A
3	,, ...	Motor-car for goods and passengers.	,, 16 ,,	12	660 lbs.	B	C	A
4	Weidknecht ..	Omnibus	,, 34 ,,	30	—	C	A	B
5	Gaudon	Cart	,, 10 ,,	—	4 tons	B	C	A
6	Le Blant	Brake	,, 12 ,,	10	1,100 lbs.	C	A	B
7	,, ...	Motor and truck	,, 60 ,,	—	10 tons	C	A	B
8	De Dietrich ..	Cart	Petroleum, 6½ h.p.	—	2,640 lbs.	C	A	B
9								
10	Panhard	Omnibus	,, 12 ,,	10	660 lbs.	A	B	C
11	Anglo-French Co. ..	Parcel van	,, 10 ,,	—	1 ton	A	B	C
12	Le Blant	Motor-car and omnibus ..	Steam, 45 h.p.	20	1,320 lbs.	C	A	B
13	Dion et Bouton ..	Tractor	,, 25 ,,	—	5 tons	A	B	C
14	,, ..	Omnibus	,, 25 ,,	16	1,056 lbs.	A	B	C
15	Maison Parisienne	Char-à-banc	Petroleum, 9 h.p.	12	792 lbs.	B	C	A

N.B.—1 ton = 1,000 kilogs. = 2,200 lbs.

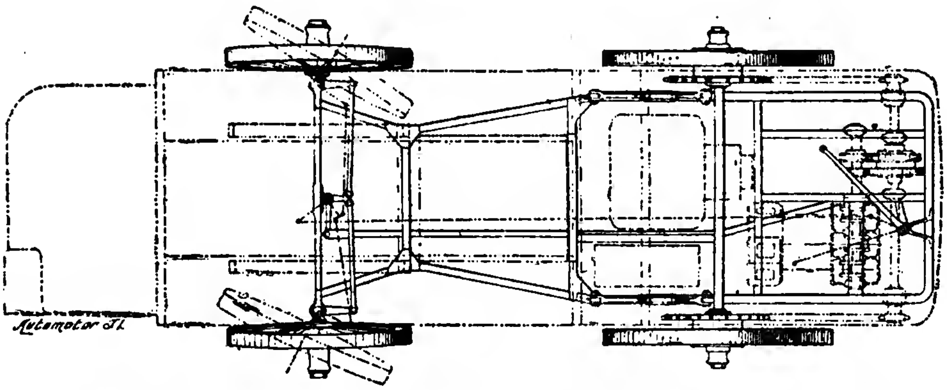
Fig. 1 (Official No. 1).—"Scotte" System—Motor-Car and Trailer.

Paris. As in the "Scotte" the forepart is occupied by the boiler, motor, bunkers, &c. The boiler is a tubulous one and the working pressure being about 210 lbs. per square inch. The motor is a three-cylinder compound, and can develop from 25 to 35 H.P., the engine running at 300 revs. Chain gearing is used to transmit the motion from an intermediate shaft which is driven by pinions. The driving wheels are about 5 feet in diameter. The total weight of the omnibus is about 6 tons fully laden, and the speed attained varies from 7 to 9 miles per hour. Its appearance is decidedly heavy and cumbrous.

No. 5 is a steam cart by Gaudon. The boiler is a tubulous one and is fired by liquid fuel, the motor is a four-cylinder simple engine which, when running at 350 revs., gives off about 10 H.P. The weight of this cart when fully equipped is about 3 tons, and it can carry about 4 tons.

This motor-car did not, however, run in the competition, although entered.

No. 6, Fig. 4, was a Le Blant brake for 12 persons. It was built in 1892, and was the winner in 1894 in the contest inaugurated by *Le Petit Journal*. It has been slightly altered since then by the addition of a roof and another seat. It is driven by three-cylinder steam motor having cranks 120 degrees apart, working as a simple engine. On the crank shaft are pinions carrying chain which transmits the motion to the rear



Figs. 2 and 3 (Official No. 4).—Weidknecht Motor-Car (Elevation and Plan).

wheels in the usual way. Steam at a working pressure of 10 kilos. per square centimetre = 142·2 lbs. per square inch is supplied by a Le Blant boiler which is a modified Serpollet. At 250 revs. the power developed is about 12 H.P.

Both boiler and motor, together with the bunkers, tanks, &c., are placed on the front of the car, the rear part being taken up by four seats. On the roof 500 kilos. = 1,100 lbs. can be carried. The wheels are of iron and are of heavy construction. The carriage is carried on springs in the usual manner. Steering is effected by a hand-wheel which gears into the front horizontal

No. 10 was a Panhard and Levassor omnibus, constructed to carry 10 passengers and their baggage, the latter on the roof. There is a 12 H.P. Phœnix oil-motor, having four cylinders arranged in the manner customary with this firm. The water for cooling purposes is contained in a tank which holds sufficient (what this may be we are not informed) for a run of 30 miles. The motor is geared for four speeds, and the speed ranges from 2½ to 9½ miles per hour. The total weight is about 2½ tons.

No. 11 was a light parcels delivery van, made by the Anglo-

Fig. 4 (Official No. 6).—Le Blant Brake.

wheel surrounding the pivot. The weight of the car empty is about 3,500 kilos. = 7,714 lbs.

No. 7 was a Le Blant train, composed of a steam tractor, Fig. 5, towing a goods-wagon laden with 10 tons of ballast. This train is intended for the mineral traffic. The engine is a two-cylinder one fitted with Walschaert valve gear, and works with steam at a pressure of 10 kilos. or 142 lbs. per square inch; at 180 revs. per minute it develops 60 H.P.

No. 8 was a Bollée oil motor-wagon built by the De Dietrich Company, and is designed to carry a load of about 1 ton or more at a speed of 9½ miles and on moderate grades at 3½ miles.

French Company, of Birmingham and Paris. It is driven by a horizontal motor having two cylinders, and develops about 10 H.P. As we hope to describe this car, with drawings, in our next number, we need not now further refer to it, except to say that this van will carry about 1 ton of goods and seemed to be well adapted for its purpose.

Although entered for the competition, at the last moment was withdrawn.

No. 12 was a Le Blant tractor, built in 1894, attached to an omnibus, Fig. 6, having a seating capacity for 24 and a baggage capacity of 600 kilos., or 1,320 lbs. The motor is a wo-cylinder

2 H 4

engine a bye-pass valve is fitted whereby high pressure steam can be at will admitted to the low-pressure cylinder. When running at 600 revs., the engines develop 25 H.P., and the speed is about 7½ miles. The bunkers will hold four hectolitres of coke and about 100 gallons of water, sufficient for a run of 20–21 miles.

No. 14 was a De Dion and Bouton omnibus, seating 14 passengers. The arrangement of the boiler and machinery is similar to the foregoing example. The speed is about 10½ to 11 miles per hour, and the weight of the car about 4½ tons. A feature of the De Dion and Bouton motors is the use of Cardan joints, by which considerable freedom of movement between the driving and driven shafts is permitted.

No. 15 was a char-à-banc, built for the Maison Parisienne, seating 12 persons, and driven by a Benz motor of about 9 H.P. It can carry about 1 ton of goods.

A feature common to nearly all these vehicles was the use of brakes on the axles or hubs

Fig. 5 (Official No. 7).—Le Blant Tractor.

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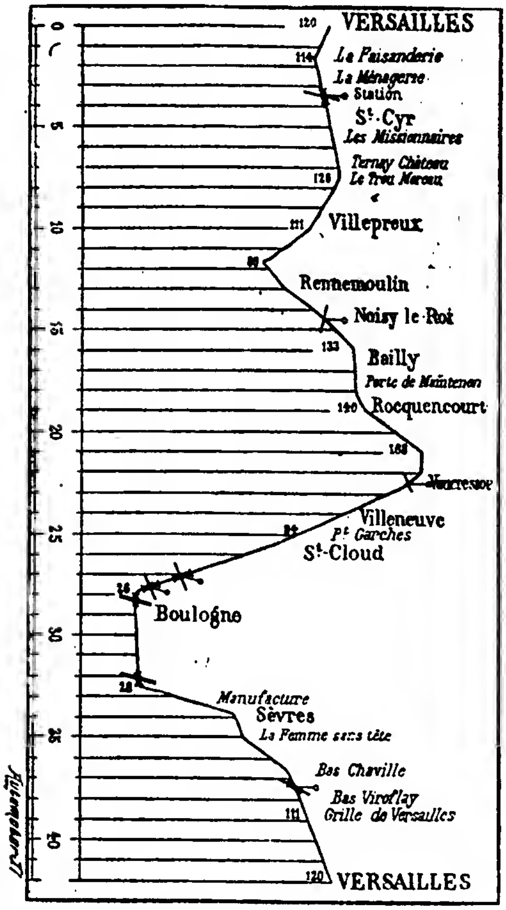
Rocher de Caucale, which looks upon the Place d'Armes, in front of the Versailles Palais.

Description of the Routes.

The nature of the gradients on the various routes will be seen by the accompanying profiles.

Three different routes lying around Versailles were selected, denominated respectively Routes A, B, and C. Route A was from Versailles to St. Cyr, Villepreux, Noisy-le-Roi, Rocquencourt, St. Cloud, Porte de St. Cloud, Sevres, Viroflay, to Versailles; the total distance being 41·3 kilometres = 25·6 miles, of which 11·20 kilometres, or 6·9 miles, was made or macadamised road.

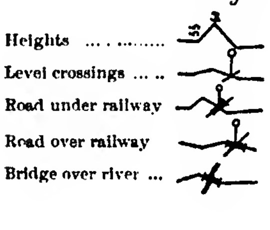
Route A.



Route B was Versailles, Ville d'Avray, St. Cloud, Suresues, Puteaux, Neuilly, Porte Maillot, back again to Rueil, Pecq, Saint-Germain, Marly-le-Roi, Rocquencourt, Versailles; the total distance being 45·9 kilometres, or 28·35 miles, of which but 3·47 miles was macadamised or paved.

Route C was Versailles, Satory, Port Royal, Dampierre, Bois St. Robert, Cernay-la-Ville, Chevreuse, St. Remy, Gif, Orsay, Palaiseau, Igny, Jouy-en-Josas, Versailles; the total distance being 66·1 kilometres, or 40·98 miles.

Signs and Scales.



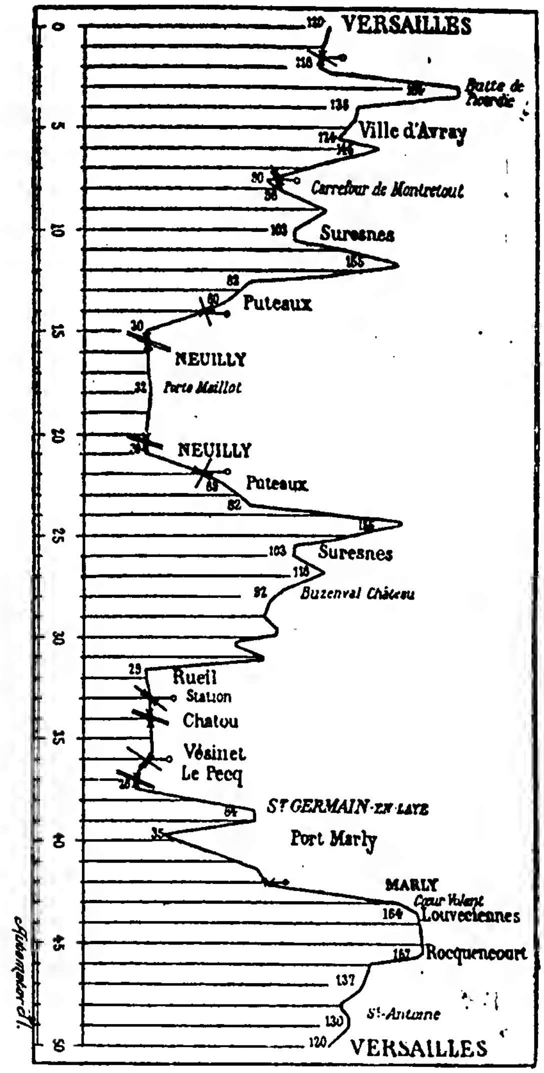
Scale, 2 mm. = 10 metres for heights.

„ 2 mm. = 1 kilometre for distances.

At various points on the route were stopping-places for taking on board fuel, water, &c., but only 15 seconds at each stopping-place was permitted.

From these profiles it will be seen that the routes are distinctly hilly, and well calculated to test the qualities of motor-cars. But one other condition was necessary to make the test perfect, and that was mud; and this was not wanting. The first three days of the trials were characterised by very

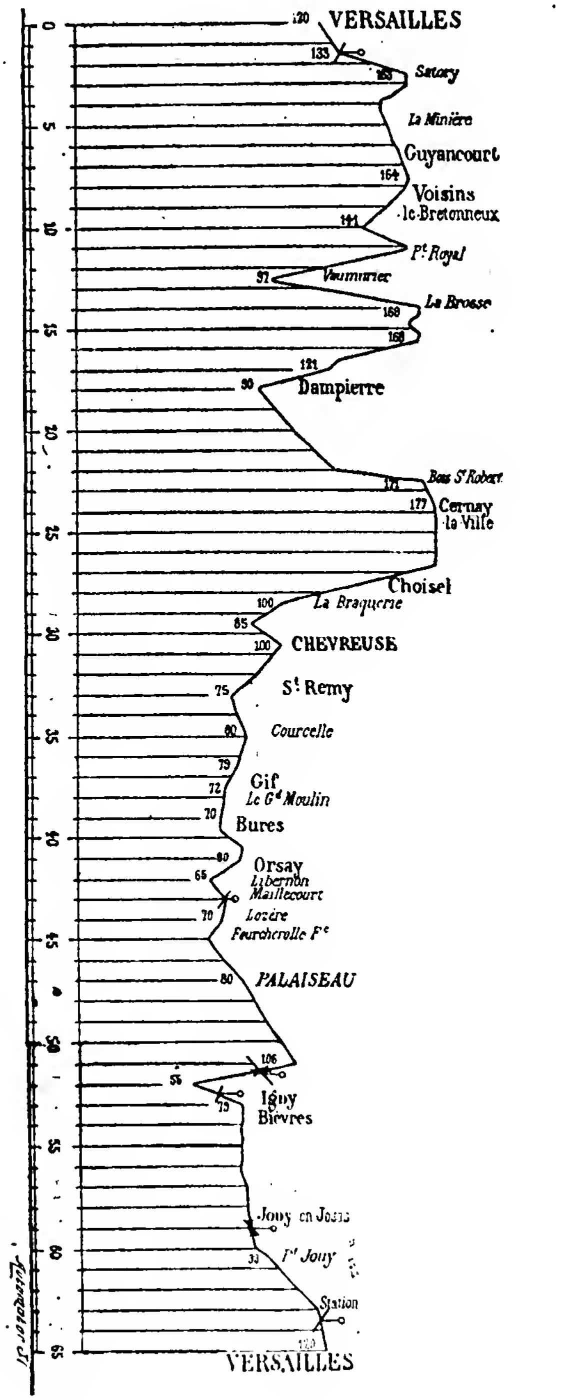
Route B.



hot dry weather, and the roads were miniature Saharas for dust, which was blown about in dense clouds, particularly near Versailles, and this not only got into one's eyes and nostrils, but blowing into the exposed working parts of the motors, especially such parts as chains, &c., added to the severity of the tests. On August 8th there was a good 12 hours' rain all over Paris and its environs, and the roads, notwithstanding their general excellence, made the going very difficult for the remainder of the trials. Thus, then, the tests were very severe, and hence are of great practical value.

As we go to press we have not yet received the Judges' report, and hence cannot give the official results. Any private judgment on the performances that we might have formed would, unless based upon official data, be invidious; we therefore withhold our criticism for the present. We may, however, say that, speaking generally, all the competing vehicles underwent the trials in a very satisfactory manner, and completely demonstrated the feasibility and economy of

Route C.



heavy motor traction. In our next issue we shall analyse the data.

LAW REPORTS.

Traction-Engine v. Motor-Car.

At the Holt Petty Sessions, last month, Ephraim Allen, locomotive proprietor, of Cley, was charged with a breach of the Locomotive Act at Briston, on July 5th. Police-constable Dunn said that on the morning of that day he saw a traction-engine. Seeing no one in front of it, he stopped it and asked the driver why he had not a man walking in front, as required by law. He replied it was unnecessary since the alteration in the Act. Witness told him he had no notice of such alteration, and bade him conform with the regulations. He, however, rejoined he knew he was right, and rode on. In the afternoon witness met the same engine and driver near Melton Constable railway-station. As there was no one in front of the engine he again spoke to the driver, who again affirmed that there had been an alteration in the Act. Both of the places at which he met the engine were dangerous.

The defendant said that with the driver and stoker he sent a man to walk in front of the engine. His son told him that he had heard that the Act had been altered. Defendant had pressed him as to whether he was sure on that point, not wishing to get into trouble.

Mr. C. W. H. Cozens-Hardy thought that possibly the son was thinking of the Act passed last year with reference to motor-cars.

The defendant admitted his responsibility, and the Chairman advised him to know more about what Acts were passed. Fined 2s. 6d., and 3s. 6d. costs.

Sir W. E. J. Vavasour's Failure.

At the London Bankruptcy Court, on August 10th, the case of Sir William Edward Joseph Vavasour, Bart., was on the list of public examinations. The debtor, who is described as of Alexander Square, W.; Hazlewood, Tadcaster, Yorkshire; and Draycott, Stoke-on-Trent, has during the past twelve years devoted the greater part of his time to the study of electricity, and has invented various improvements in electrical appliances. He has acted as the managing director of the Akester Electric Motor and Accumulator Company (Limited), &c. By consent of all parties the examination was adjourned until next November.

Tyre Case.—Important Judgment against the Dunlop Company.

Pneumatic Tyre Company (Limited) v. Ixion Patent Pneumatic Tyre Company.—On August 4th Mr. Justice Wills gave judgment in this case, which was an action brought by the Pneumatic Tyre Company (Limited) and the Dunlop Pneumatic Tyre Company for an injunction against the Ixion Patent Pneumatic Tyre Company, to prevent them from infringing the Dunlop tyre patent which was granted to Mr. Welch in 1890.

The chief feature of the Dunlop tyre, it was said, was that it was saddle-backed with inextensible edges, and with wires that held it rigidly in position. The alleged infringement consisted of inextensible edges secured by a flat band of metal sewn into a sort of pocket.

The defendants denied the alleged infringement, and contended that the patent was invalid, inasmuch as the completed tyre showed disconformity with the provisional specification.

His lordship held that the real question between the two parties was whether the bands of the Ixion tyre really depended upon tension, and on that point he had come to the conclusion that whatever might be the other forces at work in the Ixion tyre, the effective balance of force which held the tyre in position was the power of compression or contractile force. He gave judgment for the defendants on the issue of infringement and in the action, and on the question of the validity of the patent he gave judgment for the plaintiffs. He directed that the taxing master should tax the costs as if the defendants had succeeded *in toto*, and then knock off one-third of the amount, as the defendants had raised the question of the validity of the patent.

THE LAW OF PRESS CRITICISM.

The recent action of Mr. Wicks, of Wicks' Patent Syndicate (Limited), for alleged libel against the *Financial Times* has been the means of placing on the law records one of the most satisfactory definitions of the duties of the public Press in regard to the criticism of wild-cat schemes and other ventures when offered for public subscription under the Limited Liability Acts. Although we are not concerned to discuss the merits of the value of these patents, it appears that the *Financial Times*, having a full knowlege of the invention, very rightly placed their opinion of the value before their readers, and we, with the whole of tbe Press of the United Kingdom, rejoice in the good fight fought by our financial contemporary which has culminated in what will be a memorable judgment for all those concerned with candid Press criticism. The duties of the public Press could not be more clearly defined than in the words of Lord Russell, the presiding judge, who during his summing-up said :—

"This at least is clear—that when an individual or a company goes to the public with such an announcement as this preparatory, as it is admitted, to asking that indulgent public to contribute money, and to contribute large sums of money, the persons who take that step at once expose themselves to public criticism. Nay, they invite public criticism, and it is not merely the right, but I would go even further, and say it is even the duty of a public journalist who purports to be interested in and to advise the public upon financial concerns, to criticise closely and severely, avoiding misstatements of fact if they involve libel—avoiding imputation of motives if they are not able to justify them, but criticising thoroughly—aye, and I will even add severely—the claims to public support which these persons are making. If there ever was a time in which a jury, in my judgment, ought to hold the shield of protection over an honest journalist, who is honestly criticising the claims of these promoters of companies to public support, this is the time. A journalist who, for a sordid or interested motive, dishonestly attacks persons or companies ought to come under the very strongest and severest condemnation of a jury ; but the journalist who, honestly desiring to do his duty, warns the public to scan, and scan closely, the schemes that are presented to that public, and in relation to which they are asked for large pecuniary support, such a journalist deserves every protection that the law can give him."

Although we, during our brief but successful career, have without fear or favour criticised certain financial schemes which have come within our sphere, we are nevertheless glad to recognise the substantial good done by the *Financial Times* in obtaining, at what must be considerable cost to themselves, such a very explicit and satisfactory statement of the law, and one so useful and valuable to the Press at large.

NEWCASTLE STARTS ANOTHER MOTOR-CAR.

A fortnight ago a new motor-car started from the Haymarket, Newcastle, for a run to Morpeth and back. The van was built by Messrs. Harris, coachbuilders, of the Haymarket, to the order of a company that owns a new proprietary medicine. Like a tramcar, it has a door at each end. The motive power and driving gear were made by Messrs. Toward and Co., St. Lawrence, Newcastle. The coachbuilders and engineers worked to each other's hands, and their joint production is the smart-looking vehicle shown in the illustration. The motor power is steam, the steam generator being of the light water-tube type, on an improved principle. In adopting the water-tube type of boiler instead of the "flash" or "Serpollet" type, Messrs. Toward and Co. state they have been influenced by exhaustive experiments with both classes, and although there are some good points about the latter they consider the balance of advantage is so largely in favour of the former that they have decided to adopt it in their motor-car machinery. A few of the principal advantages which Messrs. Toward and Co. say they find are "freedom from excessive heat, large reduction in weight, great saving in time in first lighting and getting on to the road, absolute reliability of steam supply and pressure under all conditions, economy of fuel, and economy of space occupied." The boiler is 20 inches square and 24 inches high, contains 55 feet of heating surface, and weighs 550 lbs. It is stated to be capable of evaporating 350 lbs. of cold

Steam Motor-Van by Toward and Co.

water per hour, and discharging it at 200 lbs. pressure on a consumption of 1 lb. of coke for each 12 lbs. of water evaporated. The evaporation required for driving the van at a speed of, say, about eight miles an hour is about 160 lbs. an hour, at 100 lbs. pressure. There is thus a large excess of power at command. The steam-engines are of the horizontal high pressure type, and drive through an intermediate shaft with differential gear and sprocket wheels by chains to the two driving wheels which have rubber tyres. The starting and reversing levers, and steering handle, pressure gauge, &c., are all arranged in front of the driver. The start from the Haymarket was made at a quarter past two, the bridge at Morpeth being crossed at a quarter to four o'clock. The return journey was begun at half-past six o'clock, and Newcastle was reached a little after half-past eight o'clock, after a smooth journey without untoward incident of any kind, the machinery having worked without a hitch.

Naval Automobilism.—The Thames Valley Launch Company, of Weybridge, have, we understand, delivered 14 electric boats from their works since last September, two being for Chester, one for the Government, one for the Southport Corporation, one for Llangollen, and others to different places on the Thames, or elsewhere, for use on rivers, canals, lakes, &c.

NOTICES.

Contributions and articles likely to prove of interest to our readers will receive due attention, but in all cases the name and address of the writer must be given, not necessarily for publication.

All matter intended for publication should reach us not later than the 10*th of each month. Stamped envelope must be sent if the manuscript is required to be returned. The Journal is published the middle of each month.*

All Advertisements should be sent to the Advertising Department, F. KING AND Co., LIMITED, 62, *St. Martin's Lane, London, W.C., where Advertising Rates may be had on application.*

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The Automotor and Horseless Vehicle Journal.

A RECORD AND REVIEW OF APPLIED AUTOMATIC LOCOMOTION.

AUGUST 18TH, 1897.

ANSWERS TO CORRESPONDENTS.

WANDERWEIDE (Amsterdam).—We regret to say No. 1 is entirely out of print. You might possibly get one privately.

T. H. (Preston).—We are sorry you had so much trouble. There should be no difficulty in obtaining our paper at Smith's bookstalls. We would suggest you writing direct to the firm's head office complaining of the matter, when it would be sure to have immediate attention.

TYRE (Bolton).—The particulars you send read like a fairy tale, and we must certainly decline to give publicity to the details which you send until we have had an opportunity of completely testing your statements. If correct you evidently have a fortune before you.

MECHANIC (Londonderry).—If you apply to Jessop Browne, City Wheel Works, 104, Great Brunswick Street, Dublin, you will find he can supply you with exactly what you want.

B. L. (Coventry).—It is useless to use packing for high pressure steam joints. Face up your joints properly and use copper wire. After steam is up give an extra squeeze in all nuts.

W. W. (Cardiff).—We have not heard anything further about the steam motor-van you mention. Ask Thornycroft's of Chiswick.

F. K.—You will find an oil strainer in your tank a useful thing. You can easily make it from wire gauze.

C. H.—Indicating an oil motor is a thing which requires good manipulative skill and knowledge. Examine the piston.

W. P. (Birmingham).—We do not recommend rubber tyres for heavy motor-vans.

R. G. (Newcastle-on-Tyne).—So far as we know the Elswick firm have not made any military motor-vans. We understand that the War Office is, however, watching the development of motor-car propulsion, especially for ambulance service.

T. A. (Hampstead).—Boilers for motor-cars are not subject to Lloyd's or the Board of Trade surveys. We should advise the construction to be under the supervision of one of the large boiler insurance companies, who would assure you against risk. No, the driver need not be certified.

AN AUTOMOBILE CLUB FOR GREAT BRITAIN.

We have received from Mr. F. Simms a letter which appears in our correspondence column announcing the projected formation of an Automobile Club for Great Britain. It is, of course, very desirable that a club for the purposes indicated in the letter should exist, but it is also essential that the conduct of the club should be in hands unconnected with commercialism. Without impugning in the slightest degree the *boná fides* of Mr. Simms, we think that his connection with the commercial side of automobilism would operate as a deterrent to many who would otherwise gladly associate themselves with such a movement. It was, we believe, this feeling which operated to prevent the success of the Motor-Car Club, the failure of which to command success appears to give our correspondent "some sorrowful feelings." Clubs and kindred institutions when run for commercial ends undoubtedly tend to become a "single man's institution," to again quote our correspondent. Whether the Self-Propelled Traffic Association comes within this category is a question of fact, and so far as our knowledge of it goes, we should say it was not. As its name implies traffic is its *raison d'être*, and hence the social aspect of automobilism hardly comes within its purview, and so far as we know it is not, at any rate, intended that it should. The Motor-Car Club, on the other hand, was ostensibly social in its aims, but was really a commercial adjunct to a business and hence did not command the support of the leading British automobilists, and therefore failed. The great success of the French Automobile Club has been due to the salient fact that it was established by a body of gentlemen for the purpose of promoting automobilism in all its aspects. Its policy is a single-minded one, and it welcomes to its ranks all who, otherwise suitable, are interested in automobilism. It by no means discourages engineers and manufacturers; on the contrary it includes in its ranks persons who commercially are necessarily keen business rivals; but commercial interests are not allowed to sway its policy. The fact that its committee is composed of some of the most distinguished French public gentlemen is guarantee enough for that; and we are sure that it is to this disinterested and patriotic desire on the part of the committee to foster an industry, which we, also with "some sorrowful feelings," admit is coldly regarded by an unenlightened British public, that the splendid success of the Automobile Club of France is due.

His Excellency the President of the French Republic is glad to recognise the efforts of the Automobile Club of France and officially encourage it. We are not aware that any public man of high rank supported the Motor-Car Club for reasons which we have hinted, and which are sufficiently well known to render any further reference superfluous. It will interest our readers to know that an Automobile Club, although not the one referred to by our correspondent, is in the process of inception, and it will comprise many distinguished English names, and will also have the recognition and support of the French Automobile Club, which we may say will hardly be accorded to the institution referred to by our correspondent. Not but that the latter might not equally merit such support. We do not say nor imply that it would not; the fact, however, that the gentlemen promoting the latter are, if we mistake not, interested in the commercial aspects of automobilism is, to our mind, fatal to its success. Our remarks may appear to many to have the effect of throwing cold water on what, for aught we know to the contrary, may be a perfectly legitimate institution. We must, however, point out that Mr. Simms does not furnish us with the names of his supporters, and hence his prospectus is, to say the least, premature. It is true that a few gentlemen attended an informal meeting held at the proposed club premises on the 10th inst., but we are not aware that any large subscriptions were forthcoming, nor was there much support from those most prominently associated with the industry. We observe, too, in looking over the proposed rules that the latter are largely a transcript of those adopted by the Automobile Club of France. This is not a bad thing *per se*, but it does strike one as an odd coincidence that this prospectus and rules should be issued just at the time when another club having aims and policy similar to tho Automobile Club of France is being started. Mr. Simms may, of course, plead that owing to "such critical times" his scheme admits of no delay, but that a club is necessary to save the British motor industry from utter annihilation. We are not aware that the times are "critical." We claim to know what is being accomplished, and we should say that, so far from being critical or fraught with tribulation, the present times are distinctly propitious for those engaged in the legitimate automotor industry. The British public does not readily grasp new ideas, and it has not quite assimilated the economic possibilities of automobilism. This opaqueness has, however, its good point, as it acts as a salutary check upon those who would otherwise exploit new and immature industries. In this light the abortive trials, exhibitions, and competitions of and between motor-cars in Great Britain have been of great value—hardly, perhaps, to their promoters, but distinctly so to the public. Inasmuch as the public is only just beginning to see the advantages of automobilism, there is no particular haste for the formation of any club. We should prefer to see any such formation proceed on deliberate and well-considered lines, and accompanied by the disinterested moral and financial support of persons in high station who are alive to the needs of promoting automobilism, not so much as a sport or relaxation for the well-to-do, but as a means of promoting and facilitating internal commerce and transport. We are not aware that these views were enunciated at the recent informal meeting, and we certainly are of opinion that before definite steps are taken, and if success is to be assured, possible members should be fully informed as to these points.

THE COMPENSATION FOR INJURIES ACT.

This measure, perhaps one of the most important pieces of social legislation ever attempted, has at length become law, and takes effect from July, 1898. The principle of the new law is, briefly, that persons injured while following their employment deserve to be cared for by their employers. Such a distinctly altruistic doctrine is at first sight startling, and one's amazement is not lessened by the fact that this socialistic principle has been endorsed by a Conservative Government. The consequences of the new law will be very far-reaching, and the first will undoubtedly be to largely increase the business of those insurance offices who take up this kind of risk. Every employer will, as a matter of prudence, insure his liability; the milliner who employs but one assistant and the shipbuilder who may employ thousands, will alike find it necessary to do so. At first sight it may appear that employers are having a fresh and harsh burden placed upon them, but a little reflection will show that this is not so. The risk of liability to pay compensation to an injured employé will be but another trade risk, like fire, bad debts, and the like, and will be covered by, in most trades, a small additional percentage on the present premium. Some employers and trades will, no doubt, feel the effects of the new Act. Thus, the tradesman, greedy of profits, who neglects fire insurance, sanitation, and who gets all he can "on the cheap," will find claims come upon him as a thief in the night; the employer who follows a dangerous trade will undoubtedly find his premiums of insurance largely increased. The Act, however, is good, in that it inculcates a wholesome prudence on the part of employers of every class, and it does something to alleviate the hard lot of many families who know that the sickness of or injury to the breadwinner means a bitter struggle with poverty. It should be explained that the Compensation for Injuries Law is wholly distinct from the Employers' Liability Law. By the former the employer has to give sustenance to an employé for injuries incurred by the latter, no matter under what circumstances, excepting wilful carelessness on the latter's part. By the latter the employé can only claim compensation for negligence on the part of the employer. Owing to that besetting sin on the part of our legislators—the absence of accurate definition in their Acts—the new law will undoubtedly be good—for lawyers, and much judicial interpretation will be needed before the "evident intention of the Legislature" is determined. Nevertheless the law is a necessary and welcome addition to the Statute Book.

BRITISH MOTOR-CARS IN FRANCE.

Much might be written on this head, but all may be condensed in a few words. British motor-cars in France are in the same category as the snakes in Ireland—there are none. We are not infrequently reminded by economists and others that there are not wanting signs to show that we have passed the zenith of British enterprise, and, instead of leading the way in new industries, we are following in the wake of others. Certainly there seems some foundation for this. When the abortive *Engineer* Competition was discussed, we were assured that manufacturers did not compete because they did not wish to "give themselves away" by publishing the details of their wonderful mechanisms; they were not ready, or "they had married a wife, and therefore could not come." The favourite objection was that the conditions as laid down by *The Engineer's* judges were too stringent, and demanded an unattainable degree of excellence. Well, granting all this, how is it that no English motors were to be seen at Paris-Dieppe or at Versailles—especially at the latter place? We have been assured with wearisome iteration: "Oh, we are not going in for light vans; we are designing and building vans for heavy traffic." And one hears mysterious hints how this firm has a heavy motor-van somewhere in its back-yard, and how that firm has another somewhere else; and one is begged to forbear mentioning any particulars of certain motor-vans that apparently are "Spanish castles." One can never get a sight at these remarkable productions. If ever there was a chance given to manufacturers and engineers to show what they could do, it was by the French at the recent competition. The conditions were absurdly simple and elastic; but as regards the Versailles Competition the trials were rigorously technical, and of a much more scientific character than those promoted by *The Engineer*, and yet not one single English firm competed. In a few years' time the motor-wagon industry will be, like locomotive building, in the hands of a few. Motor-wagons will be seen on the Indian, Chinese, and Argentine plains, but they won't be of British manufacture.

Apparently British motor-wagon builders are sitting on the fence and waiting to pick up wrinkles from their French rivals. If you ask a county councillor, a tramway director, or a manufacturer, the answer is invariably the same—"Oh, yes, we are studying the question and are *waiting* to see what the experience of the French is before adopting the motor-car," and so forth and so on. We can only say that our commercial position has not been attained by our fathers "waiting to see"; they did not wait, but went and did it. Considering the outcry that has been raised by manufacturers over *The Engineer* fiasco, we are bound to say that it does not redound to their character for enterprise that they refrained from appearing at the recent French competitions; and we would ask those who had entered for *The Engineer* competition, and who drew back at the last moment, why they have also neglected the French ones? Surely designs must now be pretty well worked out. We should regret very much if those merchants and others who are prepared to inaugurate road traction systems for heavy traffic, and who are waiting, not without signs of impatience, for the suitable kind of tractor, should decide to adopt a "Scotte" or "De Dion." It must be remembered that these motors have been thoroughly well tested and are known to suit the conditions which would obtain in many towns. Are they to be adopted because there is no suitable British tractor in the market?

THE FRENCH MOTOR-CAR COMPETITIONS.

"They manage these things better in France" is a somewhat stale observation, but one nevertheless true in many matters. It is certainly startlingly true as regards motor-car competitions. For the last few years these have become quite a national feature, and every summer several are held. At first they partook largely of the sporting element, but of late this has given place to a sincere desire to produce horseless vehicles that will have practical value. A curious thing about them is that they are projected mostly by newspaper proprietors, although it is not altogether apparent that the latter derive anything more substantial than the *kudos*. It cannot be questioned that these motor-car competitions are exceedingly popular with all classes of the community. The rich find in them a new excitement distinctly more intellectual than that attaching to horse-racing and other equine pursuits; the middle classes hail the possibility of "having one's own carriage" without the expense of a horse; while shopkeepers and tradesmen welcome them as solving the problem of cheap traction and better internal transport. The interest that is thus taken in motor-cars is of an intelligent nature, and a competition gives an excuse for one of those fêtes which our French friends manage so well. Both the Paris-Dieppe and the Versailles Competitions have been eminently successful. The light oil-motors have been proved to be safe, reliable, controllable, and ridiculously cheap in working. In the hands of ordinary French workmen they give no trouble. Indeed, many of these motor-carriages are looked after and driven by page-boys. The success attained by these motors at Dieppe has, we confess, compelled us to modify some previously-entertained opinions. Like most people in England, our ideas of mechanism have been largely the result of association. When one is accustomed to move about among engines that put anything over 1,000 H.P. on to a single crank, one is apt to regard lighter mechanism with something like good-natured indifference. Hence the man who squeezes up an armour-plate or who drives an express engine, will regard an oil-motor that can be comfortably enclosed in a hat box as an interesting toy, but wholly incapable of serious and practical work. It is these very natural but prevalent ideas that we think account for the unquestionable suspicion with which motor-cars are regarded in this country; the average man cannot grasp the fact that so much power can be produced in so small a compass. Added to this there is the so-called risk attaching to the use of the lighter petroleum oils—a risk which exists, and will exist, because in our Board Schools we teach boys and girls such things as pianoforte playing and shorthand rather than the elementary physics connected with kitchen boilers and petroleum lamps. The writer may be permitted to mention in this connection that a few years ago, when the "deadly lamp" agitation was rather acute, he offered the London School Board to give a course of elementary lectures on the

A HEAVY BRONZE TAIL SHAFT.

contains over 100 pages of information. Price 6d.; post free, 7*d*., of Messrs. F. King and Co., 62, St. Martin's Lane, London, W.C. See it for the Regulations respecting Automotor-Carriages and the Carriage of Petroleum.

and is hardly what one would expect from an ex-Minister of the Crown. Liverpool has an exceptionally able municipal engineering staff, and is also a large railway centre. Surely it should not be difficult to find a suitable tramway engineer?

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FIG. 1.—PEUGEOT MOTOR (General View).

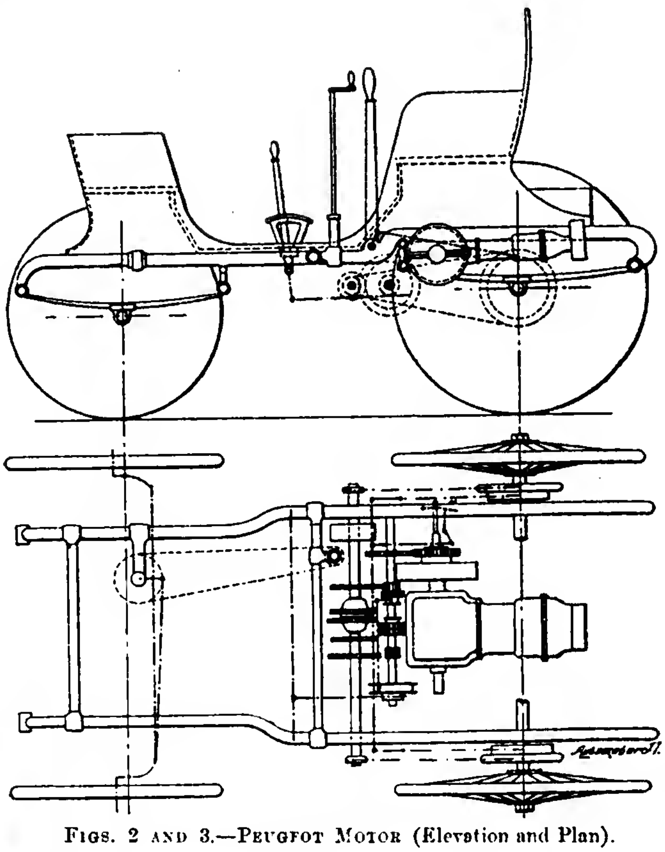
motors, they are absolutely safe, and are really wonderful examples of large power being obtained from very small and light machines. Among those who have worked hard in the development of the light oil-motor the name of M. Peugeot stands deservedly high. His motor-cars and motor-cycles are well known, and he has obtained many successes with them. Lately he has made a new design of motor which we illustrate in the accompanying drawings. It will be seen that the new motor (Fig. 1) is horizontal and has two cylinders, the casings and guider of which terminate in a cylindrical chamber, thus enclosing the cranks and admitting of very perfect lubrication. The rear part of the cylinders forms another chamber in which are the valves, &c.

The inlet valves are above and the exhaust valves below. For inspection purposes the valve chamber is fitted with a removable cover. Behind the valve box, as will be seen, is the ignition chamber containing the ignition tubes, which are heated by means of a lamp.

Figs. 2 and 3 are respectively an elevation and plan of the latest type of Peugeot car, and show the arrangement of the motor and gearing. Figs. 4 and 5 are respectively vertical and horizontal sections through the motor. It will be seen that the motor works on the Otto cycle, and that by the use of the two cylinders there is an impulse at every revolution. Attached to the end of the motor-shaft is a heavy-coned fly wheel into which fits a friction cone for transmitting the motion through the gearing. On the other end of the motor-shaft is a crank handle used to draw in and compress the initial charge of oil and oil vapour. Fig. 6 is a centrifugal governor, and Fig. 7 an expansion cam.

The admission and exhaust valves are actuated by a shaft which is placed underneath the motor. At the front end where it enters the cylindrical box, it carries a lever which is made with a slide at the upper end. This slide, K, engages in the groove of the cam, C, of which a side view is given in Fig. 7. An angular movement is imparted to it by this arrangement, giving to the distributing shaft a partial rotation. This oscilla-

with the reduced movement of



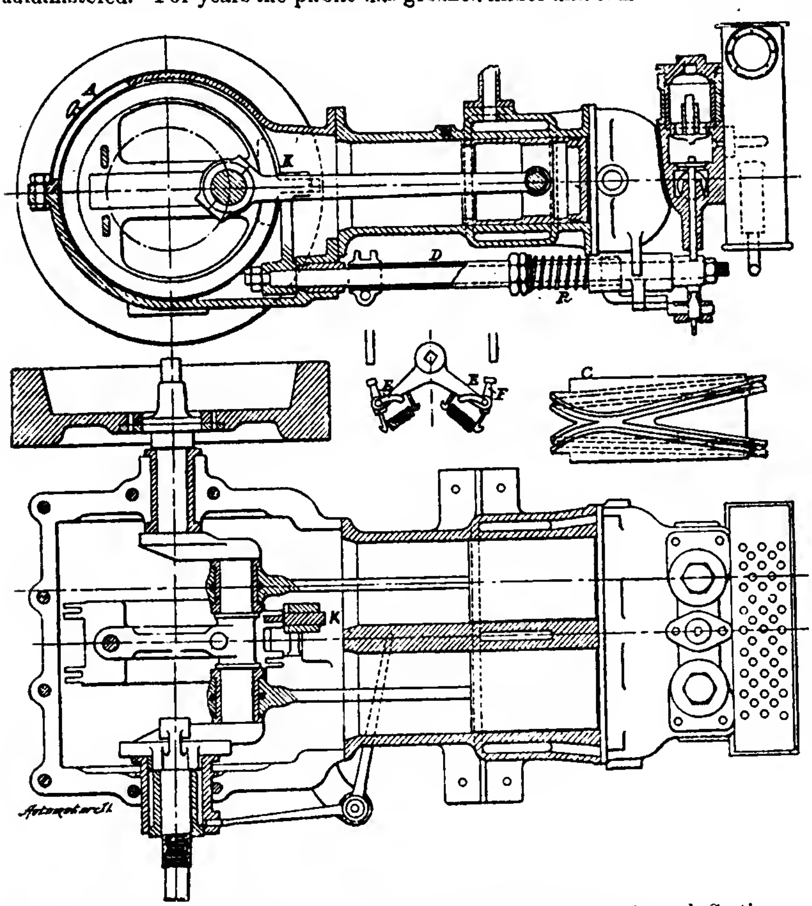
FIGS. 2 AND 3.—PEUGEOT MOTOR (Elevation and Plan).

the governor all the various parts resume their normal positions.

From the trials that have been made this motor gives very great satisfaction and is remarkably free from vibration.

POST OFFICE ANOMALIES.

The great test of the efficiency of public administration is satisfaction on the part of the public, and contentment in the rank and file of the service. Judged by this standard the British Post Office cannot by any means be said to be well administered. For years the public has groaned under and complained of official inefficiency, and for years the postal service has been characterised by seething discontent and agitation; the public is badly served, and the minor Post Office official badly treated, till at length we see the latter in almost open revolt. We do not intend here to discuss the grievances of the Post Office officials, but we may say that when we see a body of skilled and, therefore, intelligent public servants obliged to resort to the most extreme measures in order to obtain redress for admitted wrongs and abuses we can only conclude that the administration under which they serve must be badly managed. It is a safe general conclusion, and one fully confirmed by all history, ancient and modern, that dissatisfaction in subordinates is, as a rule, due to incompetency on the part of the superiors. In the army and navy scores of cases can be cited in which the gravest consequences to the public service have been averted by the simple expedient of removing the officers. We do not say that the Post Office is another case in point, but speaking from some



Figs. 4, 5, 6, and 7.—Peugeot Motor (Vertical and Horizontal Sections, Centrifrugal Governor, and Expansion Cam).

experience of its ways and methods, we cannot say that the Post Office administration strikes us as particularly successful or economical. The public pays a very high price for, after all, a very inferior service. The public does not get value for its money, nor are its interests sufficiently safeguarded. Unfortunately the British public is deplorably apathetic in looking after its conveniences. It is a generous employer who does not like to deal harshly with its servants. Thus, because the Post Office wills it, London, the metropolis of the world, is practically without a telegraphic or postal service on Sundays, and it is theoretically unlawful to purchase a postage-stamp after 8 p.m. on week days. On the other hand the public is robbed of many thousands of pounds annually because valuable letters have to pass through the hands of badly-paid minor officials who have little incentive to honesty. London, and for that matter, the large provincial cities, enjoy the worst and most expensive telephone service that prevails in any civilised country, merely because of the lack of business capacity on the part of the higher Post Office officials who have managed so badly that the public suffers under a telephone monopoly. Some day this grievous mistake on the part of the Post Office will be rectified by public money being spent in buying back public rights.

Consider also the difficulties that the Post Office has made in the matter of district messengers. A public convenience cannot be utilised to its full extent because of the difficulties made and obstacles put in the way by the Post Office officials.

A Directory of Telegraphic Addresses is surely another public convenience, yet the Post Office would neither issue one officially nor allow any private person to engage in the work. It at last dawned upon the somewhat pachydermatous brain of the "high official" that its attitude was ludicrously absurd, not to say improper, and official opposition was at length grudgingly withdrawn, and the public now has a convenience it should have had twenty years ago.

Similarly in the Engineering branch of the Post Office one sees but little evidence of acquaintance with the latest advances in telegraphy. Although it has been pottering at the subject for years and spending thousands of pounds in absolutely futile "experiments" (*sic*), the Post Office cannot successfully join up the coast lightships with the shore telegraph system; and when the next Post Office Estimates are submitted to Parliament the British public will be asked to pay a heavy royalty to an Italian electrician, who has succeeded in accomplishing what our Post Office engineers are paid to effect, but seemingly cannot, or, at any rate, have not so far. While on this subject we would draw attention to what we consider a very grave Post Office anomaly, and one which makes a most objectionable precedent. The engineer-in-chief of the Post Office draws a very large salary from the public, and at the same time carries on a very large private practice as a consulting electrical engineer. We believe there is no parallel instance to this in the whole public service. What would the public say if the Admiralty, for instance, permitted the Chief Constructor of the Navy to design privately battleships for foreign powers; or what firm would pay a servant a high salary and permit him to carry on a business of the same kind?

It would not be difficult to point out anomalies in every branch of the postal service—it simply bristles with them.

Perhaps some of the most ludicrous of these anomalies are to be found in the Regulations governing the transmission of letters and newspapers through the post. It is difficult, indeed, to say on what principle of public policy or common-sense it has been attempted to follow in framing these Regulations. By them a prepaid postage of one halfpenny is charged for the inland transmission of any daily or weekly registered newspaper, *the weight being disregarded* (*sic*). Now newspapers are commercial articles manufactured for profit. They owe their bulk and weight to the large proportion of advertising matter; and the question at once arises, Why should the Post Office act practically as a free carrier and distributor for newspaper proprietors and not for other tradesmen? At present a newspaper, if published daily or weekly, and not exceeding 14 lbs. in weight, can be sent to any part of the United Kingdom for one halfpenny, yet it costs three pence to send a pound of tea or a pound of hair pins through the post. Why should the grocer and ironmonger be discriminated against in favour of the other tradesman, the newspaper-monger? Again, inasmuch as weight cannot be moved without an expenditure of energy, and as energy costs money, and inasmuch as 14 lbs. of newspaper are moved for ·5*d.* and 1 lb. of tea or other produce is moved for 3*d.*, the question arises, Why should it cost 84 times as much to move a pound of tea as to move a pound of newspaper? As a matter of fact, from the carrier's point of view, the freight on both should be about the same, as both are easily damaged. Who, then, pays the difference in the freight charges made by the Post Office? Why the ordinary taxpayer.

It is contended that the State should encourage the cheap transit of newspapers because of the educational value; when we hear this respectable fiction we do smile. Of what does the ordinary daily nowspaper consist? Excluding two or three, not more, daily papers which have some undoubted educational value and literary merit, the ordinary "daily" consists of 75 per cent. of advertising matter, the balance is made up of such intellectual pabulum as racing, betting, cricket, football, and other sporting intelligence, Police Court news, feeble party political leaders and reviews, pompously designated as "literature"; the rest is "gush and gossip." Why the ordinary taxpayer should be mulcted in order to disseminate tons of such stuff all over the country passes our comprehension. Let us just glance at the heavy weeklies. In the following table we give the proportions of advertising and literary matter as contained in some of them:—

Table showing proportions of Literary and Advertising Matter, Total Weights, and Cost of Postage of some Weekly Newspapers.

Name of Paper.	Weight of Literary Matter.	Weight of Advertising Matter.	Total Weight.	Cost of Postage in United Kingdom.	Cost of Postage, Foreign.
	oz.	oz.	oz.	d.	d.
Engineering ...	4¼	10¾	15	½	4
Engineer	4¼	9¾	14	½	3½
Queen	11	6¾	17¾	½	4½
Field	9½	9	18½	½	5
Lancet	5¾	5¾	11½	½	3

It will be seen that the class of journal ranges from the shallow and frivolous *Queen* to the dignified and classical *Lancet*, and includes our professioual contemporaries, the engineering papers. In all these weeklies the percentage of advertising matter is very high; on the other hand so, excepting the organs of femiuism, is their literary and educational value. From the latter point of view it cannot be questioned that the advertising pages alone of the two senior engineering papers are infinitely more instructive to an intelligent boy than a score of daily papers. Let us labour this point further. Assuming that the reason why the State undertakes the dissemination of newspapers at a ridiculously cheap rate is the "educational and elevating (*sic*) advantages of a free Press," let us see how the Post Office treats that section of the Press which is published monthly. The majority of these periodicals are distinctly educational in their various ways, and hence should at least be treated on the same footing as the dailies or weeklies. Yet the Post Office carries them at the rate of 4*d.* per lb., or ·25*d.* per ounce. Since 14 lbs. of newspaper can be carried for one halfpenny, it is seen that the cost of carrying 1 lb. of monthly periodical is 112 times as much; the effect of this is to seriously hinder the circulation of at least those monthly papers which appeal to a limited and select class of the community—the heavy postage constituting a serious tax. In other words, the Post Office aids by all means in its power the dissemination of the least useful, and in many cases a very pernicious, kind of literature, and heavily taxes that which is most worthy of encouragement. Referring to the heavy weeklies again, it may be remarked that taking their weight as approximately 1 lb. they are carried for one halfpenny; were they published monthly the cost of postage would be 4*d.*, or eight times as much. This anomaly is after all entirely characteristic of Post Office ways and methods.

Lastly, we have that other anomaly arising out of the former. As we have seen, a discrimination is made in favour of daily and weekly papers as against monthlies for inland postage. For foreign and colonial postage a uniform rate of 4*d.* per lb. is charged for all. Thus to send a heavy weekly weighing 1 lb. to the North of Scotland, a distance of over 600 miles, costs only one halfpenny, but to send the AUTOMOTOR, which weighs but 6 oz., thither, costs 1½*d.* To send the same weekly to Paris will cost 4*d.*, while the charge in the case of the AUTOMOTOR is, as before, 1½*d.*

These anomalies cannot be explained by any principles of equity that we know of. We rather think that they are due to the existence of a vicious system of selection and promotion which obtains in the higher branches of the service.

The transmission of letters, telegraphic messages, and general intelligence is a special business *sui generis*, requiring a long technical training to manage properly. Yet it will be found that the higher officials of the G.P.O. are, in the many cases, without the necessary qualifications. Too frequently they owe their positions to political patronage and influence, and there are scores of men in the service drawing salaries of £500 and upwards who intellectually are in no way superior to the "lady operator," who draws a modest stipend of £60 per annum. Many ways of effecting Post Office reform are from time to time suggested in the public Press, and these range from the infliction of boiling oil *à la Mikado* upon the higher officials to their condemnation to serve as "sorters," and from entrusting the administration to those clever persons who organise successful bank robberies to placing the whole concern in the hands of a private commercial company to be run on commercial lines. We certainly are not disposed to deal Japanesely with the "higher officials," and we are not sure that the other methods have not some disadvantages attaching to them respectively. Our suggestion is, that the supply of "small crosses and orders for Mayors and Recorders" and Post Office officials should, as regards the latter, be entirely stopped until a fair amount of efficiency had been attained in the service, and the many existing anomalies removed. The "higher officials" might, in the meanwhile, be compelled to read in their own time a selected variety of those low-class papers which at present they carry hundreds of miles for a halfpenny, and be strictly debarred from reading any monthly periodical that pays more than that for postage. A few weeks of this treatment would, we think, induce a more wholesome and less "official" frame of mind. Till reform be effected, we, slightly altering the text, shall be inclined to say of the Post Office, in the immortal words of Schopenhauer:—"Incompetency sits in high plsces and folly has the casting vote."

Heavy Motor-Car Trials.—From Paris our Correspondent writes that it has been definitely decided to hold a heavy motor-car competition during October, 1898, under the same conditions as those obtaining under the recent trials at Versailles. English manufacturers will then have another opportunity, and no excuse can be made on the score of insufficient notice or time.

President	Sir DAVID SALOMONS, Bart.
Secretary	ANDREW W. BARR, Esq.
President of the Liverpool Centre	The EARL OF DERBY, G.C.B.
Hon. Local Secretary	E. SHRAPNELL SMITH, Esq.
Semi-Official Journal of the Association	THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

SELF-PROPELLED TRAFFIC ASSOCIATION.

LIVERPOOL AND DISTRICT CENTRE.

BY invitation of Mr. Alfred L. Jones (vice-president), a deputation of the council of the Liverpool centre of the Self-Propelled Traffic Association went to Paris to attend the recent trials of heavy motor vehicles, organised by the Automobile Club de France. The deputation appointed included Messrs. Alfred L. Jones, Everard R. Calthrop, S. B. Cottrell, Henry H. West, Lawrence Jones (hon. solicitor), and E. Shrapnell Smith (hon. local secretary). Various pressing business engagements, however, kept back four of the party at the last minute, Mr. West and Mr. Shrapnell Smith therefore being left to report results to the council. The chief object in view has been to learn the exact position of affairs on the Continent before the Association makes any public announcement relative to the proposed exhibition and trials, to be held in Liverpool about June next.

MOTOR-CARS AT THE AGRICULTURAL HALL, ISLINGTON.

AT the Laundry and Motor-Car Exhibition, under the management of Messrs. Cordingley and Co., to be held at the Agricultural Hall, from August 23rd to September 4th, there will be, we understand, a few motor-cars for the inspection of visitors. Amongst those who may be represented are the Anglo-French Motor-Carriage Company, with two or three vehicles, probably including one of their four-seated Victorias driven by a Petrol motor, a four-seated barouche fitted with improved double-cylinder motor and frictional spur gearing, and a four-seated dog-cart; Messrs. New and Mayne; The London Electrical Cab Company; English Motor-Car Company; and Martin's Motor Company. There will also be a steam carriage on the Serpollet system on view. In our next issue we shall give all necessary particulars of novelties, &c., which may be exhibited.

NOTES OF THE MONTH.

Recently an advertisement appeared in our columns offering £100 for steam tractor drawings. In spite of all the statements flying around about the collapse of the motor-car boom, &c., the advertiser received so many replies that he has been constrained to issue a printed letter to applicants, supplying the following details and raising queries preparatory to making a selection from those ready to supply drawings :—

"My carriage is an ordinary landau, weighing 10½ cwt. empty, and, when loaded, is easily drawn on an ordinary road by a pair of 15·1 cobs, at an average speed of 9 miles per hour. I have the desire to make and substitute for the horses a tractor as described in the advertisement, the carriage not to be materially altered, and I beg to ask you :—

"1. Are you aware of such tractors having ever been used?
"2. If so, please name them.
"3. Which of these do you consider the best?
"4. Could you improve upon it?
"5. Are you intimately acquainted with flashing boilers?
"6. If so, please name them.
"7. Which of these do you consider the best?
"8. Could you improve upon it?
"9. Can you provide for smokelessness?
"10. Can you provide for invisible exhaust?
"11. Could all your materials be easily procured, such, for instance, as the boiler tubes?"

A paragraph has recently been going the round of the Press stating that while a motor-car belonging to a Coventry firm was proceeding from London to Leeds, the driver, when two miles from Hatfield, found himself suddenly confronted with a cyclist. He caused the car to swerve, and it overturned into a ditch. The three occupants were thrown out on to the road, and sustained some injury. We have made every enquiry, and can find no authentic corroboration of this statement, either in Coventry or elsewhere. It is curious how these wonderful things happen, and nobody beyond the journalist upon the spot knows anything about them.

A motor-car was this year introduced into the Dunmow Flitch ceremonies after the "sentence" had been passed, the judge and jury parading through the field and along the village in a large motor-car.

Messrs. Windover, of Huntingdon, ran a motor-car, made by their own workmen, over to Peterborough the other day. It carried four passengers, the car itself weighed only 6½ cwt., ordinary crude petroleum being used. The journey to Peterborough and back consumed about 1½ gallons, the journey of 40 miles therefore costing about 6*d*.

The first license for a motor-car to ply for hire in Portsmouth was last month issued to Mr. Rose, of Great Southsea Street. When the application for the license was first made the General Purposes Committee did not know quite how to deal with it, as they were not certain whether the car should be classed as a hackney carriage or a traction engine. The difficulty was, however, ultimately got over, and a hackney carriage license was issued for the vehicle.

A race between a motor-bicycle and a safety pedalled in the ordinary way was decided at Coventry on August 3rd. W. J. Stocks, on the safety, which suffered two punctures, covered 27 miles 300 yards in an hour. The motor-bicycle ran splendidly throughout, keeping up a steady, even pace that would have daunted a less experienced and less capably paced man than Stocks. Soon after the start the motor slowed down, and the crowd jeered immensely, for they imagined its end had come. The cause of the pulling up, however, was that the rider thought, by the shouting of a section of the crowd, that some mishap had occurred on the track, and he requested they might be kept quiet. If Stocks is to be complimented upon his performance, then Taylor deserves also a word of praise for his steering and control of the motor. Although the motor was 300 yards behind, he would be a bold man who declared that the cycle will always be able to beat the motor.

Though the motor-car makes little headway in England, there is every prospect of its services being utilised in Westralia. Already the bicycle is much used on the goldfields, where it has proved to be invaluable; and now the motor-car is being discussed as a solution of the transit difficulty in many parts where the sandy plains form a good road, but where lack of water makes travelling difficult for beasts of burden. It is thought that the camel will be easily superseded by his pneumatic-tyred rival.

Motor cars, built in Hamilton, are running daily on the popular coaching routes in the Island of Bute.

At the Agricultural Society's Show at Harrogate last month, the Yorkshire Motor-Car Company (Limited), of Bradford, showed specimens of the sociable motor-car—capable of maintaining an average of 10 miles an hour on level ground and of making 4 miles an hour up hills, of the Bollée motor-tandem, and of the Beeston motor-tricycle.

On the last day of July Mr. Balfour rode from Downing Street to the House of Commons on a motor-car, on which was also Mr. A. F. Jeffreys, M.P. The start from Downing Street was witnessed by Mr. Chaplin, Sir W. Walrond, and other members of the Government.

One of the most popular pictures now being shown at the Palace Theatre on the American Biograph is "a motor fire-engine." Mr. Charles Morton is always up-to-date in everything he introduces.

We are glad to see that the daily Press is at length realising the importance of the motor-car. Thus the *Daily News*, in its issue of July 26th, contains nearly half a column of an account of the Paris-Dieppe contest, and even devotes an editorial paragraph to it. Says our contemporary :—"Two points are worthy of note with regard to the motor-car race on Saturday from Paris to Dieppe. The first is, that of the fifty-nine competing vehicles none were driven by electricity; the second, that the only steam-driven carriage, which carried as many as four persons, came in next to the winner. All the others were of the somewhat evil-smelling oil type, and the winner travelled at about the usual rate of a Continental railway train—namely, 22 miles an hour. Indeed, the guests who witnessed the start, and were dispatched in a first-class special train to Dieppe, arrived too late to see the winner and several others come in. To many who place more faith in the so-to-say old-fashioned method of steam propulsion, the performance of the Comte de Dion's brake ought to be an incentive to the attainment of greater perfection in its use on the road."

A motor shareholder writes to the *Birmingham Daily Gazette* and says that when at the Imperial Institute in London last year, he saw several makes of motor-cars and motor-cycles, and one of the latter (said to be driven by the Pennington motor power) was quoted as having done a mile in 58 seconds, or at that rate. He asks whether a motor-cycle has ever been ridden by a man at such a furious pace, and, if so, for what distance? We have no record of a motor-cycle having attained anything like this speed on the level. Thirty miles per hour is, we believe, the utmost that has yet been attained for a short spurt.

THE Locomotives on Highways Bill has now a fair chance of becoming law. It deals with heavy traction-engines, and while removing the vexatious nature of the present restrictions, gives improved powers to local authorities. It was originally drawn on the recommendations of last year's Select Committee, but was not drafted until this Session was well advanced, and is in charge of Mr. Griffith Boscawen, who succeeded in getting it read a second time, just before Whitsuntide, as an unopposed measure. The Bill has been before the Standing Committee on Trade, and after a long discussion and some opposition was passed.

THE Yeovil Motor-Car and Cycle Company wish it to be known that they do not use mineral spirit in their motors, but only ordinary petroleum.

THE following specimen of bucolic wit is amusing in its way. A scribe on the *Bedfordshire Times*, who evidently is trying to become proficient in writing what are known as "newsy" (horrid word) "pars" thus delivers himself:—"The gods preserve us from the motor-car when it is of the oleaginous variety. One came cantering along High Street at twenty minutes past seven on Saturday evening, and literally filled the street with its pungent effluvium, which lingered long and lovingly in the air. But what must it have been to be there—that is to say—on the car!" Note the exact time, and the exquisite alliteration in "lingered long and lovingly." This gem of provincial journalism is distinctly precious.

REFERRING to the recent conflagration at the I.E.S. Accumulator Works, the *Surrey Advertiser* says:—"It was nothing short of providential that a number of dynamos stored in the building failed to explode, otherwise the damage to surrounding property would probably have been enormous." And this is probably the type of writer put on to enlighten the British public as to the technicalities and future of motor-cars!

THE Pneumatic Brake Company (Limited), of Manchester, have introduced a pneumatic brake of simple design and specially suitable for motor-cars. It consists of an air-pressure pump, underneath the boot of the coach, connected by a copper tube to a brake on the wheel. The brake is operated by pressing the foot upon a lever attached to the pump, and the air from the pump rushes through the tube, and is forced into a pad fitted on the brake. The inflation of this pad forces a rubber block—which is fitted in an iron shoe—on to the wheel. The arrangement can be fitted either to pneumatic or iron-tyred wheels, and no matter what weight is in the carriage it is claimed that it does not alter its position.

THE Beeston Pneumatic Tyre Company have brought out a new tyre for motor-cars and other road vehicles. It is the invention of Mr. Beebe, of Ohio, and is built up by alternate layers of rubber, canvas, and crimped steel spring piano wire in enough layers to make it puncture-proof.

ANOTHER motor-car wedding procession has just taken place, this time at the Kentish village of East Peckham. The bridegroom, Mr. Joseph Taylor, is connected with the Branbridge Motor-Car Factory, and the bride, Miss Annie Rhodes, of Collier Street, is an enthusiast for these vehicles. The happy couple, together with a number of relatives and friends, were conveyed from the bride's residence to the church by a traction engine, to which were attached several trucks, all effectively decorated with flags, flowers, and evergreens. The road was lined with persons anxious to catch a glimpse of the extraordinary "turn-out." After the wedding service the newly-married couple and their friends resumed their seats in the trucks and were conveyed to the Branbridge Mills, several motor-cars joining in the procession. On their arrival the party and their novel means of conveyance were photographed. Subsequently the locomotive, with its trucks, followed by the motor-cars, proceeded to the village of Collier Street, where the wedding breakfast was served in the open air.

MOTOR-CAR excursions are now a regular feature of Blackpool. The innovation has proved immensely popular, the cars being loaded up to their fullest capacity every trip. Llandudno intends following the example of the Lancashire watering-place as soon as some motor-cars can be obtained.

AT a recent meeting of the Special Tramways Committee of the Liverpool Corporation, Sir A. B. Forwood in the chair, a proposal to elect Mr. Pearson as engineer for the new electric tramway was defeated by seven votes to five. Sir A. Forwood then resigned the chairmanship of the committee, and the further consideration of the engineership was deferred. Mr. Pearson is an American, and the feeling of the majority was that the work could be done by an English engineer or some one of the Corporation's own staff.

WITHIN the past few days a piece of land situated between Tor Railway Station and Shiphay Bridge, Torquay, has been purchased for the erection of a building, in which works are to be carried on for the manufacture of motor-cars, according to the invention of Dr. Frank Briggs, of Torquay. Possession of the property was taken on August 11th, and plant will be laid down to the value of about £2,000.

THOSE POOR BRITISHERS!

A LARGE manufacturer of cycles having works at Cleveland, Ohio, says in an American contemporary:—"It is impossible for other countries to equal American goods until they have the means and the men. By the means I mean automatic machinery. America leads the world in these devices. Automatic machinery may be bought, but unless men know how to operate it good results cannot be obtained. Germany comes nearer using automatic machinery according to the American ideas than any other country. England uses comparatively few automatic tools, most of the labour being done by hand. In the last six months, however, the makers of automatic tools in America have been rushed to death with demands made on them by English cycle manufacturers, all of whom are anxious now to get in automatic machinery. The American cycle manufacturers have done more for American export business than any other one class of men since the foundation of the Republic. The world for years has been thinking that Americans were the finest mechanics on the globe. It was largely a theory; the aggressive American cycle makers have now made it a fact, as there is not a civilised country in either hemisphere in which at least a half-dozen American made wheels are not well and favourably known. The finish, the construction, the mechanical nicety and strength, as well as proportions, verify the opinions of all people, that American mechanics have no equal." We do smile.

DOINGS OF PUBLIC COMPANIES.

Mr. G. R. Blot announces that his French house has been formed into a limited company, to be known as the Compagnie des Accumulateurs Electriques Blot, with a capital of 1.600,000 francs. The offices will be situated at 39, *bis* Rue de Châteaudun, Paris. The directors are M. Jules Offroy, M. Octave Chemin, M. Henri Ehrmann, M. Henri Hénon, M. Charles Meyer, and M. Georges-René Blot.

On the 6th inst. a meeting of the directors of the new Pennington Motor-Car and Cycle Company was held at the offices, 10, Leinster Street, Dublin. Alderman Meade presided, and the principal promoter of the Company, Mr. Pennington, who had returned to Dublin after an absence of some weeks on business in the United States, was present. Matters of importance in connection with the Company were discussed, and all the arrangements not being completed, another meeting was held on the 12th inst., when, says the *Irish Field*, the directors passed a resolution convening an extraordinary general meeting of the shareholders for Monday, August 23rd. We fear that there is nothing for the directors but to propose the voluntary liquidation of the Company, and the return of the money to the shareholders. The reason is, we believe, that the directors cannot see their way to complete with the promoters until they are satisfied that all statements are in fact as they were set forth in the prospectus. Had everything been carried through as originally arranged, this Company would no doubt have enjoyed a successful future, and would not only have resulted in the employment of much Irish labour in what will undoubtedly be one of the great industries of the future, but also would have resulted in large profits to those holding shares in the undertaking. No blame can be attached to the directors by any reasonable man, as they did everything that could be done to safeguard the interests of those who entrusted their money to them, and now that they find difficulties are placed in their way by the promoters, they have at once decided to place full information of the position before their shareholders, who can resolve, if they wish, to have back their money, less expenses incurred by the Company. This course is the only course expected from a board of directors composed of men like those responsible for the proper administration of the affairs of this Company, and we congratulate them upon their prompt methods. In the meantime we understand, as a precaution, a committee of shareholders has been formed to protect their mutual interests, with offices at 22, Blessington Street, Dublin.

Mr. P. W. Northey has been appointed receiver and manager of the Epstein Electric Accumulator Company (Limited), with a view to reconstruction.

Arrangements have been made to invite all the shareholders of the London Electrical Cab Company, as well as a large number of representative gentlemen unconnected with the Company, to a meeting at the Company's premises in Juxon Street, Lambeth, on Thursday next, the 19th inst., for the purpose of showing them what progress has been made, and to inaugurate the Company's business as electrical cab proprietors. As a start, the Company already have a couple of cabs about London, the new vehicle being very smart in appearance, and constructed somewhat in the style of the ordinary four-wheeler. On Friday last one of these cabs was driven to the Kennington Lane police-station, where it was inspected by one of the public carriage inspectors (Sergeant Howell), and duly passed as being fit to ply for hire in the streets.

The decision recently given in favour of the Ixion tyre patents is of far-reaching importance, and should undoubtedly tend to lower prices all round. It will depend upon the future action of the directors as to what extent. Several of the shareholders in the meantime appear to be dissatisfied with the *laissez faire* attitude which the directors have, so far, taken up. One correspondent points out that "the directors of the Ixion Company have now got it in their hands to knock the Dunlop monopoly entirely out of the market by cutting prices to the extent of 50 per cent., and supplying at a figure which leaves them a good profit. It is quite evident that where the Ixion, with a capital of 100,000 shares, can do business, the Dunlop Company, with a millstone of £5,000,000 round its neck, cannot follow." Whilst another, in speaking of the far-reaching effects of the decision, states that the tyre trade in this country has been a practical monopoly—the monopoly of the long purse; but patents expire, as did that of R. H. Thomson, C.E., in 1845, for a pneumatic tyre. The cycling public in this country, under the beneficent rule of this monopoly, pay, roughly speaking, 55*s.* for tyres which can be purchased of the same quality, or better, in America for 29*s.*, and on the Continent for 25*s.*, and presumably the American and Continental manufacturers sell at a profit, so that monopoly in this country reaps, over and above the ordinary traders' profit, an additional bonus of 30*s.* per pair on tyres sold. A vacuum is not more abhorrent to Nature than a monopoly to the British trader, and in due course a way round will be found, and then inflated profits on the above basis will come down with a Humpty-Dumpty sort of slump—and the success of the Ixion Company in the law courts may be the first sign of the coming storm. As the Ixion tyre, we understand, is particularly suitable for motor-cars, we hope the directors will not be slow to follow up their advantage by making some money for the Company, and thereby fulfil the "obligations they owe to the shareholders and themselves."

In view of this decision and probable competition, the new "Amalgamated Pneumatic Tyre Companies (Limited)," with a capital of £1,300,000, is a fairly strong order—especially when it is remembered that there are several other tyre-making companies, not included in the amalgamation, which hold licences from the Dunlop Company. This amalgamation is, therefore, not at all likely to stop competition, and it is significant the way in which this fact is steered round in the prospectus, the exact words being: "Undue competition and cutting of prices between the various tyre businesses amalgamated will cease." Considering that the cycle trade is on the wane, and bearing in mind the above points, we would suggest to our readers the wisdom of leaving the shares to be taken by the companies amalgamated in payment for their monopoly (?).

We understand that the shareholders of the Lamina Accumulator (Elieson's Patents) Syndicate (Limited), have decided to wind up the concern by voluntary liquidation, and have appointed Mr. T. Featherstone Smith, of 28, Basinghall Street, liquidator. Arrangements have already been entered into for the sale of the business to a larger company to develop it on an extended scale. We hear that the capital is privately subscribed, so that there will be no public issue.

New Brotherton Tube Company.—The statutory meeting of shareholders in the New Brotherton Tube Company was held on July 26th, at Wolverhampton. Mr. E. Lisle (Chairman of the board of directors) presided. The Chairman said it was not usual on the occasions of statutory meetings to say much more than was necessary to create a certain amount of confidence amongst those shareholders who had invested their money in the Company. He might say that the whole of the capital of the Company had been fully subscribed and all the shares allotted. The directors alone and their friends had taken up quite one-half the capital of the Company. He might say that he, himself, personally had invested between £5,000 and £6,000 in the Company, and other members of the board had also taken up shares to heavy amounts, and, like himself, were all large users of tubes. He did not agree with the critics, that they were likely to have a very bad time of it in connection with the tube trade in the future. He believed, on the other hand, they were going to have as good a year this next year as they had last. As regarded machinery, theirs was a very young house in the bicycle-tube making, but they had got, he should think, the latest machinery any works could have. The over-supply of tubes to-day, which was apparent, would not be so much felt because there was a trade springing up that would take many steel tubes; that was the motor-car industry. Motors, instead of being built with wood on the old carriage principle, would be built with weldless steel tubes, and they could look forward for a very big trade for tubes in the construction of motor-cars. Their Company was making a lot of tubes to-day for motors. A vote of thanks to the Chairman brought the proceedings to a close.

New Issues.

For the Month ending August 14th.

New General Traction Company.—Issue by the Railway Share Trust and Agency Company, 4, Bank Buildings, E.C., of 20,000 6 per cent. cumulative preference shares of £5 each in the New General Traction Company (Limited), at the price of £5 2s. per share. The prospectus states that those are the unissued portion of the existing preference share capital, the Company having a total share capital of £270,000—£150,000 in preference, and £120,000 in ordinary. The company was formed in March, 1896, for the purpose of installing systems of traction for light and street railways, tramways, &c., either by applying electric or other power to existing systems, or by assisting in the promotion of new schemes. The Company has already introduced electric power to tramways at Coventry and in the Isle of Man, and other schemes are awaiting Parliamentary sanction. To assist in carrying out these works, and to deal with other offers which are being made to the Company, the present issue of capital is required.

Blackpool Motor-Car Company (Limited).—Share capital £25,000, in ordinary shares of £1 each. The Company is formed for the purpose of engaging in the business of motor-car proprietors, running and letting out for hire motor-cars for pleasure and trade purposes throughout the United Kingdom, and to acquire as a going concern the business of the Blackpool Motor-Car Company (Limited). as from May 19th, 1897. In regard to the matter of profits the directors estimate, on the basis of 40 cars running, a total annual profit of £8,000 should be secured, enabling a dividend to be paid of 25 per cent. of the entire capital of the Company, and leaving a balance of £1,650. The Company proposes to chiefly use the Daimler oil-motor. Although Blackpool is selected for the commencement of the operations of the Company, the directors intend to establish branches in popular country and seaside resorts, including Brighton, Bournemouth, Harrogate, Southport, &c.; and it is also intended to undertake the conveyance of farm produce to the markets, and, in fact, do the work for which light railways were intended, and at a fraction of the cost. The purchase price for the whole of the vendors' plant, including six motor-cars, stock-in-trade, tools, goodwill, &c., and the benefit of a contract with Messrs. J. and C. Stirling, motor-car builders, Hamilton, N.B., for the supply of 40 motor-cars specially adapted for the Company's business, on exceptionally favourable terms, is £5,000, payable as to £2,000 in cash, and as to £3,000 in fully-paid shares of the new Company. The offices of the Company are The Kiosk, Talbot Square, Blackpool.

National Motor-Carriage Syndicate (Limited).—Share capital £30,000, the present issue being 12,000 shares of £1 at par. The objects of the Company are to acquire for traction and motor-carriage purposes the entire rights of the United Kingdom in the storage battery employed by the Sussmann Electric Miners' Lamp Company (Limited) for their portable electric miners' lamp. Also certain inventions of Mr. H. F. Joel, A.M.I.C.E., consisting of an electromotor of high efficiency, specially designed for the propulsion of vehicles, and a new and improved gear for transmitting the power, for which inventions four patents for the United Kingdom have already been granted and three others protected. To apply the above combined inventions to suitable carriages and vehicles, and to publicly demonstrate the utility and practicability of the same. To realise the above inventions by the sale of the patent rights to another Company (or otherwise) at a sum which shall yield a substantial profit to the shareholders herein. The Syndicate does not propose to manufacture for sale commercially the inventions acquired, and we note with satisfaction that the public are not invited to take up capital, the idea of the Syndicate being to complete the result of their experiments with their own money before offering shares publicly for subscription. It is claimed that the Company's battery will be enabled to store current in a minimum space and at a weight so much under what has hitherto been known, that it places an entirely new aspect upon the possibilities of electric traction, it being stated that an efficiency of over 90 per cent. has been obtained from the Syndicate's motor. It is proposed to apply the motive power to vehicles of the American buggy type. In some comparative results issued with the prospectus are given some remarkable figures, wherein it is stated that in a cell of the same capacity as one of the best-known makes, that owned by the National Motor-Carriage Syndicate is nearly one-third less weight and only half the size, or, in other words, a battery occupying the same space would propel the carriage double the distance. We are pleased to say that directly the battery and motor are working in a practical form we have arranged to obtain the fullest technical details for the information of our readers. The secretary is Mr. V. C. Doubleday, and the offices are at 37, Walbrook, E.C. Mr. S. A. Rosenthal is the consulting engineer and electrician.

New Companies Registered.

[Under this heading we give a full list of new Companies registered which take power to make, deal, or become interested in any manner in automotor vehicles. We shall be pleased to reply with detailed particulars to inquiries through the "Answers to Correspondents" column. All communications should be addressed to the Editor. The only stipulation which we make is that where the inquiry involves a search of the records at Somerset House—as in the case of information on the subject of the holdings of shareholders—a postal order must be enclosed to cover the Government stamp of one shilling which is charged before a search is allowed to be made.]

	Capital.
Birmingham Cycle Co., Ld	£2,000
Compressed Air Traction Co., Ld. (39, Coleman St., E.C.) ..	125,000
Crawford Cycle and Motor Co., Ld. (4, Mesnes St., Wigan)	10,000
Diplock's Patent Traction Engine Haulage Syndicate, Ld. (37, Queen Victoria St., E.C.)	10,000
Engineer Cycle Works, Ld. (York)	22,000
Franco-English Motor-Car Factory Co., Ld...	22,000
Griffin Foundry Co., Ld. (Stephenson St., Birmingham) ..	50,000
Harris's Micrometer Hub Adjustment, Ld.	5,000
Maxim Foreign & Colonial Motor Syndicate, Ld. (Wool Exchange, E.C.)	35,000
Root's Oil-Motor and Motor-Car, Ld. (100, Westminster Bridge Rd., S.E.)	30,000
Spider Motor-Car Syndicate, Ld. (Liverpool)	1,000
Windsor Cycle Co., Ld. (Featherstone Buildings, High Holborn)	25,000

The Work of Traction.—Some interesting tests have recently been undertaken in France with regard to the power required for the propulsion of vehicles, fitted with wheels with ordinary iron rims and pneumatic-tyred wheels, and the results show a marked all-round advantage by the pneumatic wheels. A Table of the pull required, reduced to kilogrammes, shows the results with different roads and different loads:—

	Iron Rims. Kilogs.	Pneumatic Tyres. Kilogs.
Snow.		
Empty vehicle, walking	17·86	11·45
" trotting	29·60	15·27
150-kilogramme load, walking....	17·83	12·71
" " trotting....	31·17	17·96
Wet Roads.		
Empty vehicle, walking	16·00	10·50
" trotting	19·55	12·97
150-kilogramme load, walking....	17·30	12·43
" " trotting....	23·00	14·16
New and Dusty Road.		
Empty vehicle, walking	17·42	14·05
" trotting	20·41	15·95
300-kilogramme load, walking....	20·75	19·14
" " trotting....	29·70	16·40

Experiments were also made with various pressure in the tyres—3 and 4½ atmospheres—but there did not seem to be much difference between the two.

CORRESPONDENCE.

**** We do not hold ourselves responsible for opinions expressed by our Correspondents.*

**** The name and address of the writer (not necessarily for publication)* MUST *in all cases accompany letters intended for insertion or containing queries.*

THE BRITISH MOTOR-CAR SYNDICATE PATENTS.

To the Editor of The Automotor and Horseless Vehicle Journal.

Sir,—Would you be kind enough to favour me with an answer as to the British Motor-Car Syndicate Company's patents?

I wish to make a motor three-wheel cycle for my own use. Can they prevent me from using a tube ignition to an oil-engine which I shall use for the power? I can remember the tube ignition for more than 10 years, the patent of which should have now run out, but I find by their advertisement that they claim all the various methods of tube ignition, electric and explosion by heat, &c.

I shall be very pleased to be enlightened on this matter, and shall esteem it a great favour for your reply, or you could probably inform me where I could get the information. Trusting you will oblige.—Yours faithfully, Chas. Watson.

[You cannot do better than read carefully Sir David Salomons's paper on "Motor Traffic," contained in The Automotor and Horseless Vehicle Journal of May 15th, 1897, p. 302, *et seq.*, and after digesting the information, pass on the paper to every one you know who is similarly desirous of constructing a motor-car. Moreover, instruct your local M.P. that he must make an amendment of the British Patent Law a plank in his platform.—Ed.]

AN AUTOMOBILE CLUB FOR GREAT BRITAIN.

To the Editor of The Automotor and Horseless Vehicle Journal.

Sir,—I take the liberty of enclosing a prospectus setting forth the objects, &c., of the Automobile Club of Great Britain, as well as regulations, from which you will learn that the leading characteristics of this new club will be that it should adequately represent, protect, and foster the true national interests of the new industry.

When I undertook the first steps for forming this new institution I could not quite banish some sorrowful feelings, for when, 18 months ago, I took the initiative regarding the formation of the Motor-Car Club, I thought to render the motor-carriage industry a service, and it was with this intention also that I organised for the Motor-Car Club the receptions to the Houses of Parliament and Exhibitions, &c., last year, in the carrying out of which I was so ably assisted by our popular Mr. Moore.

Unfortunately, the Motor-Car Club, like the Self-Propelled Traffic Association, seems to have turned out more or less a single man's institution, to avoid which was once my very object for forming the Motor-Car Club.

Although I am only too happy to admit that both the Motor-Car Club and the Self-Propelled Traffic Association have undoubtedly done some excellent work, there seems to prevail just now a kind of stagnation, nay in some cases almost unkindly feeling towards motor carriages.

Such a state of things is, of course, very unwholesome and undesirable for a young industry, the progress of which seems seriously checked. In such critical times much disinterested and true support and guidance is wanted, and it therefore appears to me just the very moment that those interested in the new movement and sympathising with same should rally round one institution, whose only object is to support, protect, and further the interest of the new industry, which, considering the hitherto great achievements of Great Britain in locomotion on land and water, is likely to become very important. I have every hope that in course of time this will be well accomplished by the Automobile Club of Great Britain.

No doubt you will be pleased to hear that our friend, Mr. C. Harrington Moore, with all his vigour, courtesy, and general knowledge in motor-car matters, is kindly assisting me in the organisation of the new club, to which he will act as Secretary *pro tem.*

I shall be happy to give any further information on the subject, and have the honour to remain, yours truly,

12, Norfolk Street, Strand, London, W.C. Frederick R. Simms.

[We refer to this matter elsewhere.—Ed.]

"Is Visione About?"—We rubbed our eyes when we learnt that the Post Office authorities had actually ordered a motor-car, and when the same appeared last week in St. Martin's-le-Grand we asked ourselves, Has there been a revolution? Allowing for the usual official inertia, we had given the Post Office just 25 years in which to recognise the fact that automotors of any kind are preferable to horse-drawn vehicles for parcels and postal services. Really this haste is quite unseemly, and altogether foreign to the traditions of the G.P.O. What has caused this enterprise?

Sunderland Engineering Exhibition.—An exhibition is announced to be opened at Sunderland in November, 1897, under the title of Engineering, Mining, Electrical, Marine, and General Trades Exhibition. As the title implies the scope is fairly wide, the classification being divided into 14 departments and 65 sections, which for a Sunderland Exhibition is somewhat ambitious. Department D comprises self-propelled conveyances, the subsections being (*a*) horseless carriages of every description; (*b*) motors suitable for conveyances, carriages, yachts, boats, and cycles. Department E includes locomotives, engines, carts, and other rural means of transport. Full particulars can be obtained from the Secretary of the Exhibition, Mr. H. H. Pinkney, at the offices, 32, Fawcett Street, Sunderland.

Fire at the I.E.S. Works.—We regret to learn that on the 24th ult. a fire broke out at the Woking works of the International Electric Storage Accumulator Company, one of the main buildings being completely destroyed by fire. The outbreak occurred about 5 a.m. in the drying room from an unknown cause, and was followed by a slight explosion, cause of which is also unknown; the fire afterwards spread to casting shop in same building, which was speedily reduced to ashes. The damage, which is covered by insurance, consists of destruction of casting shop, drying room, and loss of a considerable number of plates; most of the machinery and tools were saved, and are in use again. The interruption to business will be very slight, delay only being in execution of orders for plates which were destroyed in drying room. New buildings will be shortly erected, with increased facilities for quick delivery.

Catalogues.—We have received from Messrs. Alley and Maclellan, of the Sentinel Works, Glasgow, an exceedingly well-got-up handbook of their specialities in stationary motors. As is well known, Messrs. Alley and Maclellan manufacture in Great Britain the Westinghouse type of simple and compound engine—one of the best designed and most carefully-finished motors we know of. These motors are specially suitable for small powers, and where weight and space are serious considerations. They are characterised by great simplicity, there being few parts, easy of access, and not exposed. There are no packed joints, no guides, no crossheads, no piston rods, and no stuffing glands. They are constant thrust engines, and all working surfaces are very large, and the lubrication is copious and continuous. Lastly, their first cost is considerably less than that of any other first-class engine. Having used the Westinghouse motor, we speak from experience.

THE PARIS-TROUVILLE MOTOR-CAR COMPETITION.

Motor-car competitions in France seem to threaten to rival in popularity horse racing, and it is certainly time that a substitute was found for the latter antiquated aud unintellectual form of "sport." Hardly have the Paris-Dieppe and Les Poids Lonrds Competitions terminated than another was in progress. This was a race or run from Paris to Tronville aud took place on the 14th iust. It was essentially a light vehicle competition reserved exclusively for motor-voitures and motor-cycles. The former were to carry not less than two persons side by side, and the latter must weigh not less than 200 kilos. = 440 lbs., without stores, &c. The course was from Paris to Tronville, the route being St. Germain, Ecqnevilly, Flins, Epove, Mézières, Mantes, Rolleboise, Bonnieres, Chaffour, Paxy-sur-Eure, Evreux, Parville, La Mère Odue, La Commanderie, La Reviere Thebouville, Foulaine-la-Foret, Boisnet, Bazoques, Lieurey, Cormeilles, Les Authiux, Pont Leveque, Touques, Trouville, the distance being 173 kilometres, or 107·3 miles.

The route was not excessively hilly, there being but four or five steep hills to negotiate and much of the road was nearly level, finally ending iu a gentle descent to Trouville. Prizes to the value in all of about 11,200 francs were given away. Among those who subscribed to the funds we noticed the uames of Mr. Gordon Bennett, 1,000 francs; Lord Rothschild, 500; Baron de Zuylen, 200; *Le Journal des Sports*, 1,000.

As usual on these occasions much of the execution work was performed by the editorial staff of the latter journal, the managing director and editor, MM. A. de Lucenski and J. Aubry, acting as starter and clocker. The arrangements were much the same as were made in the Paris-Dieppe race, inclnding au exposition at Trouville.

There were 64 entries, all of which, excepting a De Dion Steam Brake, were light oil vehicles, and they included five Panhard and Levassor, eight Bollée, three Benz, and 13 De Dion et Bouton motors. Many of those who competed in the Paris-Dieppe contest also competed in this, including M. Jamin, who won the former in his Bollée voiturette.

Of the 64 entries 48 started, and the wiuner was again M. Jamin on his Bollée voiturette, doing the distance iu 3 h. 51 m., or at the astonishing rate of 27·8 miles per hour. Many other runs were improvements upon previous performances. Unfortunately, the festivities at Trouville were at the last moment clouded by a serious accident. One of the motor-car competitors came to grief at Pont Leveque, a few miles out of Trouville, and the rider, if uot killed, is so severely injured that he is not likely to recover.

The Princesse de Sagan, who takes great interest in the motor-car movement, had arranged to entertain all the competitors and their friends, to the number of 150, at a banquet on the new pier, but owing to this sad affair it was countermanded.

MOTOR-CAR PROSPECTS.

The *Rialto* and *Financial Times* last month both published the following:—

"Those who are interested in the possibility of motor-cars as a method of road locomotion might do considerably worse than read the interview with the heads of the engineering firm of Messrs. New and Mayne, which is published in this month's issue of The Automotor and Horseless Vehicle Journal. The firm apparently feels internal anguish at the suggestion that there is no such thing as an automotor industry in this country. We never doubted it ourselves; for did not a representative once go down to Coventry and walk around Mr. Lawson's amalgamated factory? However, it is something to know that 'quite a number' of firms are working at electrically-propelled vehicles, and this time it is Mr. A. New who promises 40 or 50 electric cabs in London before long. Mr. New thinks that the weight of a motor-van for carrying 1½ tons of goods would be but 30 per ceut. heavier than a horse-van. The initial cost of a motor-car would be about 25 to 30 per cent. higher than an ordinary tradesman's van, but the cost of working 50 per cent. less. Depreciation would probably not exceed 10 per cent. per annum of the prime cost. Mr. New has some valuable remarks to offer on the various kinds of cars for use, and the interview is worth perusal or cutting out for reference when motor-cars shall have emerged from their embryo stage."

The Royal Agricultural Society's Show.—This show will next year be held at Maidstone, from June 20th to 24th inclusive. The implemeut yard only will be opened on the Saturday previous, June 18th. It has been decided to again offer, in connection with the Maidstone Meeting of 1898, the following prizes for self-moving vehicles, viz.:—Class I. Self-moving for light loads, first prize, £100; second prize, £50. Class II. Self-moving vehicles for heavy loads, first prize, £100; second prize, £50.

A New American Electric Motor-Carriage.—Professor Elihu Thomson is stated to have been at work for two or three years experimenting upon a motor for carriage propulsion. An American paper says that the professor tried various elements, such as gas and gasoline, and various oils, but finally returned to his first love, the electric motor, and while the experiments have been conducted with much secrecy in temporary buildings uear the works of the General Electric Company, in Lynn, it is now understood that the perfected electric carriage will shortly be in readiness for public use. The motors are to be placed on the rear axle of the wagon, aud a speed of 20 miles an hour can be easily maintained. The electricity will be supplied from a storage battery of greatly reduced weight. The motor is light, and the steering attachment is to be connected with the front wheels. Simplicity and durability are the prevailing characteristics of the mechanism.

The Motor-Car Industry in France.—The motor-carriage industry has taken root far more readily in France and in other Continental countries than it has done in England. There are upwards of 40 firms manufacturing self-propelled vehicles in France, and the new industry is in a much more prosperous state across the Channel than it is here. The French have, says the *Practical Engineer* in a recent issue, a decided preference for mechanical road-traction, for they are not so squeamish about considerations of vibration, smell, and other minor drawbacks so long as they find autocars more economical than horsed vehicles, and, while most of the existing tramways are being equipped with cars propelled by steam, electricity, or compressed air, it is stipulated that on all new lines that are laid down mechanical power must be used. The result on the tramways has been that the service is not only vastly improved and made quicker and more regular, but it works out at a considerably reduced cost, so that many a line formerly working at a loss is uow making large profits. The experieuces of the experimenters with oil-driven motor-carriages have apparently uot been very encouraging, and all the manufacturing firms are more sanguine about the future than satisfied with the present. In regard to steam, the chief progress recorded seems to have been made by the Scotte road train, which in the transport of passengers has been put to very severe tests in various parts of France, and has come through the ordeal very satisfactorily. It is an omnibus train consisting usually of the motor carriage with a large omnibus attached to it, and the experimental service of these steam vehicles between Courbevoie and Colombes, in the environs of Paris, has, during the month or two for which the road trains have been at work, given every satisfaction not only to the public but also to the different local authorities from various parts of the country who have seen the system, and, having beiug especially pleased with the absence of the injurious effects of the traffic on the roads, have beeu considering the advisability of adopting it for passenger service in their several rural districts.

PROCEEDINGS OF SOCIETIES.

The Decimal System in Engineering Measurement.*

Broadly speaking, the decimal system is used in engineering in this country whenever calculations other than mere checking have to be made, or when very accurate dimensions have to be expressed; and in either case, in mechanical engineering, the decimals are generally those of the inch, its square, or its cube. The reason of this is fairly obvious. As regards calculations, decimals are, on the whole, far simpler than vulgar fractions, and they allow of the ready use of the slide-rule or of tables of logarithms.

It is true that occasionally simple vulgar fractions have to be dealt with, as, for instance, one-sixth in the case of the formula for the strength of a rectangular beam. In such cases the vulgar fraction would obviously be used; to convert to decimals would correspond to using a slide-rule or a book of logarithms to multiply 6 by 5, or some such simple sum.

In the case of accurate dimensions in mechanical engineering, $\frac{1}{64}$ inch is far from being a sufficiently small dimension; hence the use of the terms bare and full; and as, for interchangeable work, such vague dimensions are very unsuitable, recourse is naturally had to the use of $\frac{1}{100}$ inch and $\frac{1}{1000}$ inch. The writing down of accurate dimensions is also very cumbrous even when they can be expressed by $\frac{1}{64}$ inch.

Compare, for instance, 11 inches + $\frac{15}{16}$ + $\frac{1}{32}$ + $\frac{1}{64}$ bare with its decimal equivalent 11·98 inches. No doubt the same dimension may be more briefly expressed as $11\frac{63}{64}$ inches, but this form is not generally used in practice, and there are obvious reasons why this should be so.

It will be observed that the decimal expression has only been carried to the second place, and this is because the uncertainty in $\frac{1}{64}$ inch "bare" is of the order of $\frac{1}{100}$ inch. If the decimal expression is extended to the third place, an order of accuracy is reached expressed by $\frac{1}{1024}$ inch on the binary scale, fractions which are not practically workable.

When dimensions of no special accuracy have to be stated, the natural tendency to successively divide the unit by two gains the upper hand. Notwithstanding this tendency and the prevailing custom, it can scarcely be doubted that it would be preferable to state all such dimensions in decimals of an inch.

If decimals of an inch are adopted, the system is still incomplete, owing to here being 12 inches to the foot, 3 feet to a yard, and so on.

It is here that the metric system has a great advantage—it is a decimal system throughout. As experience in such a matter has more value than mere theory, a statement of the results of introducing the metric system of linear measurements into the works of Messrs. Willans and Robinson may be of interest.

In the first place, it is desirable to say a few words about the class of work and method of manufacture carried out at the works in question.

The Willans central-valve engine and the Niclausse water-tube boiler are manufactured, each in certain definite standard sizes, and the parts required are made to gauge and template in large batches, and have to conform to fixed dimensions within specified limits of accuracy, in order that strict adherence to the interchangeable system may be maintained.

In the machining and examination of the parts, gauges and templates are used, as far as possible, to the exclusion of the measuring rule. Whether inches or millimetres are used is, therefore, not a matter of much importance.

At the marking-off table the measuring rule is, of course, more used, and the question of convenience in the unit of measurement, and its divisions, is of greater importance. The parts are, however, dealt with in batches, and the convenience or otherwise of the unit of measurement, and its divisions, tells once only for each dimension for the whole batch.

The circumstances that led to the adoption of metric linear measurements are not of general interest, and, for reasons which need not be entered into here, they were only applied to the Niclausse boiler and to certain sizes of the engine, the earlier sizes being still made to drawings figured in feet and inches. Thus the two systems are concurrently at work in the same shop.

There would have been no advantage in refiguring these drawings with equivalent millimetres, and to make new parts to millimetres to interchange with old parts made to inches would be impossible without going to several places of decimals. The old gauges and templates were marked with the millimetre equivalent to the third place of decimals, but this was merely to accustom the men to sizes expressed in the new system. It may be mentioned that the men were supplied with rules marked with millimetres on one side and inches on the other.

The expense involved consisted principally in providing a complete set of gauges. New templates and jigs had also to be made, but only a portion of their cost is properly chargeable to the introduction of the new unit, as the greater number of them would have been required in any case.

The only difficulty met with has been in connection with the screw threads. Hitherto the ordinary Whitworth and gas threads have been retained; but, for reasons connected with the manufacture of the engines abroad, the body of the bolt or stud is turned larger than usual, the excess being 0·3 millimetre for $\frac{1}{2}$-inch Whitworth, and 2 millimetres for $1\frac{1}{2}$-inch Whitworth; intermediate sizes are in proportion, all being brought up to even millimetres. The bored holes are then able to take the corresponding screw cut to the standard used by the French makers of the engine, who use the thread of the Société d'Encouragement, which is slightly larger than the Whitworth, and which, it is stated, promises to become universal in France; it is now adopted by the French navy and railways.

The metric dimensions were introduced in May, 1893, and, after four years' working, the following is the result:—

No difficulty has been experienced in getting draughtsmen to use the new measures. No serious mistakes have been traceable to the change, and very few minor ones. The draughtsmen are practically unanimous in favour of metric measures, finding it easier to design, to check, and to read millimetre drawings. Taking all fractions into account, little more than half the number of figures formerly used are now required to express a dimension. An average case would be 3 feet $1\frac{3}{8}$ inch, which, on a millimetre drawing, would be figured 949; and an extreme though possible case is 3 feet $1\frac{3}{32}$ + $\frac{1}{64}$ inch bare, which becomes 942·4.

The need to use decimals of a millimetre is very infrequent, but in the case of inches the use of fractions is, of course, the rule. A cylinder, for example, might be figured 2 feet 6 inches on an inch drawing, and 770 on a millimetre drawing; the piston body must have a certain clearance, say $\frac{1}{32}$ inch in one case, or 1 millimetre in the other, in which case it must be figured 2 feet $5\frac{31}{32}$ inches on the inch drawing, whereas on the millimetre drawing the dimension becomes simply 768, and the use of fractions is wholly avoided.

The proportions between dimensions are more readily appreciated when expressed in millimetres; thus the ratio between 27 millimetres and 49 millimetres is much more easily apprehended than between $1\frac{1}{16}$ inch and $1\frac{15}{16}$ inch.

A point of some importance is that the ordinary foot- and inch-ticks or marks are not required, and with them disappears the possibility of having 2 inches added to each 10, or deducted from each foot in a dimension. A case of this kind occurred in which two 13-inch flanges intended to come together were shown on different drawings; in one of them a tick was introduced after the one, and that flange was made 1 foot 3 inches.

With millimetres a cypher might possibly be put in, or omitted; but a dimension ten times too big or too small, would at once be noticed as absurd.

In the drawings, scales 1, $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{10}$, and occasionally of $\frac{1}{20}$, $\frac{1}{5}$ are used. It is found that this number of scales is amply sufficient.

No mistakes have been made in marking off work to millimetres. The men preferred the old system at first, the new figures conveying little idea of size; but they are now much in favour of the millimetre, and find drawings so figured easier to read. The shop where the difficulties of the change would be most felt is that in which the tools and gauges are made; the foreman says that it was a little awkward at the outset—for about two days.

In the works manager's opinion, the metric system would prove even more advantageous in shops where measurements are taken from the rule than where gauges are used. He considers it easier to teach men the use of the rule with the metric than with English measures.

* Paper read at the proceedings of the Institution of Civil Engineers, by Henry Riall Sankey, Capt. R.E. (ret.), M. Inst. C.E.

The Value and Scope of Inland Navigation.*

Although the development of inland waterways in England has been considered and discussed in a desultory sort of way during the last decade, the all-powerful and far-reaching influence of the railways has no doubt delayed any decisive steps being taken in the matter.

The first step to be taken is to persuade the railway companies who own waterways, and even those who do not, that a system of properly constructed canals would act as an auxiliary and not as competitors in their trade, and that the two could really be worked together with advantage—minerals and other heavy goods being sent by water, and the lighter traffic reserved for the railway.

The disadvantages of waterways may be summarised under the following four headings:—

(i) The speed of traffic is necessarily somewhat slower than by rail.

(ii) The difficulty of increasing the normal speed, owing to its being regulated by the number of stoppages at the locks.

(iii) The probable disorganisation in the winter by frost, and in canalised rivers by floods.

(iv) The difficulty of arranging the levels so as to suit existing works, and the almost absolute necessity for discharging by means of a crane or other mechanical power.

The first disadvantage is in reality no disadvantage at all; it is not proposed to carry goods by canal which are required immediately, and when cost is as important as it is to-day, a trader would and does soon become accustomed to allowing sufficient time for the slower carriage of his goods.

Again, both Nos. (i) and (ii) could in any modern system of canals be much modified by the use of hydraulic lifts similar to those at Anderton and Les Fontinettes, which not only save water but obviate long flights of locks by a single fall of perhaps 50 or 60 feet.

The chief reason for No. (iii) being at present such a formidable disadvantage lies in the fact that there is little or no steam-propelling power in use on the canals, and that the sectional area and depth is so small.

Were steamers more in use, and suitable ice-weirs provided, there are very few winters in England when, by the judicious employment of labour, plentiful at such times, waterways could not be kept partially, if not entirely, open.

The fourth disadvantage has already been very successfully overcome, at any rate for bulk traffic, such as grain or coal, by the ingenious contrivance devised by Mr. Bartholomew on the Aire and Calder Navigation.

For the handling of other goods, either for discharging or transhipping purposes, the steam derricks employed on the River Weaver have been found not only rapid but economical, especially when they are fitted either on a suitable craft or are carried by the steamers towing the train of boats.

The advantages of waterways may, on the other hand, be summarised as follows:—

(i) Goods can be carried in greater bulk than by rail.

(ii) Boats can load or discharge at any point on the banks without risk of collisions or the construction of special sidings.

(iii) For fragile, or partially fragile, articles, such as bricks, pipes, light castings, &c., there is less liability of breakage.

(iv) The cost of repairs and maintenance both of the canal and moving plant is less, thereby lessening the cost of carriage.

It is quite evident that large quantities of mineral and other bulk traffic can be carried more advantageously in boat loads than in small wagon loads, and where small quantities of numerous articles are required, the difficulty can be overcome by what may be termed "omnibus" boats owned by "carrying companies," or even the canal company itself, which have a regular service, with receiving and delivery offices or sub-offices. On the Weaver a large trade is carried on in this manner, and comparatively small individual quantities of goods are carried from Liverpool to any point on the river at which they may be required: whether such point is a properly constructed dock or wharf, or only a field, the long jib of the steamer's derrick landing the load well on shore, even if the bank is unprepared.

It is seldom there are any complaints of breakage. It is, of course, useless to expect a full development of canals until there is uniformity of width and increase of capacity, the present narrow canal boat carrying, perhaps, 25 tons or less, requires the same crew as one of 10 times that capacity, and the power

* Paper read at the Engineering Conference, by John Arthur Saner, M. Inst. C.E.

required for towing in a proper section of waterway would be very little if at all increased. The actual cost of salt carriage on the River Weaver is somewhat under ½d. per ton per mile, including all interest, depreciation, stores, wages, and toll.

After mature consideration of the question of gauge the author is of opinion that a canal 40 feet bottom width, 72 feet surface width, 8 feet deep, and having therefore 443 square feet sectional area, would accommodate vessels 75 feet long, 18 feet beam, 7 feet draft, and of about 210 tons displacement.

The locks should be made to accommodate either two or four of such craft; in the latter case a steamer and train of three could pass through at once, saving much time. The advantage of adopting such dimensions would be that all the existing boats could be used until worn out without undue waste of water at the locks and lifts.

In conclusion, the value of inland waterways is at present at a discount owing to want of organisation; their scope of usefulness is greatly restricted from the same cause; but both the value and scope could be enhanced on the lines briefly sketched herein, and the question is one of such importance that it is worth the consideration of a special committee of politicians and engineers appointed to fully investigate and report on the most practical and economical method of placing inland waterways in the position they should occupy in the economy of the country.

The Value and Scope of Inland Navigation.*

THERE are at the present time frequent instances in which the old-world "monkey-boat" canal, practically in the same primitive condition as when it was constructed at the end of the last century, successfully holds its own in spite of, and in the very teeth of, the competition of first-class main-line railways equipped with every modern appliance.

Examples which occur to the author, and of which he has an intimate personal knowledge, are the Staffordshire and Worcestershire Canal, the Worcester and Birmingham Canal, the Oxford Canal, and the Warwick Canals, the latter forming part of the waterway from Birmingham to London.

These canals are all free from railway control. They are essentially narrow canals, their dimensions being roughly a top width of 40 feet, a middle depth of from 4 to 4½ feet, and with locks capable of passing a boat 70 feet long by 7 feet beam, and carrying at most 35 tons, more frequently only about 25 tons.

On none of them can steam haulage be profitably employed, whilst shallow locks abound throughout them, and mechanical lifts or other time-saving appliances have nowhere been attempted.

They are, in fact, mere ditches and of a most antiquated type, and yet, although they are in each case in direct competition with first-class lines of railway, they pay their way and carry a considerable through traffic—a fact which, *per se*, constitutes strong evidence of the value of inland navigation.

The consideration of this fact also leads directly to the question of the scope of inland navigation and of its possibilities if a systematic development of the waterways should be undertaken.

At present the canals cited merely serve the purpose of keeping down railway rates. This is certainly a useful function, but, nevertheless, falls far short of the full capabilities of a modernised system of inland navigation.

The canal of the future must do much more than this. With well-planned improvements it has within its scope the reduction of the cost of carriage of heavy goods to a point far below anything which can be attempted by railway haulage unless it happens that the present railway charges are inordinately in excess of what they should be.

For these benefits to be reaped to the full, however, the sectional area must be increased, bridge spans must be widened, and changes of level must be concentrated and overcome by mechanical lifts.

Such an alteration in the canal will permit of a large bulk of goods being conveyed in one bottom instead of in many small canal boats, and of the substitution of mechanical propulsion for that of men and horses, as at present.

If with such improved conditions the administrative arrangements are also modernised and regular services established the cost of conveying goods may be reduced to about one-half of what has been possible upon the old type of canal, the extent of the reduction depending very much upon the nature of the improvements.

The actual extent of the improvement, and the sectional area to be aimed at, might be supposed to depend mainly upon the quantity of traffic which such improvement would be likely to draw to the canal, but there are frequently other determining factors.

The author has had on several occasions to make surveys and prepare estimates for the improvement of canal navigations, and he has always found that there is a point up to which improvements may be carried out at a moderate cost, but that owing to some local circumstance the moment that point is passed the cost increases inordinately.

In such cases it is prudent to carry out the least costly scheme in the first instance, even if it should eventually necessitate a portion of the work being done twice over.

As an instance, he may mention that he has recently had to report upon the cost of improving the waterway between Bristol and the South Staffordshire iron district, and he found that out of the whole distance of 103 miles, no less than 78 from Bristol inland were navigable by barges of 225 tons carrying capacity, or could be made so with a few inexpensive alterations.

For the last 25 miles, however, the waterway—the Staffordshire and Worcestershire Canal—was navigable by small canal boats only, and very early in the investigation it became obvious that whilst the navigation could be adapted to the 225-ton barge or its equivalent right up to Wolverhampton at a moderate outlay, any increase, however slight, in size of vessel to be accommodated would require costly alterations in the lower reaches.

He has therefore advised the Improvement Committee to confine their efforts for the present exclusively to the enlargement of the 25 miles of canal, so that it may be of the same capacity as the remaining 78 miles of the navigation.

He has recommended that the improved canal shall have a top width of 60 feet, a bottom width of 40 feet, and a depth of 7 feet, with locks capable of passing vessels 85 feet long, 19½ feet beam, and drawing 6½ feet.

He estimates the cost of the work at £360,000, which includes a provision for reducing the number of ponds into which the canal is split up from 31 to 11, substituting inclined plane lifts in many places for the numerous groups of locks. It also provides for a number of straight cuts which will do away with awkward bends and shorten the travelling distance by 2¼ miles.

* Paper read at the Engineering Conference of the Institution of Civil Engineers, by EDWARD DIMMACK MARTEN, M.A., M. Inst. C.E.

The outlay represents an expenditure of £16,000 per mile of finished canal as compared with the original inclusive outlay upon existing canal of under £6,000 per mile.

The improved navigation will accommodate not only a 225-ton barge for use between Bristol and Wolverhampton, but also a thoroughly seaworthy steamer capable of running between Wolverhampton and London, Liverpool or other ports, and carrying 150 tons, and the writer believes, as the result of careful calculation, that if full and regular return loading can be relied upon, and if the work were done by a Trust not seeking profit beyond what is required to pay interest upon capital invested, the actual cost of conveying heavy goods between Wolverhampton and ship side in London will be little more than half the charge now made by the railway companies.

The subject of ways and means, though not strictly an engineering one, is all-important. Space does not permit of the writer entering upon it, but he ventures to suggest as an exceedingly useful topic for discussion at a conference of experts, the question as to the auspices under which works of canal improvement shall be carried out.

Is there any prospect of its being taken up as a national concern? Or is it to be left to the Company Promoter? Or shall it be put into the hands of a Trust delegated by the district to be benefited, and if so, shall the required capital be raised upon the security of the rates of such district?

NEW INVENTIONS.

Claiming particularly to apply directly or indirectly to Motor Vehicles, &c.

Compiled for "THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL" by HERBERT HADDAN and Co., Registered Patent Agents, of 18, Buckingham Street, Strand, W.C., London.

**** *At the request of a number of subscribers we are pleased to announce that for the future we have arranged to more thoroughly cover the field of completed Patents referring to the Motor-Car Industry, by reproducing the latest Specifications and Diagrams.*

Patents Applied For.

Abbreviations: Impts., Improvements in; Relg., Relating to.

1897.

July	1.	15,663.	W. G. HEYS (M. Jouffert). Impts. relg. motor-cars.
,,	1.	15,665.	J. W. DRABBLE. Impts. relg. velocipedes, autocars, &c..
,,	1.	15,667.	J. FLETCHER. Impts. velocipedes and motor-driven vehicles.
,,	1.	15,719.	C. A. HOLLSTEIN. Impts. electric road cars.
,,	2.	15,737.	J. WALKER. Impts. method of driving autocars, &c.
,,	3.	15,870.	A. MÜLLER and H. TUDOR. Electric propulsion of vehicles, boats, &c.
,,	3.	15,877.	L. CEREBOTANI and C. MORADELLI. Feeding electricity to motor-cars.
,,	5.	15,949.	A. A. POPE. Suspension of motors and transmission gearing.
,,	5.	15,950.	A. A. POPE. Supporting steering wheels.
,,	5.	15,951.	A. A. POPE. Impts. steering mechanism.
,,	5.	15,952.	A. A. POPE. Impts. transmission gearing.
,,	7.	16,133.	CASTELD and FEARNHEAD. Lever gear for mechanically-propelled vehicles, cycles, &c.
,,	9.	16,296.	G. A. and H. P. PHILLIPS and F. R. BAKER. Impts. driving chains.
,,	9.	16,310.	R. V. TATIN and J. A. TANIÈSE. Impts. steam-propelled vehicles.
,,	10.	16,401.	W. PECK. Automatic steering gear.
,,	13.	16,508.	C. M. TURRELL and THE COVENTRY MOTOR COMPANY (LIMITED). Starting cranks or pedals for motor vehicles.
,,	13.	16,511.	G. F. PRIESTLEY. Impts. relg. driving apparatus.
,,	14.	16,705.	C. B. CALLOCH. New or improved motor-car.
,,	14.	16,715.	E. H. HODGKINSON. Impts. velocipedes and automotor carriages.
,,	16.	16,865.	C. LAURE. Impts. driving gear.
,,	21.	17,226.	H. A. LAMPLUGH. Impts. cycles and motor-carriages.
,,	22.	17,314.	H. H. LAKE (W. A. McGuire). Impts. relg. motor vehicles for railways.
,,	26.	17,494.	R. T. WARREN. Canopy shield and protector for motor-cars, &c.
,,	27.	17,552.	R. HARBURN. Raising or lowering handle bars.
,,	30.	17,851.	A. W. SAWRY. Impts. mud guards.
,,	30.	17,872.	E. S. LERMIT. Impts. gear cases.
,,	30.	17,896.	E. RICHARDSON and H. H. MOUNTFORD. Reducing vibration in motor-cars, &c.
,,	30.	17,908.	A. B. CUNNINGHAM and G. T. HARRAP. Impts. motor-cars.

Specifications Published.

7,333. Gas, Petroleum, or like Motors. Albert Eduoard Le Brun, Montrauge, France. March 20th, 1897.

This invention relates to a new gas, petroleum, or like motor, and relates more particularly to the special arrangement of the fly-wheel, which forms at the same time an engaging sleeve or device, to the parts provided for regulating the distribution and to the control of the pistons.

The improved motor comprises in principle two convergent cylindrical parts,

a^1, the pistons, b^1, b^2, of which travel in the same direction and actuate the driving shaft, c.

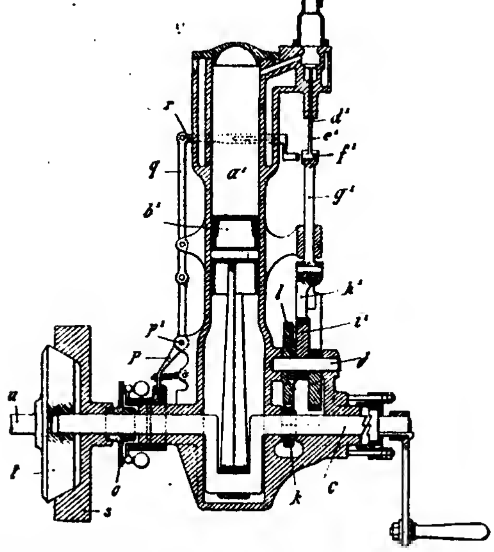
The explosive mixture is admitted to the explosion chambers by any suitable device; its ignition is effected in the usual manner, either by igniters raised to incandescence or by means of an electric spark.

The distribution is effected in the following manner:—

The rods, d^1, d^2, of the inlet valves are raised alternately by the extremities of bell-crank levers, e^1, e^2, pivoted at f^1 and f^2 respectively to the rods, g^1, g^2, to which a reciprocating motion is imparted by means of the connecting rods, h^1, h^2.

These latter are driven by the excentrics, i^1, i^2, respectively which are arranged at an angle of 180° upon an intermediate shaft, j.

FIG. 1



This shaft is driven by the shaft, c, by means of toothed wheels, k, l, which are in the relation of one to two, so that the intermediate shaft, j, makes only half a revolution for each complete revolution of the shaft, c.

This arrangement is regulated in the following manner:—

The shaft, c, imparts its rotary motion to a governor, o, of any suitable description, which acts upon a lever, p, pivoted at p^1. This lever, p, actuates by means of a vertical rod, q, an horizontal bar terminating in a T-shaped portion.

Under these conditions, if the speed of rotation of the shaft, c, increases, the balls of the governor separate, the lever, p, acts upon the vertical rod, q, and the horizontal bar advances in such a manner as to stop the extremities of the bell crank levers, e^1, e^2, as they rise, and prevent the latter from acting upon the corresponding rod, d^1, d^2, of the inlet valve.

The admission of the explosive mixture is thus interrupted until the speed of the shaft, c, again becomes normal, for when this has taken place the balls of the governor again approach each other, the vertical rod, q, moves back, bringing with it the horizontal bar, r.

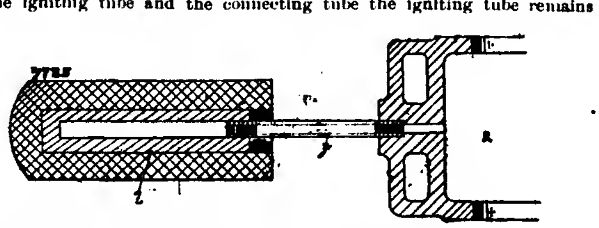
The shaft, c, carries a fly-wheel, s, of a special kind, which forms also an engaging sleeve, acting upon a conical pulley, t, fixed upon a shaft, u, which communicates the motion so imparted to it to the different parts to be actuated.

Engagement and disengagement are effected by imparting a motion of translation to the shaft, u.

The shaft, c, carries at its free end a crank or handle by means of which the motor can be started.

7,785. Automatic Igniting Apparatus. Donat Bánki, 11, Rorsahegy utca 6, and Johann Csonka, of Szövetség utcza 5, Budapest, Hungary. March 25th, 1897.

This invention consists in connecting an igniting tube, Z, by means of a thin tube, z, with the combustion chamber, R. By employing suitable dimensions for the igniting tube and the connecting tube the igniting tube remains



glowing without exterior heating, but only by the heat derived from the explosions in the cylinder and the lighting operated by this glowing tube is effected regularly near the dead point.

A tube, z, which has to be kept glowing by the explosion heat, must be composed of an appropriate material which receives heat well, and must have a surface receiving a great heat in proportion to the heat delivering surface; also the igniting tube must possess a sufficient mass in order to receive and hold a corresponding quantity of heat in itself. In order to correspond to all these conditions there must be used a tube about 4 to 6 mm. thick (preferably of copper) with a bore not less than 6 to 7 mm. A thin igniting tube, as used for ignition in explosion motors with exterior heating, is cooled, as soon as the exterior lamp is taken away, and has therefore not the property of automatic ignition.

In this lighting tube, composed of the two parts, Z and z, the part, Z, has a high ignition temperature, whilst the tube piece, z, will never obtain so high a temperature, that is to say, it can keep a lower temperature than is necessary for ignition from the explosion period up to the moment of ignition. The ignition is therefore effected by the tube, Z, and an ignition by the tube piece, z, is excluded.

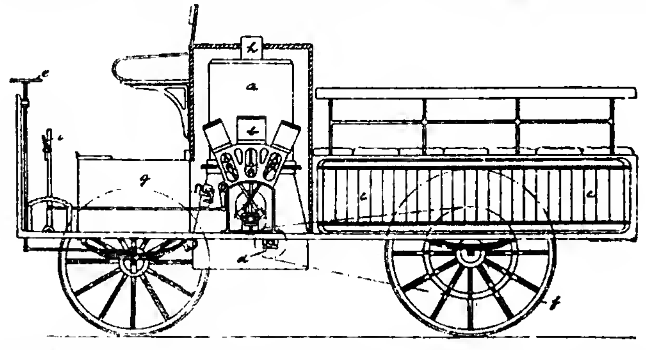
This property of the thin connecting tube, z, gives the explanation for the fact that by inserting this tube early ignitions are avoided.

At the beginning of the compression the whole tube, Z and z, is filled with uncompressed combusted gases, but before the tube opening there is the combustible mixture. On compression, the combustible mixture penetrates first into the thinner tube, z, and moves the expanded gases into the tube, Z. In consequence of the rising compression there would pass continually explosive mixture from the tube, z, into tube, Z, which mixture is ignited by the hot walls of the tube, Z, and will continue burning on the tube opening, z. Near the inner piston dead point the piston velocity becomes less, the compression and the current through the tube, z, will therefore become weaker, until the flame moves finally through the tube, z, back into the cylinder interior.

10,478. Motor Road Cars. James Compton Merryweather and Christopher John Wallace Jakeman, of the firm of Merryweather and Sons (Limited), Greenwich Road, Greenwich, Kent. May 15th, 1896.

Relates to improvements in the construction of self-propelled carriages actuated by steam.

In one form use is made of one of the patent boilers (No. 1855—80) as used in steam fire-engines, fitted with an automatic gear for feeding the boiler with water, and an automatic gear regulated by the steam pressure for controlling the supply of liquid fuel to the furnace. In order to dispose of the exhaust steam a compound engine is used, preferably with three cylinders, which exhaust at a low pressure into a surface condenser formed of flat copper tubes



preferably under the vehicle. The water from the condenser is collected in a closed tank, and any remaining vapour is conducted into the uptake through a superheater. The engine and boiler are carried on a light steel frame, and the carriage body, which may be closed or open, is supported thereon by suitable springs. The wheels are fitted with elastic tyres, covered with a preparation of leather to reduce the wear, and are arranged to run freely on fixed axle arms, two of the arms being pivoted at suitable points for the purpose of steering. Gearing is provided for varying the relative speed of motor and carriage, and balance gear is fixed on the intermediate shaft to allow for turning curves.

A is the boiler, B the engine, C the condenser, D the balance gear, E the steering wheel, F the driving wheel, G water tank and coal bunker, H is the uptake from the boiler, and I the reversing lever.

10,424. Cooling the Surfaces of the Cylinders of Explosively-Driven Engines. Frederick Richard Simms, 12, Norfolk Street, London. May 15th, 1896.

The ribs employed for the cooling of the explosion chambers are made so as to project radially outside the cylinder, and are made larger and larger in diameter as they approach to the back end of the cylinder, so that the outline will resemble that of a frustrum of a cone. The ribs may form helixes round the cylinders. The ribs or projections are curved so that their peripheries are turned towards the front of the cylinders, and holes or slots are made in these ribs or projections, which holes or slots are preferably to be arranged so that they hit and miss one another; and when projections only are used and not continuous ribs on the outside of the cylinders, these projections are to be preferably arranged also to hit and miss when viewed from either end of the cylinder. The holes or slots are for the purpose of increasing the surface exposed to the air by allowing the air or draft to pass through, and they are arranged and shaped as stated, to cause the air that will impinge upon the surfaces of the ribs or projections to be forced into more intimate contact with the metal of the projections or the ribs, and with the body of the cylinder.

Or the projections may take the form of thin rods or wires projecting from the sides of the cylinders at right angles, in a manner similar to that of the hairs of a brush or broom, and they are curved and increased in depth in the same manner that the ribs or projections previously mentioned are; or these thin wires may be fixed on the outer rim of the projections described.

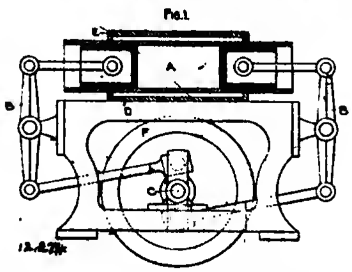
In lieu of curving the ribs or projections so as to present concave surfaces towards the front of the cylinders that it is desirable to cool they may be inclined forward, and this will produce a similar effect.

12,274. Internal Combustion Motors. John William Hunter, Eastdown Works, Dermody Road, Lewisham, Kent. June 5th, 1896.

This invention has for its object the construction of a motor which shal be as free as possible from shock and vibration when in action, so as to render it specially suitable for the propulsion of automobile vehicles and launches, and for use in situations where a rigid foundation is not available.

Description of Drawing.—A, cylinder, showing pistons at half stroke; B, rocking bar, with arms extending upwards to connect with pistons, and down to crank, the connections at both ends of the cylinders being the same; C, crank shaft, having a double throw crank, the cranks and pistons at opposite ends of cylinders being connected together and operated as shown; D, frame supporting the mechanism; E, water jacket; F, fly wheel.

An engine built in this manner has its two cylinders acting alternately, thus

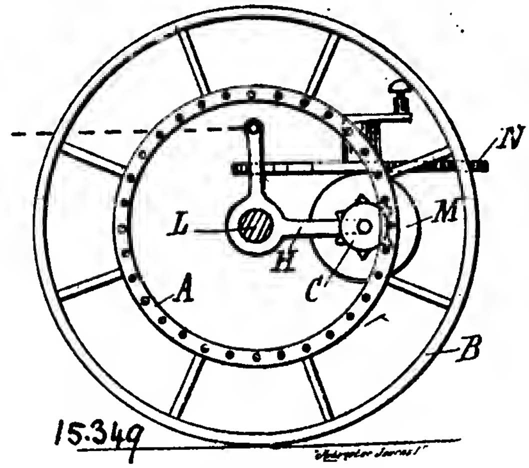


giving an impulse once in every revolution of the crank shaft. Any number of cylinders having their pistons connected in like manner with the rocking bar at each end of the cylinders, all acting on one crank, could be employed; but a much better plan is to duplicate the two cylinder arrangement, using a shaft provided with two pairs of cranks set at right angles to each other, which arrangement will furnish an impulse twice during each revolution of the crank shaft.

This motor may be worked by gas, petroleum, spirit, or any product capable of forming an explosive compound, and is fitted with the usual valves, &c., necessary to the working of a gas or oil engine, and may be fired either by a heated tube or electrically; but these parts are not described or illustrated, they being such as are common to motors of this class. The cycle of operations when the engine is working is as follows in a single cylinder engine:—1, drawing in the charge; 2, compression; 3, firing; 4, exhaust; but any other cycle may be adopted if practicable, and variations in constructional details may be permitted providing the general principles involved are adhered to.

15,349. Mechanism for Transmitting Power in Autocars or Horseless Carriages. Hippolyte Lepape, 23, Rue Montaigne, Paris, France. July 10th, 1896.

The transmitting mechanism is supplied with a toothed wheel furnished with either interior or exterior cogs, or with a lantern wheel, A, held in any convenient way to each of the driving wheels, B, of the autocar, this lantern or other wheel, A, being actuated by toothed pinions, C, keyed on the shaft, D.



This shaft, D, is supplied with a differential motion in case the two driving wheels should be actuated by the motor. The said shaft, D, is held by the two bearings, E, jointed according to Cardan's system, fixed on oscillating arms, H, secured on the axle of the driving wheels, A. Between the arms, H, the shaft, D, has a polygonal section, or is supplied with a long cotter or projection, thus allowing the friction pulley, the hub of which has a similar section, to be placed freely on the shaft, the object of this disposition being to unite intimately the shaft and the pulley in the rotatory motion, and, moreover, to allow the pulley to slide from left to right without the rotation being interrupted.

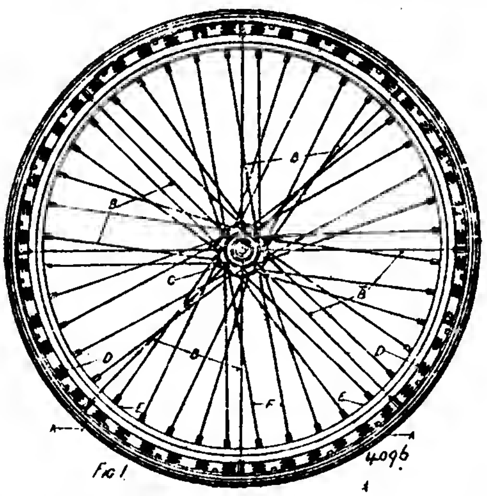
20,141. Tyres for Wheels of Carriages, Motor-Cars, &c. John Ebenezer Hopkinson, Para Rubber Mills, West Drayton, Middlesex. September 11th, 1896.

Relates to the construction of those tyres for carriages and other vehicles which consist of an outer solid or "cushion" tyre bearing upon a pneumatic or air tube, the latter and a portion of the former being enclosed within a metal or other suitable rim.

The outer tyre is formed with a groove on each side so that it may be retained between the re-entrant flanges of a suitably shaped rim. The grooves thus formed in the outer tyre cause the latter to be furnished with inner and outer double flanges. The outer flange may be flat or curved or corrugated or moulded to any desired pattern. The inner flange bears upon the air tube enclosed within the rim and should be curved so as more or less to conform to and partially enclose the air tube. One or more layers of canvas or other fabric are inserted between the outer tyre and the air tube and solutioned or otherwise secured together, great care being taken to make a perfectly secure attachment of all the various parts together. Or the solid tyre may be formed with a groove on each side to be retained by re-entrant flanges on the rim, the rim below the flanges sloping slightly outwards, and the solid tyre having a corresponding shape, the pneumatic tyre being normally narrower than the solid tyre. In this way the composite tyre is kept with approximate accuracy in its position when it approaches the flanges of the rim, and the friction between its sides and those of the rim when it is constrained to move within the rim is materially reduced.

4,096. Wheels for Cycles, Road Vehicles, &c. Richard Thomas Bellemey, King Street, Sydney, New South Wales, and Charles Bellemey, Rush Street, Woollahra, near Sydney. February 15th, 1897.

The tyre, A, is made of wood, or iron, or steel, or like material, and may have an outer facing, or wearing strip, if desired. As shown, this tyre, A, is made segment shape, and of wood, and it has stiffening spokes, B, reaching inwardly



to a ring, or boss, C, set centrally around the hub of the wheel. The spokes, B, are attached to this tyre and to the central ring, C. The springs, D, are shown as helical, though they may be flat, or of other shape, and these springs are placed between the tyre, A, and the rim, E, sitting up against the inner face of the tyre and being fastened thereto, and against the outer face of the rim, E, and being fastened thereto.

It will be seen that in passing over inequalities upon the roadway, that the springs, D, will compensate for those inequalities, and will allow the tyre and the tyre spokes and central ring, C, to flexibly move without affecting, or only very slightly affecting, the inner wheel constituted by the rim, E, the rim spokes, and the hub, and thus very little vibration will be felt.

Various modifications are described.

5,748. Mechanism of Power-Propelled Vehicles. Frederick William Lanchester, Cobley Hill, Alvechurch, Worcester. March 14th, 1896.

This invention relates to improvements in the gearing and controlling and steering mechanism of power-propelled vehicles, and consists, firstly, of the method of controlling the transmission of power by means of a epicyclic train of wheelwork of which a part is acted on by a brake or brakes; secondly, of the method of controlling the relative motion of steering wheels on independent centres by means of separately centred levers arranged to actuate the respective wheels by sliding or equivalent link connection and coupled to one another; and thirdly, of steering mechanism, comprising two independently mounted steering wheels in combination with separately centred actuating levers coupled to one another and to suitable operating mechanism, consisting of a handle bar pivoted to a tiller bar and having a slotted extension in sliding contact with a fixed pin or bracket.

6,740. Gas, Oil, or Hydrocarbon Vapour Engines. Joseph Ibbett, of Market Square, St. Neots, Huntingdon. March 27th, 1896.

The engine is of the inverted cylinder type, and the valves employed to govern the admission of air and gas, and the emission of the exhaust products of combustion may be operated in any convenient manner. Surrounding the upper half of the cylinder is a helical coil of pipe, and this is arranged to be in close contact with the exterior of the cylinder, and is preferably brazed thereto. The lower end of this coil is open to the atmosphere, and the upper end communicates with the interior of the cylinder through the air and gas admission valve. The gas or hydrocarbon vapour is admitted at any suitable point in this coil so as to be mixed in the most intimate manner with the air entering, before passing into the upper end of the cylinder.

The crank and its shaft, together with the connecting rod, is enclosed in an air-tight case, and the reciprocation of the piston acts as a pump and draws in air through a helical coil of tube, which surrounds the lower half of the exterior of the cylinder, and forces it out through a valve in the casing which surrounds the crank and shaft. The current of air which is by this means caused to pass through the coil serves the purpose of cooling the cylinder, or the air thus drawn in may be forced into the upper coil for mixing with the hydro-carbon. The lower end of the casing which surrounds the crank shaft is used as a receptacle for oil, and arrangements may be made to connect this with the different parts of the engine in such manner as to ensure perfect lubrication.

The lower end of the piston is formed in the ordinary manner, but it has an elongated portion at its upper end which has an internal and external metallic shell, these two being divided by a layer, or layers, of some material which is a non-conductor of heat, or which conducts it but imperfectly. The interior of the inner shell of the elongated part is open to the interior of the casing which surrounds the crank shaft through an opening in the under-side of the piston; by this arrangement the cooling of the piston is secured.

THE AUTOMOTOR

AND

HORSELESS VEHICLE JOURNAL

A RECORD AND REVIEW OF APPLIED AUTOMATIC LOCOMOTION.

Circulates amongst Makers and Users of Motor-Cars, Cycles, etc., in the United Kingdom, the Colonies and the Continent.

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CONTENTS.

AN ELECTRICAL CAB SERVICE FOR LONDON.

THE practical solution of the horseless cab problem may now be said to be accomplished. At various times it has been demonstrated that, under certain limiting conditions, electricity could be usefully employed as a motive power for vehicles. Unfortunately, till recently these conditions have been so very strictly limited as to preclude the commercial use of such vehicles. Storage cells were both excessively heavy and easily damaged. They could only be charged at certain secluded spots, usually remote from the area of their use, and they also required a long time in charging. Current, too, was dear, as was the cost of replacing damaged plates in the cells; and so, although it was known that electricity could be most usefully employed in launch and carriage work, yet, owing to the practical difficulties before mentioned, nothing was ever accomplished. During the past few years these difficulties have been lessened to such an extent that electric traction has now become a commercial possibility. The weight of the storage cells relatively to the charge has decreased very much; the cells are now much better, mechanically and electrically, than before, and will stand a good deal of hard use; current can be obtained in a multitude of places, and at a price just one-fourth of what it was less than 10 years ago; while, lastly, the economical employment of that current is also much better effected than was formerly the case. In short, electrical cabs are now possible owing to the improvements that have been effected in storage cells, motors, and in the price of current. In order to take advantage of these improvements the London Electrical Cab Company was formed some nine months ago to construct hackney vehicles propelled by electricity to ply for hire in the streets of London; but as the management of a large number of vehicles could only be economically undertaken by making proper arrangements, considerable time and thought had to be expended in designing a suitable station. We need hardly say that an electric motor-van station is about as much like a stable as a theatre is like a barn. Suitable premises were at length secured at Juxon Street, Lambeth, S.E.—not a particularly pleasant neighbourhood, but one that will no doubt thrive with the new industry in its midst. Juxon Street and its environment somewhat reminds us of Lant Street, Borough—every other house takes in lodgers of a dilapidated kind. Much alteration was needed to render the premises a suitable abode of the horseless cab. The ground floor was made of concrete, and the first floor is built like a gallery (Fig. 6), and is carried on steel joists and columns, leaving a large open space which admits abundance of light and air. On the ground floor is the housing accommodation for the cabs, where they can be cleaned, &c., the alternating dynamos, of which more anon, and a small hydraulic lift. In the gallery above are two pairs of rails about 4 feet 6 inches gauge, on which are trucks. There is also a large switch-board, and from this are led the conductors for charging the batteries.

For obtaining a supply of current the Company could either have put down its own plant or could purchase it from the Supply Companies. Considering that there would be but little economical advantage in having a plant which, even if of sufficient size now, would quickly become too small, and if of large size now would be idle or running light half its time, and also that all Supply Companies find it difficult to increase their day load, the Cab Company decided—and very wisely, we think—to take their current from the Deptford Central Station. As, however, this current is alternating, and reaches the consumer at a pressure of 2,400 volts, it became necessary to put down motor generators which should transform the current to a continuous low voltage one, suitable for charging. At Juxon Street there are two such motor generators, and space for a third.

Each motor generator consists of a Thomson-Houston alternator coupled to a direct current generator. These are mounted on the same bed-plate (*see* Figs. 1, 2, and 3). Each motor has a capacity of 75 kilowatts. The *modus operandi* is as follows:— A battery gives current to the alternator, and when this is at the proper speed, and synchronises with the current in the outer mains (a periodicity of about 80), the latter are switched in; the direct current is then regulated till of the proper pressure for charging. By this method of transformation no secondary or intermediate transformers are necessary. The charging current so produced costs about 1½*d.* per unit.

The cabs are handsome-looking vehicles (*see* Fig. 4), in shape something like coupés. The windows right across the front (which are made to open), and the extra side windows make the carriage very light and pleasant to ride in. They are upholstered in leather, and possess many more small luxuries than the public vehicles now in use—such as the electric light both in the inside and outside lamps, rubber tyres, spring cushions, &c. The driver's seat is in front, but owing to the rounded dashboard the carriages do not have that appearance of being so utterly incomplete without the horse, which might have been expected. Many persons contend that the driving seat should have been at the back, the same as in a hansom, so that the "fare" could have an unrestricted view. On consideration, it will be easily understood that this might be somewhat risky, as the driver of a motor-carriage must be able to see the ground immediately in front of him, especially for traffic in the London streets.

Early experiments made by the Company to determine the energy required to propel the road vehicle on solid rubber tyres, disclosed the fact that the tractive effort on wooden pavements barely exceeds that of a tramcar running on rails,

Fig. 1.—General View of Alternator and Generator.

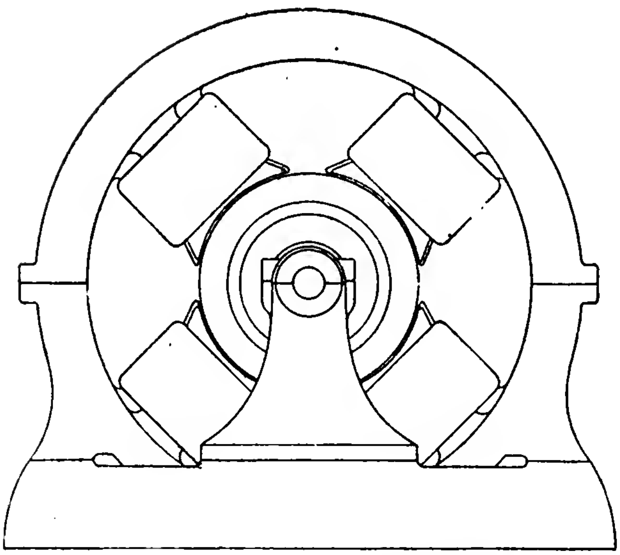

Fig. 2.—End View of Alternator.

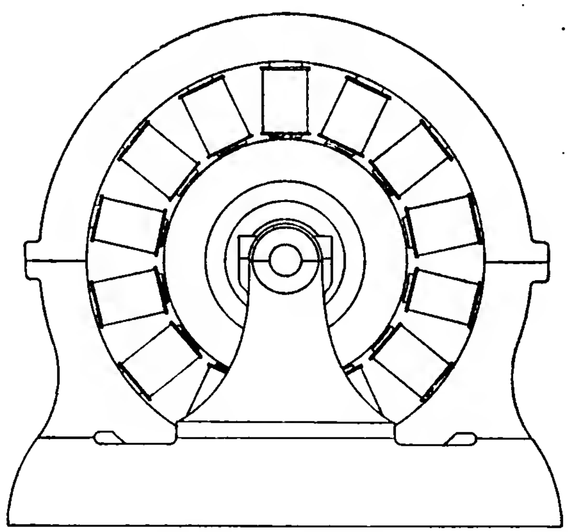

Fig. 3.—End View of Generator or Charging Dynamo.

and even on an ordinary macadamised road the energy taken is not much greater. When, however, the thick mud, such as that met with only in the country, is encountered, the tractive effort is very considerably increased; and this Company, therefore, whilst maintaining that it is perfectly practicable to run electrical vehicles in the streets of London, or other well-paved and comparatively level towns, with commercial success, do not suggest that the same holds good of vehicles to be used on country roads.

has been ingeniously arranged within the gear wheel driven by the motor-pinion and forms a very compact arrangement. The chains connecting the counter-shaft with the driving wheels are of Renold's laminated type.

The battery used on each of the vehicles consists of a set of 40 E.P.S. traction type cells, having a capacity of 170 ampère hours when discharged at a rate of 30 ampères. These cells are all mounted in one tray, which is slung under the bottom of the cab by four suspension links supported by springs under

Fig. 4.—The New Electrical Cab.

The electrical mechanical equipment on each cab consists of a 3 H.P. Johnson Lundell motor with a double wound armature and double wound fields. The series parallel controller by which the connections between the windings of the armature and fields are manipulated is under the control of the driver, and consists of a switch, to be described further on. On each end of the armature spindle is a raw hide pinion which gears into a counter-shaft, which in its turn drives the two driving wheels of the cab through endless chains. As the two wheels are driven by the one motor it was essential to adopt a differential gear of the "Jack-in-the-box" type to connect the two halves of the counter-shaft together. This gear (Fig. 5)

compression, and the ordinary carriage springs again separate the cells from the vibration to which the carriage wheels are exposed. In the case of an electrical cab, such as those now put into service by the London Electrical Cab Company, the accumulators weigh upwards of 14 cwt. out of a total weight, including passengers, of, say, 30 cwt.

It was originally estimated that two sets of cells would be required to enable the cab to do an ordinary day's work in the streets of London, it being considered that one set would propel it about 35 miles. The economy of the motor and controller arrangements, however, is so considerable that it is now found the cabs will do at least 50 miles with one set of cells, and the economy in the use of current thus experienced will make the running of the cabs cheaper than was originally expected.

It being considered that one of the sources of expenditure in the maintenance of traction cells is the amount of pulling about they are usually subjected to in taking them in and out of the vehicles, the cabs have been designed so as to entirely prevent any such damage occurring in their case.

The cabs are placed over an hydraulic table on to which the tray of cells is wheeled on a light skeleton iron trolley. The table is then raised until the tray comes into the position in which it can be attached to the suspending links. The hydraulic table with the trolley is then lowered and the cab left free to propel itself away.

When the cells are to be changed the cab is propelled over the hydraulic table and the reverse operation takes place.

The charging arrangements for the cells are very complete. A battery having been detached from the cab in the manner previously described is run on rails over the hydraulic lift by which it is elevated into the charging gallery (*see* Fig. 6) above. The battery with its trolley is taken on a second trolley along the gallery into its proper charging position where it is connected up to the two conductors through the low tension

speeds allow of the full energy of the current being utilised in the motor without any absorption in resistance, and the cab can thus "crawl" using only about the same number of watts per car mile as when running at full speed. In the reverse direction from the top position the series parallel controller on the first step short circuits the motor through the starting resistance, thereby gently braking the cab. On the second step backwards the motor is completely short circuited, bringing the cab to a dead stop, and the third step backwards reverses the connections between the armatures and fields, all being in series to enable the cab to be moved at the slowest speed backwards. The whole of these movements are produced by the use of one lever placed at the side of the driver's box. The circuit from the accumulators to the controller and motor passes through an ingenious switch arrangement attached to the foot brake which can also be used for bringing the cab to a stop. This switch is arranged to brake the circuit when the foot brake is applied and to brake it rapidly so that there is no injurious arcing at its contacts. It is therefore impossible in the use of either the electric or the foot brake for a careless driver to apply the brake whilst the current is still passing through the motor. The foot brake has another advantage in the crowded London

FIG. 5.—THE ELECTRICAL CAB COMPANY'S DIFFERENTIAL GEAR.

supply. One of these conductors passes directly back to the charging switchboard through a regulating resistance and ameter, the other conductor being attached to a common return. Each battery is, therefore, separately connected to the charging switchboard and the charging current regulated by its own regulating resistance switch. The cells on which these switches are mounted are also used for registering the time at which each battery is put on to the charging circuit and the rate at which it is being charged.

The double wound motor and series parallel controller is perhaps the most important arrangement on the cab, ensuring, as it does, the greatest economy in the consumption of current at whatever speed the cab may be running. The controller is arranged so as on the first step to connect on two armature windings and the two field windings of any series with a small starting resistance—this is not a running speed but is only intended to start the motor into motion. On the second step the windings are still in series but the resistance cut out, and with this arrangement the cab runs at a speed of about three miles an hour. The third step places the armatures in parallel but leaves the fields in series, and with this arrangement the cab runs at about seven miles an hour. The fourth step places the field windings in parallel and the cab runs nine miles an hour. It will thus be seen that three normal running

streets, for when moving in a block the driver can set his controller handle to slow ahead and then start and stop the cab time after time as the traffic slowly moves on by simply putting on and taking off his foot brake.

It may be here pointed out that the stopping of these electrical vehicles is far more under control than any horse-driven carriage, a fact we have demonstrated for ourselves. Not only is it fitted with a much more powerful brake, but the driver can readily reverse the action of the motor, and there is, of course, no horse slipping.

A special plug or key is in the possession of each driver; without this key it is impossible for anyone to move the carriage. When leaving his seat the driver simply places the key in his pocket. The advantages of this are obvious.

The steering and driving of the cab is simplicity itself, and requires no skilled knowledge whatever. Out of 15 hansom cab drivers who were tried, it was found that 12 within two days were quite capable of guiding the vehicle in any traffic.

On the left hand side of the driver's seat is a lever handle; the carriage commences to move immediately this handle is pushed forward, and the more forward the handle is moved the faster moves the vehicle, from one mile to 10 miles an hour. Reversing the handle simply means making the carriage go slower, and when reversed beyond the stationary point the carriage commences to go backward. The driver's right hand is occupied by moving a little wheel, which steers the vehicle in any direction. The brake-power is applied by the driver's right foot; directly this is applied the electric current is cut off, so that there is no energy acting against the brake.

Although they had declined to grant licenses to several other kinds of motor-carriages, which licenses had previously been applied for, the Scotland Yard authorities unhesitatingly agreed to give the necessary license to these cabs, subject to the sensible restriction that each vehicle should be accompanied by its driver, who was required to prove that he was capable, not only of guiding the carriage, but of turning it in a very small space, and of stopping it immediately when required. These tests were satisfactorily fulfilled.

The inauguration of the new cab service took place on August 9th, when, on the invitation of the directors of the Company, a large and distinguished body of guests, including many of the prominent members of the turf, electrical, and journalistic professions, assembled to inspect the new vehicles. The proceedings were fully described in the daily papers, and so we need not refer to them any more than to say that an interesting feature was an address by Mr. W. H. Preece, F.R.S., who said it was some gratification to him to be called upon to come there and inaugurate such a great and interesting undertaking. He knew nothing about these electric cabs until last week, but since then he had had many pleasant drives in them, to the amusement of the omnibus drivers, but, he feared, also to the chagrin of the cab drivers. There was a strange fascination about electricity. It was true there was a "cussedness" about it, in that it had a knack of doing that which was least expected, but at the same time he had always found that it never failed to do what might be fairly expected of it when it was carefully handled. He had great faith in electricity as a mode of traction. The horse was a most imperfect machine; its principles were horrible to the engineer. It moved in unstable equilibrium, and sometimes got a bad fall in consequence. Then it was unmechanical in its movements, and was very weak in its head, for if it got frightened, or mentally disturbed, God alone knew what it would do. They had seen only the previous day a horse run into a post office in the City, presumably for peace and quietness, yet every Londoner knew that the very last place where he might hope to find peace and quiet

FIG. 6.—THE ELECTRICAL CAB COMPANY'S CHARGING STATION.

was in a post office. Then the horse must be well fed. It was subject to disease as we were, and it was very much shorter lived. The driver must constantly be thinking of his horse, and if he did not it very soon came to grief; indeed, they both frequently came to grief together. Still, they must all love the horse and care for it in the best way they could, but at the same time it was decidedly necessary to see whether they could not find another and more perfect way of doing its work. Then, again, the horse wanted special accommodation, yet when they looked around them in the building they were in to-day they would find room for 50 cabs, whilst the horses were put in the gallery and wanted no food at all. People would, doubtless, stick to the horse for what it was worth until the question of economics came in, and the electric motor applied itself to the work economically and efficiently with almost human power of discrimination. It was ready for work under all circumstances. The motor was self-regulating; the energy expended by it varied exactly with the work it had to do. It puts its shoulder to the wheel when going uphill, and not only applies a brake when going down hill, but that very action serves to restore the energy taken from it. In that respect it was decidedly unique. Fourteen years ago, in Vienna, he had ridden an electric cycle. Mr. Volk, of Brighton, had also experimented with an electric dog-cart. Then we had recently had occasional glances at an electric omnibus in the streets of London, and he had ridden in a very successful and comfortable little carriage in Wolverhampton, built by Messrs. Elwell, Parker, and Co., and the demonstration to-day was the summit of their efforts, and what they were doing here was also being done in Paris, New York, and Chicago. But all their success with electric carriages depended upon the cells, and improvements in the accumulator had been a very powerful factor in their development, as well as improvements in the batteries employed for supplying the necessary energy. The accumulator itself had made a progress that was simply marvellous. In 1881 it required 300 lbs. weight to absorb one Board of Trade unit or kilowatt hour, for which now only about 100 lbs. weight was needed. In this respect there was, however, room for considerable further improvement, and although they had been able to reduce the weight of the accumulator to one-third of what it was before, they were still hoping for something better. The cabs of the Electrical Cab Company carried 40 cells, absorbing 16 units. The currents they used were alternating currents generated at Deptford, and changed into continuous currents in the building they were now in, and the batteries were charged in the galleries above. There was very little loss on the whole, and a set of accumulators on being charged would suffice to drive one of the cabs a distance of 50 to 60 miles—that is to say, one unit of power would drive the car about four miles. The cost of the electricity was only 1½*d.* per unit; in other words, 2*s.* per day, or ·35 of a penny per mile. For current the Company had contracted for regular supplies at a fixed charge of 10 per cent. for maintenance. They had met there that day to set the new movement going. He hoped to see charging stations everywhere throughout the city; indeed, at every cabmen's shelter. They would then be able to see what was the durability of the cells. He had himself an absolute belief in the power of electricity as the ultimate motive agency. He was pleased to think that the problem would now be satisfactorily elaborated, and he wished the Company every success.

Mr. W. C. Bersey.

Mr. H. H. Mulliner (the Chairman) said he had been pleased to hear Mr. Preece's remarks, and to find that he thought so well of the electric cab. At the same time he would like to say that the principal credit of what they had done was due to Mr. Brougham and Mr. Bersey. They would now show those present the practical working of the cabs, and he would first explain that in placing them upon the streets the price of hiring would be the same as for ordinary horse-drawn vehicles. The cab drivers were, in fact, their best friend. They had had large numbers of applications from cab drivers to be taken on as drivers of their vehicles, and they had found no difficulty in teaching them readily to handle the cars. He proposed a vote of thanks to Mr. Preece for what he had done for them that day.

At the conclusion of the formal proceedings, the cabs were placed at the disposal of the company, and many of those present availed themselves of the opportunity afforded them to indulge in a ride and test the capabilities of the vehicles. The route selected was over Westminster Bridge and through the heavy traffic to Charing Cross. The appearance of the cabs, the wonderful ease with which they were controlled, the smoothness of their running, excited universal admiration. We have no hesitation in saying that the best appointed horse-drawn carriage is simply not in it with these electrical cabs. Their design and workmanship leave little or nothing to be desired, and the greatest credit is due to Mr. Manville, the consulting engineer, and to Mr. Bersey, the manager, for producing such faultless machines. Already the Company has been overwhelmed with applications from people usually designated as "carriage folk" for the hire of the cabs for the next London season. Indeed, out of the 15 cabs present on the opening day, 13 were at once hired for terms varying from a month upwards.

There is, of course, the vulgar opposition of the horsey people, but this so far has confined itself to that particular form of humour peculiar to those who drive horses. The electrical cabs are being turned out as fast as possible, and within the next few months there will be nearly 100 plying for hire in London. It only remains for us to congratulate the Company upon the splendid success which has attended this experiment in automobilism.

Mr. J. W. Barnard, Secretary to the Electrical Power Storage Company, writes :—

"I am instructed by my directors to call your attention to the fact that the storage battery which has rendered possible the solution of the problem of electric traction on common roads, and which is being used by the London Electrical Cab Company for the propulsion of their vehicles, is the practical result of patented inventions, the outcome of the 16 years' experience of this Company and its staff.

"It may further be a matter of interest to the public to know that the battery is manufactured in London, giving employment to a large amount of British labour."

The *Daily News* of the 8th instant says :—"Motor-cabs are certainly finding general favour, and there are now 17 of them running in London. There have been eight out on the ranks this week, and by Monday there will be 12. By the end of next week the Company expect to have altogether 25 of the new vehicles, and after that a further order for 50 cabs now in hand should give them about four additional ones every week. Scotland Yard, of course, examines and tests every vehicle before licensing it, and one of their tests is to make each driver take his cab up and down the very sharp incline in the Savoy between the Strand and the Embankment. With regard to the cabdrivers' protests against the new introduction, there is certainly less occasion for it than is ordinarily the case where mechanical inventions are first introduced. We are assured that every driver thus far employed is an old cab-horse driver, and that the cab washers are all taken from cab-yards. The men for whom no place can be found in connection with motor-cab service are the horsekeepers. Their places must inevitably be taken by engineers' fitters. That is unfortunate, but it cannot be helped, and no very considerable number of men at a time are likely to be thrown out of employ, and though, of course, it intensifies competition for employment, the occupation of horsekeeper is, of course, in considerable demand in other ways."

Zola on Automobilism.—The great French realistic writer, Emile Zola, writes to *Les Sports* to the effect that he is a partisan of the automotor, and is convinced that the horse will exist only as a curiosity when the practical electric motor is found. The advantages of the automotor are incalculable ; it is an instrument of civilisation and fraternity.

THE AUTOMOTOR INDUSTRY.

The Daimler Company's Works.

Coventry may be said to be the home of light machinery construction, and whether for watches, cycles, or motor-cars, the legend that a machine is "made in Coventry" is at once a guarantee of fitness and excellence. Coventry cycles are known all over the world and command the best prices, and from the manufacture of cycles to that of motor-cars is but a step.

Fig. 1.—Daimler Motor (Front View).

Indeed, the mechanical instinct seems to be a distinguishing feature of the Coventry people, and no doubt dates from the time when a citizen, somewhat harshly described by the late poet Laureate as a "low churl," "bored a little augur hole in fear," in order to obtain a view of Lady Godiva under circumstances known to most people—at any rate in Coventry, where that lady's name is still very properly venerated. Whether this theory is correct or not is immaterial, the fact remains that skill in the construction of light machinery is hereditary with most of the inhabitants. When, then, the Daimler and other motor manufacturers selected Coventry as the scene of their operations they showed wisdom.

The Daimler motor was originally a German invention, and was the outcome of much labour and experiment on the part of an engineer of that name who assisted Dr. Otto in the perfection of the gas engine.

Fig. 2.—Daimler Motor (Plan).

The Daimler motor of the standard type is a two-cylinder vertical engine using light petroleum as the motive power and working on the Otto, or more correctly the Beau de Rochas, cycle. The cylinders are 80mm. in diameter by 120mm. stroke. The engine runs at about 750 to 800 revs., and gives off about 3½ to 4½ H.P. It is, in proportion to its power, an exceedingly light and compact motor, weighing but 325 lbs., and has shown itself admirably adapted for motor-cars, launches, &c.

The general arrangement of the motor as applied to cars is shown in Figs. 1, 2, and 3, which are respectively a front view, plan, and side view of a motor mounted on its frame but without the body. It will be seen that the shaft of the motor is placed longitudinally, and hence its motion has to be transmitted to the second motion shaft by bevel gearing. Like all motors working on the Otto cycle it is uni-direction, and hence the reversal of the driven shaft has to be accomplished by means of gearing, as has also any variation in the speed. All this gearing is cased-in as seen in plan and runs in a bath of oil.

The second motion shaft drives the rear wheels by means of pinions and chains, the usual differential gearing being interposed. Although the number of working parts is large, and at first sight the gearing may appear to be complicated, yet in practice this has not been found to be a disadvantage, and ordinary drivers with no mechanical knowledge find no difficulty in handling these cars. At the rear of the frame are the oil and water tanks, both having a capacity sufficient for a 50-mile run. The various types of motor-cars manufactured by the Daimler Company are shown in Figs. 4

Fig. 4.—Daimler Crawford Waggonette.

Fig. 3.—Daimler Motor (Side View).

to 8—Figs. 4 and 5 being a Crawford wagonette with the hood up and down; Fig. 6 is a Rougemont car; Fig. 7 is a tradesman's van, several of which are in use; and Fig. 8 is a latest pattern parcel van driven by a four H.P. motor.

The Daimler Company does not, however, confine its operations only to motor-cars, but manufactures motors for launch and small craft propulsion. For river work and yachting purposes an oil launch is well suited, being at once clean, compact, and light. In these small vessels the reversing is effected by means of bevel friction gear. In Figs. 9, 10, and 11 we illustrate the usual type of Daimler launch, such as is supplied to the harbour and river authorities, and which is largely used up the Thames and on the Scottish lochs.

Fig. 9 is a longitudinal fore section, Fig. 10 fore-deck plan, and Fig. 11 a midship section. These launches are built in any desired way, either for sea or river use. For the former they are made fuller in their lines, and are partially decked, so as to enable them to stand a choppy sea. The engine is also cased in and is of a more powerful description. For river work a light construction is permissible with fine lines, and hence a good speed can

Fig. 5.—Daimler Crawford Wagonette.

be obtained with very little expenditure of power. The propellers are of brass or manganese bronze, and are carried in the usual way. For the larger craft reversing can be effected by adopting a reversing pitch propeller, which is worked through a rod passing through the hollow main shaft, but for small craft the bevel friction gear, as seen in Figs. 9 and 10, answers admirably. The method of working these engines is as follows:—

Referring to the drawings, the pressure valve, G, which is actuated by the exhaust forces the oil fuel for supplying the motor from the tank, B, to the vaporiser, C; this valve also supplies oil to the ignition burners, D, and hence a continuous supply is maintained when the motor is running. In starting the motor the initial pressure of oil is obtained by means of a hand air-pump forcing air into the tank, B, through the inlet cock, H.

Fig. 6.—Daimler Rougemont Car.

The explosive charge in the vaporiser, C, is obtained as follows:—During the downward stroke of the piston air and petrol are sucked in and mixed, this mixture of air and oil vapour passes into the ignition chamber, the necessary proportion of air and oil being maintained by the inlet jets being suitably adjusted. The petrol is always maintained at the required level by means of the float valve in chamber E.

Before starting the motor the ignition tubes must be heated to a bright red by the burners, D, which must be lighted up by means of the methylated spirit heater. With motors using ordinary petroleum a small saucer is provided underneath the burners to obviate the use of the torch. This saucer should be filled with methylated spirit, which must be allowed to nearly burn out before applying the pressure from the hand air pump. This done, the petrol passing through the heated burner tubes becomes vaporised, and the flames burn briskly with a blue-green tint. If the flames spit, flare, or burn a yellowish colour, this indicates that the burners are not sufficiently heated. In the case of petroleum motors it is requisite to heat the vaporiser as well as the burners before the motor can be started. This takes about 10 minutes, and is best done by means of a brazier's lamp. During the running of the motor the vaporiser is automatically kept up to the necessary temperature by the exhaust.

The ignition tubes being red hot (and with petroleum motors the vaporiser is sufficiently heated) the motor can be started. To do this, press down the rod, W, and give the crank handle, L, one or two turns (after pushing in the starting tongue in axis of same), when the first charge will be drawn into the ignition chamber and fired. The motor will then run at full speed without further assistance. Before starting the motor the reversing lever, M, must be placed in the central notch, in which position the propeller shaft is disconnected from the motor. By moving lever forward the propeller is connected, and the launch will move ahead. By moving the lever right aft the reversing gear is brought into operation, and the launch will go astern. By drawing up the rod, W, the valve rods are thrown out of gear and the supply of oil to the motor cut off, the burners being still fed. By opening the air cock, U, the pressure in the tank, B, is released and no oil flows to the ignition tubes; the flames are then extinguished.

Although from this description it may appear that these motors require a certain amount of skilled attention, yet such is not the case. Ordinary watermen after a few lessons find no difficulty in manipulating them.

The Company's works are situated at Coventry, and comprise a very large well-lighted factory with offices and stores. The works have railway sidings running into them, and are, moreover, close to a canal, and hence raw material and finished pro-

Fig. 7.—Daimler Tradesman's Van.

ducts can be handled with the least cost. The factory is extremely well arranged, and as far as possible all operations are consecutive—that is, the raw material goes in at one end and comes out at the other manufactured into motor-cars, &c. The character of the machinery will be gathered from the accompanying engravings. Fig. 12 shows the brass turning shop; Fig. 13 is the light machine shop. There are some eight separate shops altogether, all equipped with the latest and most expensive machinery, mostly, as regards lathes, of

FIG. 8.—DAIMLER PARCELS VAN.

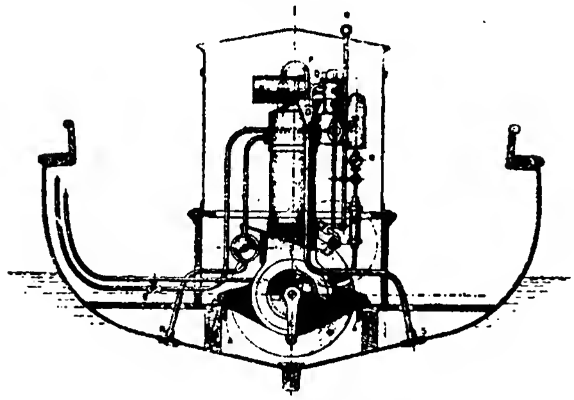

FIG. 11.—DAIMLER LAUNCH (Midship Section).

FIG. 9.—DAIMLER LAUNCH (Longitudinal Fore-Section).

FIG. 10.—DAIMLER LAUNCH (Fore-Deck Plan).

Fig. 12.—Daimler Company's Brass Turning Shop.

American make. When we say that some £20,000 has been spent in plant alone it will be seen that the Daimler Company has laid itself out to do a big business. One of the most interesting shops is shown in Fig. 14, which is the engine erecting and testing shops. Here the motors are subjected to a prolonged testing on the brakes. As will be seen, very complete arrangements are made to ensure this being properly and systematically done. Iron standards are placed at intervals and to these the motors are bolted. Some 20 machines can be tested at once. Fig. 15 is the carriage erecting shop, and like all the others is large and spacious, being 130 feet by 120 feet. At the time of our visit there were some 50 motor-cars under construction and orders were plentiful. We observed that in the Daimler factory the metric system prevails, all measurements being in millimetres. It will thus be seen that Mr. J. S. Critchley, the manager, is quite ahead of the latest engineering practice. With the magnificent plant the Company possesses it deserves every success, and the busy appearance of the works gives ample evidence that this is being achieved; some 250 men are employed, and already the Company is talking of extension. Its motors are well known and have stood the test of hard use. As is well known, it was the Daimler motor that gained the first place in the Paris-Marseilles Competition of 1896. In conclusion, our visit was undertaken for the purpose of seeing what was being done in the motor-car industry. We saw everything that was necessary to convince any unbiassed person that the Daimler Company is carrying on a large business in the manufacture of motor-cars.

The Press on Motor-Cars.—The Institute of Journalists—a somewhat hybrid body—has lately been holding its Congress at Cardiff, and we observe from the proceedings that much of the usual gush was indulged in about the "formation of public opinion," "independent judgment," "freedom of thought," and so forth. We do not dispute the general proposition thus advanced, but,

Fig. 13.—Daimler Company's Light Machine Shop.

FIG. 14.—DAIMLER COMPANY'S ENGINE ERECTING AND TESTING SHOP.

on the contrary, have some vivid recollection of what the "formation of public opinion" by the (from a professional and technical point of view) uninstructed writers in the daily Press means. Before the Jubilee the Press warned the public of the dangerous crowds, the risk of fire, the absence of food that would be features of that aupicious day. There was not the slightest ground for this old woman's claptrap from Fleet Street. Yet the public believed it, with the result that there were no crowds, no fires, and food was so plentiful that it was thrown away by the ton, and those who had looked forward to making a legitimate "thing" out of the Jubilee, such as by letting seats, &c., lost heavily—not that we feel at all sorry for them. Similarly, as regards motor-cars. When the Brighton affair was on, and, like all things, was duly off, the Press went into hysterics, and cab and omnibus proprietors contemplated bankruptcy, farmers and carriers looked at their horses and softly recited that poem beginning, "My beautiful, my beautiful, that standest meekly by," &c., &c. They thought because the Press had said so that horses would be useless. Of course this was utter nonsense, but still there *was* a slump in horseflesh, because the Press had taken an utterly wrong view of the question. We then gradually descended from the *L'Allegro* attitude to the *Il Pensero* of utter depression, consequent upon the failure of *The Engineer* competition and the "pessimistic" (good word that) attitude of the daily Press. The worthy proprietors of Aldridge's and Tattersall's took heart once more, and with much thankfulness carried on their business again. We now have the chorus of approval and sanguine anticipation on the part of the daily Press as a result of the successful inauguration of the electrical cab industry in London, and omnibus drivers and "kebmin" are again given over to the most gloomy views of the future. Now no one has greater faith in automobilism than ourselves, and no one more cordially detests the horse for urban traffic than we do, yet, supposing for the moment that by this time next year all cabs and omnibuses would be mechanically propelled, horse property would be

FIG. 15.—DAIMLER COMPANY'S CARRIAGE ERECTING SHOP

2 L 4

as good an investment as ever. But all history shows that changes are not lightly made in the habits of people, and motor-cars have to win public approval just in the same way as did steamships, rifled guns, silk hats, rational dresses, and other things. Our point is, that the public should not heed to any extent these predictions of the daily Press, because those who utter them are not either in the position to know what is being attempted or competent to pass judgment on mechanical matters.

AUTOMOTORS AT THE AGRICULTURAL HALL.

At first sight the connection between laundries and automotors is not very apparent; yet, as the family wash is usually brought home in a van, and as, for hygienic and sanitary reasons, an automotor is preferable to any horse-drawn vehicle, it is evident that clean linen is better carried in an automotor than in an ordinary horse-drawn cart. Hence the spirited proprietors of our contemporary, *Industries and Iron*, Messrs. Cordingley and Co., so far from doing anything incongruous, as some writers in the daily Press have suggested, displayed sound common sense in associating laundry machines and appliances with motor-cars in one exhibition. With the former we need not concern ourselves further than to remark that every year washing clothes, one of the most unpleasant domestic duties, is rendered less so by the many labour-saving appliances that are from time to time introduced. In spite of all these, however, laundry work demands considerable muscular effort, and is not much liked. A dearth of labour seems to be the general complaint on the part of those who manage laundries, and it is rather surprising to learn that at the present moment work could easily be found in London for at least 5,000 ironers at good wages. At the Agricultural Hall many fine examples of washing machines were to be seen. Coming to the motors, most of the leading makers exhibited. The London Electrical Cab Company showed three of their vehicles, which were universally admired. The London Motor Van and Wagon Company have made the construction of light vans a specialty, and had three good examples on view, one being the "Harlene" van, which has been running in London for over two months with the most satisfactory results. Another one was a light canvas-covered van, very suitable for laundry purposes. It is propelled by an oil-motor of the British Motor Syndicate type, which gives off from 4 to 4½ B.H.P., the total weight of the van complete being 18½ cwt., and the carrying capacity being about the same. Four speeds are provided, ranging from 3 to 12 miles per hour. The Daimler Motor Company showed two specimens of their handiwork, in the shape of a Knightley carriage and a Siamese car. The former is a four-seated phaeton, and is propelled by a 4½ B.H.P. Daimler motor, the speed attained being, we were informed, 17 miles per hour. The latter is similar to the former, save that the body of the car is detachable, and either a phaeton or van body can be fixed at will. This system of having two car bodies and one motor frame has much to recommend it, and is decidedly novel. An enterprising tradesman could thus use his motor-van for business in the week, and as a carriage on Sundays and holidays.

The Great Horseless Carriage Company showed two Bollées, or, as the firm prefer to call them, Coventry Motettes, and two vans, having Daimler motors. Indeed, the exhibition was mainly confined to motors of this make. The Hon. C. S. Rolls showed his Peugeot phaeton, which has done a lot of travelling in its time, and looks as if it needed renovation. We regret that neither Messrs. New and Mayne, Messrs. Roots and Venables, the Lifu Company, Thornycrofts, nor the Anglo-French Company exhibited. It was anticipated that there would have been at least 30 cars, but on the occasion of our visit we could only count 12. As an exhibition of motor-cars it must be pronounced a failure, and we cannot understand the attitude of non-exhibitors.

CABBY'S FAREWELL TO HIS STEED.

The *St. James's Gazette* publishes the following pathetic poem:—

So long, old 'oss; you're jest played aht, you've taken you're last fare,
Your quarters are the knacker's nah, and mine are Lord knows where;
There ain't no room in London nah for either you or me,
We're crahded aht by cabs as go by electricitee.

It warn't all beer and skittles, even in the palmy days,
What with the cove with principles, his legal fare as pays;
But when the "biz" was pretty brisk, and cabby got the pull,
I could plank dahn for the Derby on my fancy 'arf a bull.

It's nuts, it is, on some fine day, to pick up some young nob,
And drive 'im all the morning till the fare is nineteen bob;
And then he stops at Gresham 'Ouse, and shahting "Cabby, wait,"
'E takes 'is 'ook the other end aht into Bishopsgate.

Or on a lovely autumn when the rain came dahn in sheets,
Or when a bloomin' blizzard set us skatin' in the streets,
And after yon 'ad planked dahn to the yard each bob you 'ad,
And fahnd yerself to balance up a dollar to the bad.

Then to take yer to the stables at the other end of tahn,
And strip yer frozen 'arness off, and rub yer old 'ide dahn;
And yer got yer jolly skin full, and a decent place to doss,
Which was often more nor *I* got by a jolly site, old 'oss.

But nah—so long, my beauty; for this latest style I bar—
I ain't a going (what do *you* think) to run a motor-car;
While there's a crossing to be swept, a job to do—no fear—
I reckon I'm too old to turn a blooming engineer.

Municipal and County Surveyors, Please Note!—According to two distinguished French cyclists who have been touring throughout Europe, including our own country, the roads in England are the worst maintained of any and the most impracticable in Europe, and, worse still, the inns are no better than the roads. A criticism we venture to say severe but not altogether untrue.

Some Useless Automotors.—The Admiralty have decided that all Whitehead torpedoes of Mark I (Star) and Mark II (Two Star) are to be at once destroyed, together with all their fittings. There are about 300 of these torpedoes in the service, and although they cost about £500 each, the Admiralty have been compelled to condemn them in consequence of the unfavourable reports that have been made as to their erratic movements after firing.

An Indian Prince at Coventry.—Last month His Highness the Marajah Thakore Sahib, of Morvi, visited Coventry for the purpose of inspecting the Daimler Motor Works, His Highness being interested in light railways for the development of his own country in North-West India. He arrived at Coventry from Birmingham, accompanied by Mr. F. H. Gill, M.I.Mech.E., who is connected with a firm that has put down 150 miles of light rails for the Prince, who is interested in motor-driven vehicles, and is taking advantage of his visit to England to learn what he can on the subject. On arriving at Coventry he was driven in a motor-car by Mr. Critchley, of the Daimler Company, to the King's Head Hotel, where luncheon was served, and he afterwards proceeded to the Company's works on the Foleshill Road. The whole of the afternoon was spent there, the Prince manifesting an intelligent interest in the details of motor construction. He left Coventry in the evening.

STEEL TRAMWAYS FOR ROADS.

THE American correspondent of *The Engineer* writes to his paper:—"One of the suggestions which has been put forward by the Road Inquiry Bureau of the Government, is that steel rails should be laid along country roads, so as to reduce the tractive effort required, and therefore enable farmers and other carriers to haul very much heavier loads than are practicable on ordinary country roads. The idea has obtained some foothold, and a special section of H-beam or rolled joist—having a wide and slightly concave top flange—has been recommended as the most suitable form, having enough rigidity to keep the trackway in fair level, the rails being connected by tie rods or tie bars. This form of section, however, has not been adopted by the Bureau, and it proposes a rail of inverted trough section, having a slight rib along the inside edge of the top, the metal being $\frac{7}{16}$ inch thick, and the width of tread 8 inches. The rails are to be bedded in gravel laid in well-drained trenches, and to be connected by rods at the middle and ends. The joints will probably rest upon saddles in order to prevent low joints, and each joint would form a 'rerail,' so as to put wheels on the rail, and so prevent the formation of ruts alongside the rails. It is claimed that with such a track the traction will be reduced from 40 lbs. per ton on macadam to 8 lbs. per ton on the steel roadway. The weight of material would be about 100 tons per mile, costing £400 to £700 per mile, according to the size of the contract. A lighter type of track could be built with 50 tons of steel per mile at a cost of about £200 per mile. These prices are for material only, exclusive of trenches, gravel, and construction. In view of the agitation in Great Britain for greater traffic facilities for the agricultural districts, it might be interesting to enquire whether such a system as this might not be applicable in some districts where even the 'light railway' has not penetrated, but where greater facilities are desired."

AN AMERICAN ELECTRIC CARRIAGE.

As will be gathered from the accompanying drawings, the electric brougham of Messrs. Morris and Salom, of Philadelphia, is a remarkably handsome and well-designed affair, embodying as it does the best taste and workmanship. It forms one of the automotor cabs now plying for hire in New York city, and it will be interesting to compare it with the electrical cabs now running in London, and which we illustrate on p. 485. Referring to the American design (Fig. 1), it will be seen that the vehicle consists of a carriage body and boot, the latter containing the battery of secondary or storage cells. It will be noticed that the body is slung rather low—a point which is of advantage to elderly people, but which in a very slight degree tends to rolling. We may as well here state a fact which, so far as our experience goes, but few carriage builders are aware of, that for smoothness of running a high centre of gravity in any vehicle is necessary—*pace* the fast express engines on the American and English roads. It will also be noticed that the fore wheels are larger than the rear ones, and that the former constitute the driving wheels, and the rear wheels the steering ones. Thus in these important points, we see what we may reasonably regard as the best American practice is utterly at variance with the best English and Continental practice. Both cannot be right, and, in our opinion, from a scientific point of view, the American design in this particular is faulty. In other respects the design has much to recommend it. The carriage itself is comfortable and well upholstered, and will carry two persons. In Figs. 2, 3, and 4 we give respectively an elevation, underneath plan, and front view of the car. It will be seen that the latter is supported on plate springs which are connected in the usual way to the axles. The wheels are of the pneumatic bicycle type, the fore ones being 36-inch diameter and the rear ones 32-inch diameter, the spokes being $\frac{1}{4}$-inch steel wire; the tyres are 3-inch Harford's, $\frac{1}{2}$-inch thick rubber, and are inflated under a pressure of 80 lbs. per square inch. Steering is effected by a system of rods, &c., terminating in the handle, F

FIG. 1.—MORRIS AND SALOM'S ELECTRIC CARRIAGE.

FIG. 2.—MORRIS AND SALOM'S ELECTRIC CARRIAGE.

FIG. 3.—MORRIS AND SALOM'S ELECTRIC CARRIAGE.

(Fig. 2), this being its normal position; when pushed forward to G the vehicle goes to the right, and when pushed back to H, to the left. We cannot say that this strikes us as being a commendable arrangement. It is not a positive gear; the direction in which a starting lever or wheel is moved should always indicate that in which motion is to be made. A driver who lost his head in a crowded street would probably do some damage with this steering gear. The motive power is furnished by a battery carried in the boot, L (Fig. 2). This battery consists of 44 cells of the type 3 F of the Electric Storage Battery Company; the current passes into the two Lundell motors. These are series-wound machines and weigh about 150 lbs. each. On each armature spindle is a pinion which

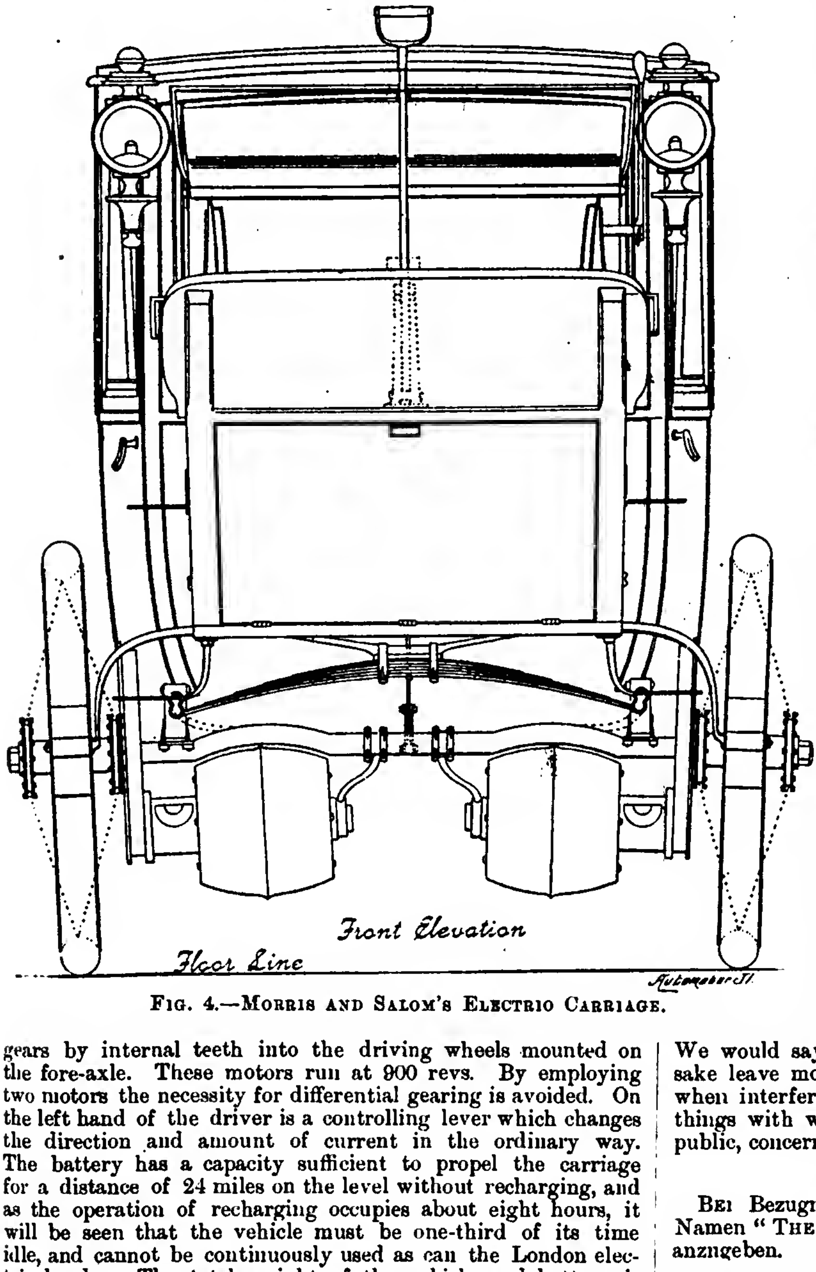

Fig. 4.—Morris and Salom's Electric Carriage.

gears by internal teeth into the driving wheels mounted on the fore-axle. These motors run at 900 revs. By employing two motors the necessity for differential gearing is avoided. On the left hand of the driver is a controlling lever which changes the direction and amount of current in the ordinary way. The battery has a capacity sufficient to propel the carriage for a distance of 24 miles on the level without recharging, and as the operation of recharging occupies about eight hours, it will be seen that the vehicle must be one-third of its time idle, and cannot be continuously used as can the London electrical cabs. The total weight of the vehicle and battery is about 2,600 lbs., of which the battery accounts for 1,000 lbs. Of this total weight two-thirds are on the front wheels and the balance on the rear wheels. This distribution of weight is not in our opinion proper, and we expect that this will be found to be the case in practical work, especially in hill climbing. The performances of these cabs, of which 100 are, we understand, on order, will be watched with interest, and it will be instructive to learn which is the more economical in working—the New York or London ones.

PETROLEUM AND MOTOR-CARS.

Our contemporary, *London*, publishes the report of the chief officer of the Public Control Department of the London County Council under the ridiculous and sensational headline, "Death in Lamp Oil." By the way, why cannot the organs of municipalisation, such as *London* and the *Daily Chronicle*, employ a more sober style? Half the good that these papers undoubtedly do is marred by the adoption of a shrieking, emotional method of treating affairs. This kind of thing may no doubt appeal to many, but it hardly commends itself to those who have any pretence to common-sense or sound judgment.

On the question of motor-cars, the report says:—"The Locomotives on Highways Act, 1896, received the Royal Assent on August 14th last, and came into force on November 14th, 1896. This Act relaxes the restrictions of previous enactments on the use of locomotives on highways so far as they relate to vehicles propelled by mechanical power and under three tons in weight unladen, and not used for the purpose of drawing more than one vehicle (such vehicle with its locomotive not to exceed in weight unladen four tons). Section 5 of the Act provides that the keeping and use of petroleum or of any other inflammable liquid or fuel for the purpose of light locomotives shall be subject to regulations made by a Secretary of State, and regulations have been made which provide that a motor-car may carry 40 gallons of petroleum in two metal tanks, each containing not more than 20 gallons. There is no obligation on the part of owners of motor-cars in which petroleum spirit is used to notify the local authorities that they keep petroleum for use in such motor-cars, nor is power of inspection given to local authorities to see that the regulations are complied with. As the absence of these provisions rendered it difficult to satisfactorily enforce the regulations, the Public Control Committee asked the Home Secretary to consider these points whenever the amendment of the regulations was contemplated. The Home Secretary has expressed his agreement with the Council's views, but as the number of motor-cars using petroleum is inconsiderable, he is of opinion that the necessity for the suggested amendment does not present itself yet, and the experience of this department is quite in accord with this view." We would say to the London County Council, For goodness sake leave motor-cars alone till they become a public danger, when interference would be justifiable. There are many more things with which the Council might, with advantage to the public, concern itself than motor-cars.

CONTINENTAL NOTES.

We note that the Government of the Duchy of Luxembourg has concluded an arrangement with M. Scotte for the use of his trains in the Duchy.

MM. De Dion et Bouton have dispatched an omnibus tractor which will haul another omnibus for service in Geneva and the neighbourhood.

The Paris Cab Company are contemplating how they can transform their cabs into motor-cars. They prefer electricity, but are trying other systems.

We notice that automobilists in France as in England complain bitterly of "Policemanism." It is time that concerted action was taken to abate this nuisance.

It is curious that neither in Berlin nor Vienna has automobilism caught on. In the former city a solitary motor-car is occasionally to be seen, and there are four or five in the latter.

A motor-car race for amateurs took place on August 30th. The course was from Carcassone to Perpignan, a distance of 120 kilometres. It was organised by the Société des Chauffeurs du Midi.

In Belgium a recent police regulation prohibits the driving of motor-cars by persons less than 18 years of age, and in Brussels a motor-car must not go at a speed faster than a horse can trot.

The Compagnie Générale des Automobiles is making experiments with a new rotary motor on the epicycloidal system, the invention of a M. Valentin. The results are said to be satisfactory.

An enterprising French gentleman, M. Sevin, has started a school of automobilism for giving instruction to coachmen and others. The idea seems a good one, and we hope it will meet with success.

The Northern Railway Company of France are making exhaustive trials with three motor-cars. One is a Serpollet, another a Panhard, and the third an electric car made in their own shops. It will be interesting to know the result.

We are glad to observe that the French coachmen take a much more sensible view of the introduction of automotors than do their English colleagues. The French Cabmen's Union declares that automobilism will be the making of the Union.

The French Post Office is about to use electrical automotors in place of the four-wheeled carts. The head office at Paris has an electrical installation, and so charging could easily be effected. The new mail-carts will go 20 kilometres without recharging, and carry 800 kilos. of parcels.

The English visitors to the Paris-Dieppe race will learn with pleasure that Madame Jubault has presented a little daughter to her husband. M. Jubault has also been presented with a handsome gilt medal by the Touring Club for his services on the former occasion. We congratulate M. Jubault.

Next year it is proposed to have a Grand Motor-Car Concours from Paris to Vienna. It has also been suggested to have one from Paris to London, but the Channel passage has constituted a difficulty. The latest proposal emanates from M. le Comte de Dion, and it is a Motor-Car Competition from Paris to Berlin and St. Petersburg.

In spite of the patriotic and purely unselfish desire of the French agricultural "interest" to impose a tax upon motor-cars, but three out of 86 of the general councils have so far pronounced in favour of the proposal. Of course, the plea for a tax is that stale one which we hear so much of on this side—the necessity of maintaining the breed of "'osses."

With the steady increase of automobilism in France a new kind of mischief has arisen. If a motor is left at a hotel unattended it is becoming a favourite pastime with the street prowlers to set the mechanism in motion and see what happens. It would be just as well to provide a locking or braking apparatus so as to avoid any risk of this playful attention.

This is what a London correspondent of *La France Automobile* says of England:—"England is a country of absolute liberty. There are neither Customs dues, nor soldiers, nor policemen. The faults are the rates, which a policeman is always on hand to receive. Those who do not pay work a certain number of days on the streets, and so on. Happy England!"

It is said that the firm of Panhard and Levassor has been converted into a limited liability Company with a capital of 5,000,000 francs. The name of the new Company will be Société des Anciens Établissements Panhard et Levassor, the directors being M. René Panhard, M. Hippolyte Panhard, M. G. A. Clément, M. Descubes, M. René de Knyff, M. G. Pierron, M. Garnier, and M. Daimler.

The authorities at Vichy are emulating our own bumbles; they have issued an order to the effect that in the town the speed of motor-cars shall not exceed 4·8 miles per hour. Each motor-car must have an efficient sound apparatus, and must have a name plate and efficient brake. Motor-cars must not cause an obstruction, and must stop on the approach of a restive horse. Really it would seem that the excellent Maire of Vichy had been taking lessons from an English provincial magistrate.

A new type of motor-carriage has been recently completed by Messrs. Panhard and Levassor, of Paris, in the shape of a two-seated vehicle, fitted with a single-cylinder motor. The same firm has also constructed a small petroleum motor-vehicle to run on rails for the Northern Railway Company of France. The vehicle, which is to be used in connection with the postal service, measures only 8 feet by 5 feet, although intended to accommodate four persons, and is driven by a two-cylinder motor.

Two French gentlemen, M. le Comte de Beaumont and M. le Comte de Mussac, have just accomplished a remarkable journey of 2,480 miles in a four-seated Panhard carriage of 4¾ H.P. Leaving Paris on July 25th, they proceeded to Reims, Dinant, Spa, Liege, Brussels, and Ostend; returning to their home in La Vendée by coast roads of Normandy and Bretagne. The journey was without the slightest mishap, and was a most enjoyable one in every way, and the cost of the fuel was only a few francs. Had this journey been attempted with a coach and horses the expenses would have been very heavy.

In Great Britain the law relating to vehicles comprises something like 80 Acts of Parliament. France is trying to beat us. M. Lépine, Prefet de Police of the Department of the Seine, has signed an *ordonnance*, which, by the way, is a volume of 270 pages, defining what motor-cars may and may not do. Each motor-car must have an authorisation containing a minute account of the anatomy of the machine. Ownership must be specified. The responsibility for accidents is unmistakable and not to be evaded. Really this *ordonnance* reads something like our Explosives Act passed during the dynamite scare. The new law comes into force this month.

LAW REPORTS.

Motor-Car and Bicycle.

On August 18th, at the Fleetwood Police Court, two summonses issued against Henry Thomas, motor-car conductor, Blackpool, were heard; one for driving without a light, and the other for furiously driving a motor-car on the highway. On the first charge the driver was fined 5*s.* and costs. In the second case the driver was summoned for driving the car at a greater speed than 12 miles per hour, which was the limit permitted by the Local Government Board regulations. It was alleged that the car kept behind two bicyclists for over two miles, and the men had to ride as hard as ever they could to escape being run over. Finally they got to a place where there was a cross road, and they turned up this lane and thus got out of the way of the motor-car. To illustrate the rate at which the car was travelling, Mr. Blackhurst, who prosecuted, said that it travelled over a distance of half a mile in one minute and 55 seconds, which was equal to a rate of 16 miles per hour. Evidence for the prosecution was then given including the usual police evidence as to speed.

For the defence Mr. Bracewell, one of the occupants of the motor-car, said he had ridden bicycles ever since the days of the old "bone-shaker," and had also ridden a motor-bicycle, so that he was accustomed to calculate speed. In his opinion the motor-car never travelled, during the time stated, 16 miles per hour. Defendant was a careful driver, and the car never went more than 12 miles per hour. When the constable came up and said they had been going at 15 miles per hour, witness said it was nonsense and an impossibility. Other evidence having been given, the Bench retired, and said they were satisfied that a greater speed than 12 miles was driven, and defendant would be fined 10*s.* and costs.

The Locomotives Act.

On August 26th, at the Newcastle Police Court, the adjourned summons against Walter Morrison and Co. for a breach of the Locomotives Act, 1865, was heard. Mr. R. S. Holmes, who prosecuted, said the case against defendants was that having three wagons attached to a traction-engine they employed only three men to take charge, instead of four. The law was that if there were more than two wagons there must be an extra man to look after them in addition to the driver, stoker, and flagman. The defence, he believed, was that there was a fourth man. Unfortunately an accident occurred on the date of the offence (August 5th) in Barrack Road, by which a little boy was killed. At the inquest there was no suggestion that there was a fourth man in attendance until after the accident. Mr. Holmes then called witnesses, who swore that there were only three men in charge of the engine and wagons. For the defence it was submitted that when the engine and wagons left Elswick on the return to Newcastle there were four men. Mr. Hall, who defended, expressed regret, on behalf of defendants, that there should have been any accident. After hearing all the evidence, the Bench came to the conclusion that there had been a breach of the law, and expressed dissatisfaction with the evidence of some of defendants' witnesses. They imposed a fine of £10 and costs.

A sitting was held on August 24th at the Bankruptcy Court for the public examination of W. Marshall, mining and electrical engineer, of 16, Tokenhouse Yard. Although the liabilities were £12,945, the assets were estimated to produce a surplus of £43,000. In the course of his trading he found £6,000 or £7,000 in connection with patents which were eventually taken over by the London Electrical Omnibus Company (Limited), formed in May, 1896, with a capital of £250,000. As consideration for his interest in the patents, the debtor was to receive £20,000 in cash and £80,000 in shares; but he ultimately agreed to accept unsubscribed shares to the extent of £27,633 for returning £13,816 of the cash consideration. The debtor attributed his failure to inability to realise these shares in the London Electrical Omnibus Company (Limited), and to other causes. A proposal having been lodged for the payment of 20*s.* in the pound to the creditors, the meeting was adjourned to October 20th to enable the necessary steps to be taken.

A Drunken Motor Cabman.—The conduct of motor-cars and cabs has so far been marked by great skill and care on the part of the drivers, and up to a few days ago no charge of insobriety has ever been made against anyone in charge of a motor-car. This honourable record has at length been destroyed by one, George Smith, 25, of 192, Portnall Road, Harrow Road, who was charged at Marlborough Street, London, on the 10th inst., with being drunk when in charge of a motor-cab, of which he was the licensed driver. P.C. Russell, 247 C, stated that he saw prisoner in Bond Street in charge of a four-wheel electric cab. Suddenly the vehicle swerved from one side of the road to the other, and ran across the footway, into No. 165, New Bond Street, breaking the water-pipe and the beading of the window. Thinking that prisoner was unable to manage the vehicle, witness asked him to get down from the box, and, finding that he was drunk, took him to Vine Street Police Station. He then denied being drunk, and the divisional surgeon was sent for, who certified that he was. The prisoner, in his defence, admitted having had two or three glasses of beer. He was very sorry, and said it was the first time he had been charged with being drunk in charge of a cab. Mr. De Rutzen, the magistrate, said: "You motor-car drivers ought to be very careful, for if anything happens to you the police, who have a happy knack of stopping a runaway horse, might find that stopping a motor is a very different thing. There will be a fine of 20*s.*" To Mr. George Smith, then, belongs the distinction of being the first driver to be convicted of being drunk on a motor-car.

Horse Statistics.—According to the Police returns, the number of horses employed in London amounts to 80,000; of which 20,000 are employed in the omnibus traffic, 10,000 on tramways, 15,000 in the cab trade, and 3,000 by brewers. The railway companies own 21,000; coal merchants, 2,500; municipal bodies, 1,300; tradesmen, 2,000. Messrs. Carter, Paterson, and Co. own no less than 6,000. It is estimated that 26,000 horses are killed annually in London. So frequently is the cry raised "'orse dahn!" that even the street boys are connoisseurs in the art of street slaughtering, and regard that operation with a charmingly *blasé* air. But let a motor-car incur some temporary disarrangement, and lo! and not only does the crowd shout, but a "free and enlightened Press" joins in the cacophonous chorus of silly delight.

New Motor-Car Wheel.—Mr. John Nutsford, of Carlisle, is credited with having invented a new form of wheel, which is intended to supersede the present pneumatic-tyred wheel in general use. It is stated that he has arranged terms for the sale of the patent for the magnificent sum of £100,000. The purchaser is Mr. John Price, C.E., of Workington, who is acting on behalf of a number of gentlemen in that town who are about to acquire the Cumbrian Cycle Works there, and to float a company under the name of the Cumbrian Cycle and Motor Company (Limited), with a capital of £250,000, it being intended to lay down plant sufficient to turn out from 200 to 250 bicycles, and from 1,000 to 1,500 of the Nutsford wheels per week. The new wheel has two rims, an inner and an outer one—an ordinary solid or cushion tyre being fixed on the latter—and the two are connected with each other by means of two rows of coil springs, the ends of which pass through each rim and are secured by nuts. The arrangement of the springs and the manner in which they are fastened is an important feature of the invention.

COMPRESSED-AIR LOCOMOTIVES.

In our recent issues we have mentioned that on the New York elevated railways compressed air was about to be tried as the motive power. Previous experiments had been made in this direction, but with little success, owing to the low pressure of air carried in the reservoir. By adopting a series of tubes made a Scotch engineer. It has been in successful operation for nearly a year in connection with tramcar propulsion, and it was this success and the many advantages of the system that led the directors of the Elevated Railroad Company to give it a trial. Referring to the accompanying engravings, Fig. 1 is a general view of the locomotive from which it will be seen that externally the air locomotive looks somewhat like an ordinary steam locomotive but without the funnel of the latter. Figs. 2 and 3 are transverse sections showing the nesting of the tubes and

Fig. 1.—New York Elevated Railway Compressed-Air Locomotive.

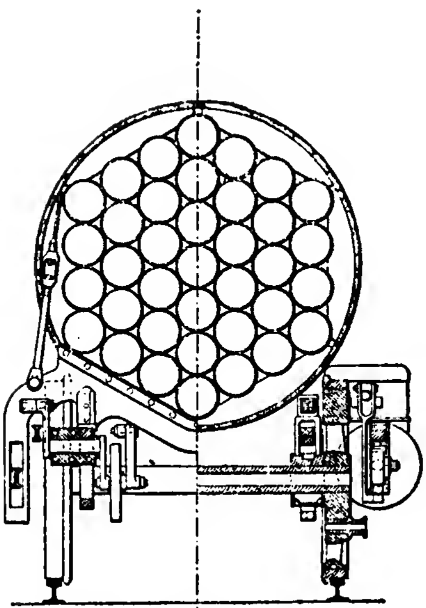

Fig. 2.

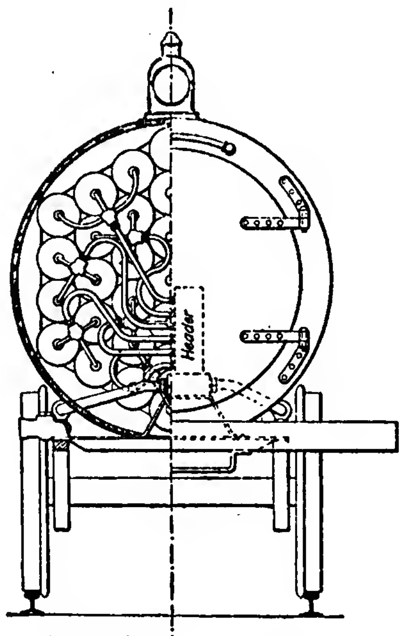

Fig. 3.

on the Mannesmann process as the reservoir, such a high pressure as 2,500 lbs. on the square inch can be safely carried, and sufficient energy can be stored to enable the locomotive to perform its duty with the same certainty as steam. The present system is the invention or design of Mr. Robert Hardie, their connections. These tubes are 27 in number, 15 feet 6 inches long, and 9 inches in diameter. They are made of steel and are homogeneous throughout. Indeed, it is the Mannesmann process that enables such high pressures as are now common to be used at all. Since on expanding air there is a fall of temperature, it is necessary to heat the air as it passes to the cylinder; this is effected by means of a hot-water tank holding 50 gallons of water, which is heated by a stove. The air from each reservoir is led by a small pipe to a vertical collecting chamber, from whence it is led by pipes to the cylinders. As the air is at very high pressure, reducing valves are interposed in the passage, and the air reaches the cylinders at about 150 lbs. per square inch. The driving mechanism is like that of an ordinary locomotive, and calls for no special remark, except that a Meyer cut-off gear is fitted. The dimensions of the engine are as follows:—

Cylinders	13 ins. by 20 ins.
Driving wheels	3 ft. 6 ins.
Driving wheel base	6 ft.
Total wheel base	13 ft. 6 ins.
Weight on driving wheel	16 tons.
Weight, total, in working order	22 tons.
Ports, inlet and outlet....	1 in. by 12 ins.
Valves, travel	3 ins.
Valves, lead	$\frac{1}{8}$ in.
Valves, lap	$\frac{1}{16}$ in.

The engine is intended for service on the Sixth Avenue line from Rector Street to Fifty-eighth Street, a distance of 4½ miles, with 14 stops, hauling a train of 130 tons. On trial the engine has made easily 45 miles per hour. The pressure of air carried is 2,500 lbs., and this can fall to 450 lbs. before it is necessary to re-charge. At the charging station there is a quadruple air compressor having cylinders $21\frac{1}{4}'' + 9'' + 7'' + 3''$ by 36" stroke. This will compress 500 cubic feet of air per minute to 2,600 lbs. The air is stored in a battery of Mannesmann tubes having a total capacity of 820 cubic feet, the time required to charge the locomotive being but 1½ minutes. The air compression engine is driven by a Corliss engine of 230 H.P. These trials are being watched with great interest on both sides of the Atlantic, and we trust they will be successful.

An Electric Omnibus.—There is now in operation at Greenwich, U.S.A., an electric omnibus which runs on the main road, without rails, but is supplied with current from an overhead wire, and while such a system is not of very general application it is thought, says *The Engineer*, that there are many cases in which such a service can be successfully installed to replace horse omnibuses on country roads, as between a small town and a railway station a few miles distant. The carriage was formerly driven by storage batteries. It is mounted on four wheels, having pneumatic tyres, and the forward axle is driven by the motor, which is connected with the brake, so that as either one is put in operation the other is thrown out. The current is supplied to two overhead trolley wires—one outgoing and one return wire—8 inches apart, which are suspended from a third wire by triangular metal frames. The "trolley" device consists of a set of rollers running on one or other of the two main wires, and so attached as not to fall off or run away when the carriage is descending a hill. This is attached to a double wire, which passes over the top of a pole at the back of the carriage, and the end of which is wound on a spring drum of the carriage. If the carriage crosses from side to side of the road the wire is paid out, the spring drum keeping it taut. The poles for the overhead wires are 150 feet apart, and they are partly on one side and partly on the other side of the road, but there is no trouble with the contact device where the wires cross the road. The present distance is a quarter of a mile, but is now to be extended from the town to the railway station, 1½ miles, the town having refused to allow the construction of an electric tramway on this road. The run of a quarter of a mile is made in 45 seconds, but the object of the experiment has been to obtain convenience rather than speed. The carriage can run in either direction, turn round, and move across the road to avoid other carriages. Two carriages can be run, having trolleys on the two wires. The carriage is practically noiseless, and is practically equal to a two-horse omnibus.

AUTOMOTORS IN A.D. 2000.

THE great American socialist author, Edward Bellamy (author of "Looking Backward," &c.), in his latest work, "Equality," takes a very enthusiastic view of the future development of automotors. He predicts that in the twenty-first century the horse will be as extinct as the dodo, his place having been taken by the electric motor. His disappearance is also responsible for an improvement in the public roads.

This new work is a sequel to "Looking Backward." In "Looking Backward," Mr. Bellamy described the world as he thinks it will be in the year 2000, and in his new book, "Equality," he enters into details and explains how the revolution was brought about which inaugurated the millennium before described. The story of "Looking Backward" briefly summarised is as follows:—

In the year 1887, Julian West, a rich young Bostonian, being a sufferer from insomnia, caused a chamber to be built of stone beneath the foundation of his house for use as a sleeping room. When even the silence of seclusion of this retreat failed, he called in a professional mesmeriser to put him into a hypnotic sleep, from which his manservant, Sawyer, knew how to arouse him at a fixed time. One night, when under the hypnotic influence, West's house was burnt down and he was supposed to have perished in the ruins. He was, however, safe and sound in his secret chamber, and 113 years later, September, A.D. 2000, Dr. Leete, a Boston physician, in conducting excavations in his garden, came upon this vault and discovered West still in his sleep. Dr. Leete resuscitates him, and after a short time West returns to the full vigour of youth which his appearance still indicated. His experiences and observations, naturally under the guidance of the doctor, are set forth in "Equality"; and in the course of the book the hero discovers that:—

"Thanks to the passing of the horse, it was possible to reduce the breadth of the roadways by half or third, to construct them of smooth concrete from grass to grass, leaving no soil to be disturbed by wind or water, and such ways once built, last like Roman roads, and can never be overgrown by vegetation."

Electricity has also replaced the horse in all agricultural operations. Julian West, taking an airship, sails over the Continent for the purpose of seeing the changes that had been brought about in the new area, which he describes as follows:—

"I saw a large field from which the crops had been cut. Over its surface was moving a row of great machines, behind which the earth surged up in brown and rigid billows. On each machine stood or sat in easy attitude a young man or woman with quite the air of persons on a pleasure excursion

"Evidently," I said, "these are ploughs; but what drives them?"

"They are electric ploughs," replied the doctor. "Do you see that snake-like cord trailing away over the broken ground behind each machine? That is the cable by which the force is supplied. Observe these posts at regular intervals about the field. It is only necessary to attach one of those cables to a post to have a power which, connected with any sort of agricultural machine, furnishes energy graduated from a man's strength to that of a hundred horses; and requiring for its guidance no other force than the fingers of a child can supply."

This revolution is not only in agriculture, it is the same in all other kinds of work:—

"Almost no heavy work is done directly now, machines do all, and we need only to guide them, and the lighter the hand that guides, the better the work is done."

"With one of our shovels," says the guide and friend, "an intelligent boy can excavate a trench or dig a mile of potatoes quicker than a gang of men in your day, and with no more effort than he would use for wheeling a barrow."

Not only is everything done by machines, but Mr. Bellamy holds out a prospect of our being able to make machines without hands, by the direct exercise of our will power. Electricity as an omnipotent instrument delivers the race from any necessity of manual labour.

A truly pleasant picture.

NOTICES.

Contributions and articles likely to prove of interest to our readers will receive due attention, but in all cases the name and address of the writer must be given, not necessarily for publication.

All matter intended for publication should reach us not later than the 10th of each month, and be addressed to The Editor of "The Automotor and Horseless Vehicle Journal," 62, *St. Martin's Lane, London, W.C. Stamped envelope must be sent if the manuscript is required to be returned. The Journal is published the middle of each month.*

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The Automotor and Horseless Vehicle Journal.

A RECORD AND REVIEW OF APPLIED AUTOMATIC LOCOMOTION.

SEPTEMBER 15th, 1897.

ANSWERS TO CORRESPONDENTS.

A. H. H. (Eccleshill).—The address of the London Electrical Cab Company is Juxon Street, London, S.E.

J. W. (Northgate, Halifax).—We cannot send you a copy of the pleadings, as we have no authority to do so, but your best plan would be to apply to the solicitor who has the whole of the cases in hand.

F. Beech (Ilkley).—(*a*) The number of the patent is 11,307 (1896), which can be obtained from the Patent Office, Chancery Lane, for 8*d*. You will notice that a diagram and particulars of same appear in this issue. (*b*) We are sorry we have no No. 1's, which is out of print. We are sadly in want of them ourselves.

Steel Tubes and Frames (Westminster.)—Several first-class firms are willing to manufacture to design. Apply to such Companies as the New Brotherton Tube Company (Limited), Wolverhampton; Standard Weldless Tube Company, Victoria Street, Westminster; I. Oldbury, Reliance Works, Wednesbury; Climax Weldless Tubes (Limited), Catherine Street, Lichfield Road, Birmingham, &c.

W. Bobbett (Teignmouth).—It is impossible for us to enter into private correspondence with inventors relative to designs, &c. We have received your models, and, while they are ingenious, the principle adopted by you of making one car-frame serve for other kinds of bodies is not new. At the recent Agricultural Hall Exhibition there was a motor-car shown which possessed this featnre. We would suggest that you get out a complete set of working drawiugs and submit them to some firm of engineers or carriage-builders. If the design commended itself you would have uo difficulty in getting a car made.

A. Jackson (Birmingham).—No, do not wash your rubber tyres with any kind of mineral oil. Petroleum is a powerful solvent.

R. L. (Wednesbury).—In ordinary work a bicyclist develops about $\frac{1}{10}$ H.P.

J. Johnston (Liverpool).—Your valves probably want grinding in. You had better let this be done by an engineering firm.

P. Alston (Belfast).—The cause of the steam-motor not starting is that owing to the position of the cranks the admission valve on the horse-power engine is closed by the slide. Reverse and get the cranks into a better position, then put the links for the go-ahead position.

G. Jennings (Manchester).--The best pumps we know of for pumping petroleum are the Worthington.

OURSELVES.

There are times in the histories of newspapers as of individuals when a little self-congratulation may be rightly indulged in. Such an occasion now presents itself to us; with this issue the Automotor completes its first year's existence. A year ago the automotor industry hardly existed, and the idea that it required (as what industry does not?) an organ in the Press to represent it seemed to many people rather premature. We, however, recognised that automobilism had at length come to stay and is destiued to become a powerful factor in solving the economic problem of cheap internal transport, and an independent organ which should do something towards educating the people ou the subject seemed to us eminently desirable. We therefore projected this journal upon the public and are glad to say that not only have our efforts in this direction been attended with considerable success, but also that the results to ourselves have beeu no less so. The importance of automobilism is very generally recognised, and this is shown by the fact that many of our coutemporaries devote more or less attention to it; but obviously the industry will be best served by a journal exclusively devoted to it, and this is the function of the Automotor. We have to record a steadily increasing circulation—the best proof that our efforts are appreciated. Our success is largely due to the fact that we are strictly catholic in our views; we have no financial or other interest in any motor, but are glad to publish the good points of each and to give friendly criticism of all.

A year ago, when motor companies were being floated with excessive capitals and exaggerated prospects, we warned our readers that the industry did not then warrant exploitat on on a large scale. Our views have been amply justified by events. Since the automotor first appeared, very substantial and satisfactory progress has been made in the industry. Crude types have been perfected or abandoned, the general design and construction have been improved, and the motor-car of to-day is a reasonably reliable vehicle. All these various steps in the process of the evolution of the motor-car have been duly recorded in our pages. Much, however, remains to be accomplished before the motor-car attains the perfection of the locomotive; this will be greatly facilitated by the dissemination of ideas through the pages of an independent journal, and this is the task we have set ourselves in the Automotor. Designers and constructors will find in the Automotor particulars of the latest advances iu automobilism, and we spare no pains to make our information accurate and useful. As occasions offer, we publish detailed technical descriptions and working drawings of successful motors, and we find that they are much appreciated. Automobilism, as its name indicates, is not necessarily confined to traction ou roads. A Whitehead torpedo, a canal tug, or Thames steamboat, and a flying machine are also automotors, and these will be discussed in our pages. So much for the industry.

In other directions we shall be uo less active; the motor-car has many insiduous enemies, and not a few people would do much to hinder its progress. As our readers are aware, we cast a severe and minatory eye upon those who, entertaining a misguided prejudice in favour of the horse, allow the scales of justice to incline against the users of motor-cars. There are also those who, under the plea of the safety of the public, seek to restrict the sale of petroleum and its products, thereby striking a blow at the manufacture of light oil motors. *We've got them on the list.* It will thus be seen that there is plenty of work for us and a wide field for our operations. We have every assurance that, so far, our efforts are appreciated by our readers. We shall eudeavour to deserve that appreciation.

SITTING ON THE FENCE.

It is frequently said that automobilism is far more advanced in France than in England, as indeed it is. The reason is that those who should lead in this matter in England have been sitting ou the fence. We hear wails in the Press, because very large orders for electric tramway plant go to America. The reason is that our tramway directors sit upon the fence; they wait and see, and won't encourage anything in the nature of experiment. Oh, oh! they are prudent business men. And so in London we have about the worst tramway system to be seen anywhere, and we still cling to the "gee-gee." In another column we describe a compressed-air locomotive, the invention of a Scotch engineer, who could not get his proposals considered on this side. Our railway directors, as usual, are sitting on the fence. In London we have two railways—the Metropolitan and District—for which air-compressed locomotives are eminently desirable. Although for many years past the bad ventilation on these lines has been a continual reproach, and has even called for Parliamentary notice, yet nothing effective has been done—the directors are sitting on the fence.

On the River Thames we have the worst steamboat service—if such it can be called—of any capital city in the world. Similarly our Fire Brigade engines are simple, low pressure, obsolete, horse-drawn vehicles, that would hardly be thought good enough for a bush township in Australia. And what is the London County Council doing in these matters? Why, sitting on the fence. In other directions we see the same extraordinary apathy, inertia, and disinclination to shift out of a rut. We complain of foreign competition, low prices, and strikes; yet what are the leaders of public opinion doing to lessen these economic evils? Why, nothing; they are sitting on the fence all the time.

SOME ESTIMATES OF THE HORSE.

There was once a certain schoolboy who was required to write an essay upon the horse; he commenced:—"The horse is a noble animal, very useful to man; he has a shiny coat, and eats oats." Although somewhat lacking in literary style, these statements are, in the main, correct, if insufficient. We are not disposed here to amplify them; on the contrary we should rather like to dispute with this juvenile authority the question of nobility, although we know we should be hopelessly beaten, because, gazing one afternoon with mingled awe and admiration at the mounted cavalry men in Whitehall, we heard several exclamations from a crowd of females to this effect:—"Oh, don't they look lovely! Ain't they noble!" Whether *they* meant the horses or the riders, or both, we could not ascertain with definite accuracy, but there can be no mistake that to many minds, especially those of females, the horse *is* a noble animal. In view of certain recent utterances by eminent men, it has occurred to us that the schoolboy or student of the future may in passing an examination be required to answer some such questions as these:—What mechanical principles are involved in the anatomy of the horse? Regarded as a machine, what is its efficiency? What is the average useful effort of a London cab horse? How would you "indicate" a horse? Compare a horse with a motor-car and state the cost of energy in each? Also estimate their commercial efficiencies? In order to answer these questions our student would consult the authorities on horses and motor-cars, and he would very properly look up Sir David Salomons's paper on motor traffic. In that excellent monograph he would read:—"Finally, the best existing motor the world has yet seen for its power, method of fueling, suspension springs, and travelling long distances before recharging, is . . . . the horse." This is somewhat like the essay referred to; it is a series of direct statements, well expressed, and, to many people, quite conclusive.

Our student might, however, have consulted another high authority, Mr. W. H. Preece, F.R.S., who inaugurated the electrical cab service in London recently, and who in the course of a humorous and interesting speech said:—"Now, the horse was a very imperfect creature in several respects. He was constructed on principles which were horrible in their operation. He moved in unstable equilibrium, and sometimes got a bad fall in consequence. Then he was very weak in his head, for if he got frightened or disturbed, God alone knew what he would do. They had seen only the other day how a horse ran into the post-office at Ludgate, the very last place where he would hope to find peace and quiet, and there did a good deal of mischief before he could be quieted. Then the horse must be well fed. He was subject to disease as we were, and he was short-lived. The driver and his horse might easily come to grief together. Still, they must all love the horse and care for him in the best way they could; but it might become necessary to see whether they could not find another way of serving his master better."

Here, then, we have from two high authorities in engineering science two absolutely opposite statements; both cannot be right, and it would be instructive to learn why Sir David Salomons regards the horse as such a perfect motor and why Mr. Preece holds that it is such an imperfect one. We should not think of deciding the question in the face of such diverse views, but we may point out that much depends upon the point of view adopted. Like our schoolboy, Sir David evidently regards the "nobility" and the "glossy coat" of the horse as factors in estimating its value as a motor, and rightly so, because the æsthetic sense has to be satisfied. For the combination of strength and grace the horse is unquestionably a perfect embodiment. Mr. Preece seems to approach the animal in a severely materialistic and utilitarian spirit. He simply asks himself how to move this cab in the cheapest and safest manner, and he therefore condemns the horse as inefficient, and no one will, we think, venture to contest his verdict. In recounting the apparent discrepancies in the views expressed by these distinguished men, we must also consider the environment. In the country the horse forms a pleasing feature which harmonises with surrounding objects. He is not then objectionable, but, on the contrary, as our schoolboy says, "very useful to man." In the towns, for which use Mr. Preece was considering him, he is an unmitigated nuisance, to be condemned alike on sanitary, hygienic, and humane grounds.

THE IRISH MOTOR COMPANY.

Considering the standing of the directors of this abortive Company, it surely was reasonable to suppose that they had satisfied themselves that there was a business to be done before going to allotment, and that their property in patents, &c., was of some value. On these elementary points the directors evidently failed to obtain reliable information. It is not often we see men of position and wealth displaying such a want of business knowledge, and we are afraid that the reputation of the directors will hardly be enhanced by this stupid fiasco. They also seem to have acted with precipitancy in exploiting machines of but very doubtful commercial value or utility. Considering who these directors are we quite fail to understand how they contrived to place themselves in such a ridiculous position. The Board included Alderman Meade, who has been Lord Mayor of Dublin twice, and who is a Privy Councillor and LL.D. of Trinity College, Dublin, a director of several companies, and one of the largest building contractors in Ireland; the Right Hon. S. A. Dickson, Q.C., late M.P., well known as an Ulster Liberal and as an authority on land matters, and who has been a member of Royal Commissions, &c.; Mr. J. Malcolm Inglis, J.P., Scotsman, and coal importer, well known on Unionist platforms in Scotland; Sir Howard Grubb, F.R.S., of telescope fame. Individually these men are no doubt eminent in their various walks of life, and no one would think of questioning their ability to mind their own business. Collectively they displayed the innocence and business capacity of babes and sucklings and—and this is their only redeeming feature—with the transparent honesty of such. The directors of the Irish Motor Company have acted as men of good moral but very bad business principles. We cannot but regret that the concern was ever started, as it is such things which retard the automotor industry. There is one more point. The directorate of this Company illustrates again the folly of shareholders putting money into a manufacturing concern, the technical details of which manufacture they know nothing and the direction of which is in the hands of men who know less. What but disaster can possibly be expected? What practical knowledge of traction did these directors possess? The answer is, None, because had they such knowledge they would probably never have attempted to acquire such "valuable patents."

AN ABSURD CANARD.

A FEW days ago as a motor-car belonging to Messrs. Arnold Goodwin and Son, of Southwark, S.E., was proceeding across Ludgate Circus it collided with a van and the shock damaged the naphtha reservoir and caused a leak. The naphtha ran out and the car had to bring up in an adjacent bye street. Repairs were effected inside of half an hour, and the motor-car proceeded on a 20-mile journey. To the surprise of everyone with the slightest knowledge of motor-cars, the Press almost with one accord published a series of the most untruthful and misleading accounts of the affair under full headlines and large capitals that could be imagined. Occurring where it did right in the heart of the journalistic world, there were no doubt a good many scribes in the crowd who saw in the accident a chance of making "copy," and very fine and lovely was the "copy" that appeared the next morning about this trivial matter. The *Daily Mail* especially distinguished itself. Many other papers with some reputation for sobriety, such as the *Whitehall Review*, ran the *Daily Mail* closely. It seemed that for some occult reason or other there was a unanimous desire on the part of the Press to magnify a temporary defect into an "alarming explosion of a motor-car." We can only express our astonishment that apparently respectable organs of public opinion could lend themselves to publish such utter drivel. At the recent meeting of the Institute of Journalists at Cardiff, we heard a lot about the "dignity of the profession," the "responsibility of the Press," and so forth, and yet we see these "dignified" and "responsible" editors publishing with a light heart and without inquiry a tissue of falsehoods; and journalists wonder why the public does not think more of them? The actual facts of the "explosion" as communicated by Messrs. Arnold Goodwin and Son are these:—The car is propelled by a Benz motor, and is in daily use in the City for commercial purposes. The cause of the trouble was a weak spring in the exhaust valve, this not closing sufficiently caused the carburettor to leak; there was no explosion. We have been asked, Why does the Press publish such absurd and mendacious statements as this one? The reason is, we think, this: We must recollect that there is a very close connection between the daily Press and the turf or horsey interest. All or nearly all of the daily papers depend largely for their circulation upon the horse racing and betting intelligence. The horse, like the soldier, is a fetish with the great British public, and therefore the motor-car is naturally disliked, and the Press reflects this opinion and exaggerates in an absurd manner every trifling accident that occurs. The more intelligent section of the public recognises that all mechanism is liable to get out of order, but inasmuch as the motor-car offers such undeniable advantages over the horse these minor accidents are not seriously regarded by sensible people. We by no means quarrel with those papers who publish such canards as the one we have referred to, only we would ask those editors and others concerned: Does it enhance your professional reputation? Does it tend to increase the public respect for your paper to publish wilfully what after all is an utter falsehood?

THE PRESS ON THE ELECTRIC CAB.

IN a leaderette, the *Daily News* of August 20th, says:—The motor-cab appeared in the London streets yesterday, and with some pomp and ceremony. It is not exactly a thing to take the winds of March with beauty, but neither is the "growler," to which variety it belongs. It is driven by electricity, which means that it makes neither noise nor smell, and it has the supreme virtue in cabs, that it gets along. One stray specimen from the well-stocked depôt of the Company in Lambeth was seen mounting the incline of Norfolk Street in a most spirited manner, with two fares inside. They were apparently in collusion with the driver; but the attempt of all three to look as though they had been doing that sort of thing all their lives was a distinct failure. The cabman manifestly could not meet the eye of his fellow-driver of the old dispensation. He carried no whip, and somehow looked like a person who had forgotten some essential article of clothing. In this respect his appearance was almost indelicate. The other drivers were moody or thunderstruck—at any rate, they said no word. They may have felt that "blackleg" was below the necessities of the situation. The cab seems to turn about and wheel about with the facility of the Jim Crow of negro melody. It looks like a cross between a brougham and a four-wheeler, and it has a sort of bustle, where bustles should be, which may be supposed to contain the apparatus. This will afford the small boys a more comfortable seat than the ordinary springs, and will probably disarm the opposition of their powerful corporation to the change.

A representative of the *St. James's Gazette* interviewed Mr. W. Bersey, the manager of the Electrical Cab Company, and in answer to questions the latter said:—"The prospects of the Company were excellent. We haven't half enough cabs. Our full complement at present is 15; but of these 10 are hired privately every day. As a matter of fact, I could send out the whole 15 under like conditions—namely, 25*s.* a day; but we think it desirable to have as many on the streets as possible. The new vehicle is already very popular. The other day one of our men returned from his day's plying for hire with gross receipts amounting to £2.

"I think we have reason to be satisfied with a driver who brings us in a profit of 30*s.* a day from one cab. Others have earned considerably over a £1. One of our men came back with 12*s.* as the result of three hours' work, while another earned £1 2*s.* in six hours.

"We are getting a regular supply of three new vehicles a week, and we could wish that they came in more rapidly. We could easily find work for at least 100 cabs, even if they were confined to private hiring."

In answer to the question, "How will the introduction of the motor-cab affect the ordinary cabman? Is there likely to be a rush for the new cabs, and is it true, as was stated at a meeting of cabmen the other day, that if such a rush occurs you will immediately raise the price of hire to the cabby?" Mr. Bersey replied, "No; to take the last question first, we have no such intention. We find no difficulty in obtaining drivers qualified to manage the electrical cab. An intelligent man can easily make himself proficient in two days, and we immediately send him round to Scotland Yard, where the authorities unhesitatingly grant him a licence if he proves himself to be a capable driver. As for the ordinary horse-hansom, I should be sorry to see it disappear. There is room for both kinds of vehicles in a great city like London."

NOTES OF THE MONTH.

THE Stock Exchange "tape" quoted motor-cars recently as "'orseless carriages."

MESSRS. AVELING AND PORTER (Limited), of Rochester, have secured the contract for supplying road rollers for the Norfolk County Council.

A MERCHANT at Washington, U.S.A., applied for permission to use a horseless delivery wagon, but the permit was refused by the District Commissioners on the ground that horseless vehicles frighten horses, and are likely to cause runaways and accidents!

THE Glasgow Sanitary and Open Spaces Committee have serious thoughts of using motor-vehicles in connection with their sanitary system. A deputation was the other day appointed to report upon the subject after they have obtained practical information upon the subject at Coventry and elsewhere.

THE Board of Admiralty have appointed Mr. Stanley Dunkerley, M.Sc., of the Department of Applied Mechanics, Cambridge, to be Professor of Applied Mechanics at the Royal Naval College, Greenwich, in succession to Professor J. H. Cotterill, M.A., F.R.S., who is about to retire from that post after over 24 years' service.

AT the recent half-yearly meeting of the London General Omnibus Company, Mr. Burns, one of the critics of the methods of the directors and who evidently believes in motor omnibuses, drew attention to the danger of increasing the stock of extra buses with a prospect of having in the near future to purchase electrical and other motor buses.

THEY are very fond of motor-cars in Ireland. Last month in connection with a bazaar held at the Bray Town Hall, the principal prize was a motor-carriage, the drawing being presided over by Sir Rowland F. N. Fanning, J.P. The prize was won by Miss Boland, 29, Upper Leeson Street, Dublin, who was the lucky owner of ticket No. 3,928.

THE Burnley Corporation have purchased a motor steam mowing machine, and it has been put to work in Queen's Park, where crowds of people collected to see it. It has cost nearly £100, but there is no doubt as to its utility. The machine saves both horse and manual labour, only one man being required to attend to it. It not only cuts the grass, but rolls as well. Its weight is 16 cwt.

WE understand that the Motor Touring Company of Llandudno is so far satisfied with the result of its experiment that next season many more motor-cars will be employed, and the whole thing done on a more extensive scale. That the public appreciate the motor-cars is indisputable. Nervous and timid people who would not sit behind a pair of high-spirited horses for all they were worth, have no hesitation in going on board a motor-car.

ACCORDING to the *Financial News* a great tube combination is being attempted in Birmingham, the idea being to amalgamate all the manufacturing firms in England and America. The price of tubing will be put up at least 100 per cent., which means that the present discounts will be reduced to equal this increase in price. At the same time an association is to be formed among the tube-drawers, who are asked to refuse to work for any firm or company which is not affiliated to the master tube association. The men are being told that this will be to their advantage as their wages will be maintained if their employers are able to sustain the prices. So far, however, the proposed amalgamation has not made much headway.

THE experiment with motors as dust collectors being made by the Chiswick Urban District Council, is exciting much interest among other sanitary bodies. So far it has proved successful. Mr. Ramsden, the Surveyor to the District Council, reports that a week's experience with one of the cars shows that they are very easily controlled, and far more economical than horse labour. The steam wagon does the work of three ordinary carts, and Mr. Ramsden estimates that the Council will save between £500 and £600 a year by the adoption of the new system. As a proof of the ease with which these motors are managed, he cites the fact that the driver of the steam-roller learned to control a motor in one or two days, and that the machine easily negotiated the steep incline of Kew Bridge with a load of two tons. The motor has a Thornycroft boiler working at 150 lbs. per square inch, and a horizontal engine of about 9 H.P. It is also fitted with a condenser.

THE ideal accumulator is hardly yet an accomplished fact if we are to believe the statements put forward by a Mr. A. W. Turner, of Birmingham, who writes as follows in regard to the Electrical Cab Company's accumulators, which weigh about 14 cwt. :—"Providing an accumulator can be produced to weigh 4 cwt. instead of 14 cwt., and yet supply the same amount of electric power, all of your readers must readily perceive that much better results can be obtained—a lighter vehicle to carry the accumulator, &c. Two Birmingham men have invented and secured, under patent protection, such an improved system of electric accumulator: one man is a practical machine pattern-maker and millwright, and the other man is a practical, well-known metallurgist. Arrangements are being made to manufacture all kinds of motor vehicles for the streets of Birmingham and London, also to make hand-lamps as substitutes for the death-dealing paraffin lamp, the light weight of the new accumulator permitting of reading lamps being made that can be carried about easily from place to place, or in the pocket, also on cycles." We can only hope the above statements are correct, but for ourselves, before accepting them as accomplished facts, we are inclined to wait until we have practical proof of such results.

The Motor-Car in China.—There is probably no country in the world more suitable for motor-cars than Eastern China. The country, generally speaking, being a vast alluvial plain, travelling is not unpleasant so long as it is confined to the rivers and canals, but when it comes to making journeys of many days' duration in the native carts it is something awful. An enterprising firm that would introduce motor-cars would at once get all the business it wants. Unlike the railways, there would be no native prejudices to overcome, as the motor-car would not depreciate the *fengshui* of any locality. It could make a detour which the locomotive cannot. We are glad to note that the motor-car is likely to soon make its appearance in China. According to the latest issued diplomatic report a wealthy Chinaman of the capital has given an order for an automobile car to a French firm of manufacturers. It is not known that this example has yet been followed, but the vehicle supplied may, if proved to be constructed with the stoutness and solidity rendered requisite by the peculiar character of the metropolitan thoroughfares, be the means of creating a profitable demand.

LES POIDS LOURDS, OR THE HEAVY-WEIGHT MOTOR-CAR COMPETITION.

In our August number we described the principal features of this competition, and gave a description of the vehicles, but as the Automotor was published just as the trials had concluded we were unable to complete our account in time for that issue; moreover we were desirous of including in it the official report of the trials. Unfortunately this has not yet been issued by the Automobile Club. We now propose to give a short account of the performances of the competing vehicles as, without waiting for the official report, the data available is sufficient to enable certain general conclusions to he reached. It will not, we think, be denied that these trials have been of the utmost interest and importance, and when the official reports are issued they will furnish reliable data of the utmost value. From the description of the routes it may be assumed at once that the Versailles roads are really worse than would be experienced in ordinary country traffic, and if a vehicle successfully passed this onerous French trial it is safe to say that it is fit for any service. The "Scotte" Company had three entries; the first, officially known as No. 1, was a motor omnibus, having a seating capacity for 12 passengers and two attendants. Its weight, fully equipped, but without passengers, is 7,700 lbs. It is propelled by a pair of vertical engines of 16 H.P. It carried eight passengers and 1,496 lbs. of ballast and two sacks of coke. This vehicle ran all her trials in the most satisfactory manner, maintaining a fairly uniform speed, even on the gradients, of about 5½ to 6 miles per hour. No difficulty of any kind was experienced. It was stopped on the steep gradients and started again quite easily, and was at all times fully under control. Omnibuses of this type have been running between Colombes and Courbevoie, two suburbs of Paris, for some months past, and have, we understand, given great satisfaction. They are comfortable—at least they accord with the French idea of comfort, which in matters of travelling is hardly as advanced as our own. Certainly the Scotte omnibus is a step in advance of our own London bus. It is equally as ugly, but its great merit is that it (the Scotte) is not disfigured with advertisements and is not dependent upon horses. A good feature of the Scotte motor, as also of the De Dion, is the facility with which the steam pressure can be varied at will. While on the flat a pressure of about 6 kilogrammes per square centimetre, or 85 lbs. per square inch, suffices; this is quickly increased to twice this on reaching a gradient. This facility of obtaining extra power at will is the great secret, in our opinion, of the success of these motors. On Route C, 66·1 kilometres or 40·98 miles, the consumpt was 539 lbs. of coke and 400 gallons of water.

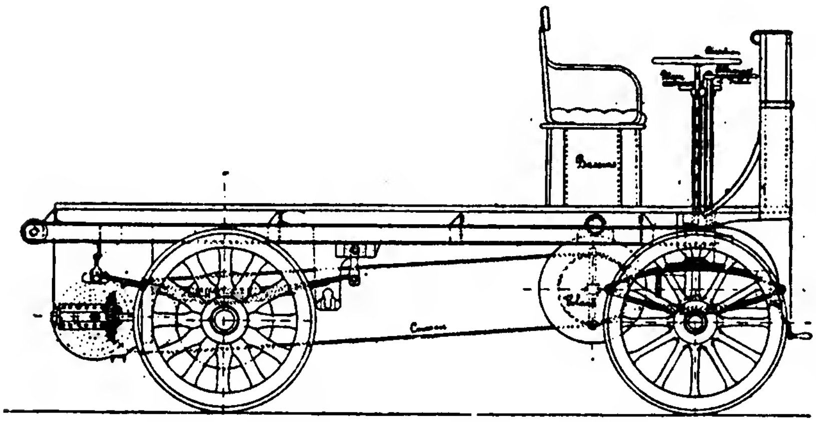


Fig. 1.—De Dietrich Motor-Lorry (Elevation).

No. 2 was a Scotte "tracteur à marchandises," or motor-wagon hauling a kind of goods truck. On this train were three persons and 9,240 lbs. of ballast. The routes were traversed without mishap; the speed being nearly three miles, the performance was considered remarkably good. No. 3 was a "train Scotte" or motor-omnibus hauling another omnibus, the total weight of the two being 11,000 lbs.* This train carried 23 passengers and 2,640 lbs. of ballast. The highest speed attained was 15 miles per hour, and on an incline of 14 per cent. the speed was 2·4 miles per hour. The starting and stopping trials were eminently satisfactory, the brake power ample, and the general performance very good. These Scotte trains have undoubtedly shown that heavy traction is quite a practical and commercial possibility even on the worst roads.

No. 4, a steam omnibus, designed and built by M. Weidknecht, well illustrates what we have often remarked, that a locomotive engineer is not necessarily an authority on horseless vehicles any more than an ordinary van-builder is. M. Weidknecht as a manufacturer of railway plant no doubt is an authority on railway matters, but we venture to doubt whether his ideas as carried out in this vehicle entitle him to be considered as a motor-car engineer. We gave the salient features of this vehicle in our last issue, and the impression that we gained by inspecting it was fully confirmed by its behaviour. On the flat this omnibus, which carried nine passengers and one ton of ballast, could hardly maintain a uniform speed, or perhaps it would be better to say that a uniform pressure of steam could not be maintained for any length of time and it fell on mounting the hills. Whether this was due to insufficient heating surface or excessive consumption of steam it is impossible to say off hand. The boiler appeared large enough, but it had to supply three cylinders. On the two easy routes the performance was on the whole satisfactory. But Route B, as will be seen, is calculated to try any horseless vehicle pretty severely, and the Weidknecht could not surmount the Côte de Picardie or the Côte de Pecq without stopping to breathe and quench an

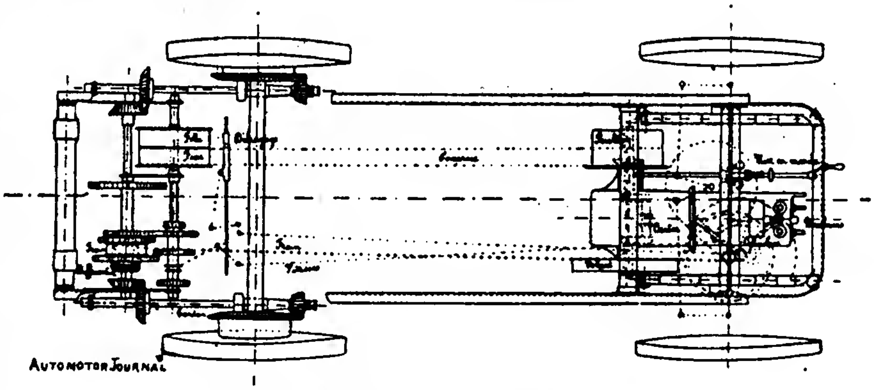


Fig. 2.—De Dietrich Motor-Lorry (Plan).

* In our last issue, p. 453, an error was made in the numbering of the Scotte vehicles. The Official No. 1 was placed in our table as No. 3 and *vice versâ*. The correct numbering is that now given.—Ed.

insatiable thirst. While adjourning to a convenient pump at Port Marly for this purpose the vehicle took charge and brought up against a house, both being hurt, the motor-car receiving severe injury to the under-frame, which rendered it necessary for her to abandon the competition. On a run of 28·35 miles, the consumpt was 732 lbs. of coke and 314 gallons of water.

No. 6 was the Le Blant brake, a vehicle of which we had formed a good opinion. A description of it will be found on pp. 454 and 455. Unfortunately, it broke down badly at the first attempt and also caught fire. It was withdrawn from this competition, but from its previous record we think M. Le Blant will be justified in modifying the design to the extent of making his vehicle a little more substantial, so as to give it a chance when tackling those awful Versailles routes.

No. 8 was a lorry by M. Dietrich; this vehicle is illustrated in Figs. 1, 2, and 3, which are respectively an elevation, plan, and rear view. The car is propelled by a petroleum motor placed underneath the fore part, driving by belting the rear wheels. It is steered by the fore wheels, all of which are of the same diameter, viz., 80 cm. = 31·49 inches. The motor is a two-cylinder horizontal Bollée, working on the usual Otto, or, to be more correct, Beau de Rochas, cycle. At 660 revs. it gives off 6½ H.P. There are two counter-shafts and the usual differential gearing. The method of transmitting the

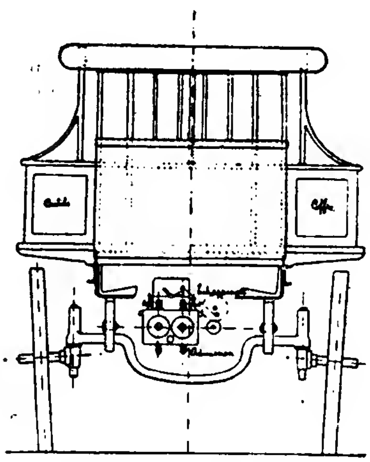


Fig. 3.—De Dietrich Motor-Lorry (Front View).

motion from the second counter-shaft to the rear wheels is decidedly novel. On the inner plane of each rear wheel is a bevelled-toothed wheel into which gears a bevelled pinion which is driven by bead wheels from the second counter-shaft. Four speeds are provided, ranging from 2½ to 9½ miles per hour. The weight carried is from 2,600 lbs. to 3,300 lbs., depending upon the road. The construction struck us as being very good, but we do not think the design would stand the test of prolonged work. The consumption of naphtha or gasoline is about 1½ pints per mile. The tanks will hold sufficient water and oil for a run of 50 to 60 miles. The dimensions of this lorry are 10·7 feet by 4·8 feet by 3 feet high, and its price is £240. From its performance this lorry seems to be a practical machine in spite of its peculiarities in design. It ran the trials well and gave satisfaction. It covered 40·98 miles in 10 hours, and the consumpt was 35·2 pints of oil.

The Panhard omnibus, No. 10, 12 H.P. Phœnix Motor (Improved Daimler), completed the trials very successfully. It carried 10 passengers and 660 lbs. of other weight. On the level it did all that could be desired, being fairly fast without any unpleasant smell or vibration. In climbing the hills the low-speed gearing has to be used, and the speed of course falls off very considerably—as low as three miles per hour, although the former speed was from eight to nine miles. While doing the distance (Route A), 25·6 miles, the consumpt was 39 pints of gasoline and 181 pints of water, and 26 pints of lubricating oil. We cannot but think that had the motor been more powerful it would have been an advantage in every way.

No. 13 was the De Dion et Bouton tractor, and No. 14 the De Dion et Bouton omnibus. These are illustrated in Figs. 4 and 5. In Figs. 6 and 7 we give two line drawings showing the arrangement of the motor mechanism in the omnibus. It will be seen that there is a pair of compound engines, CC, driving the shafting, H, on which are mounted the pinion D gearing, with G on the second-motion shaft which turns shaft E, on this latter is mounted the differential gear; for further description *see* pp. 456 (*ante*). Both vehicles performed admirably; they maintained a fairly uniform speed; even on the steepest gradients they were easily controlled, and starting and stopping on a hill was equally easy. In short, whether for passenger or goods traffic, it would be hard to improve upon these vehicles, although, as we remarked before, we cannot approve of giving such powerful motors wooden wheels, and we fancy that on prolonged service our criticism would be justified.

On a run of 25·6 miles the De Dion omnibus averaged 7·4 miles per hour, including stoppages, the consumpt being 220 lbs. of coke and 400 gallons of water. The De Dion Tractor consumed on a run of 24·6 miles 191 lbs. coke.

The char-à-banc of the Maison Parisienne, No. 15, of 9 H.P., Benz motor, carried 12 passengers and 790 lbs. of other weight. It was, however, unable to negotiate the steeper hills, and got stuck on the Côte de Picardie (*see* profile of gradient, Route B, p. 457), and had to unload before it could proceed. This occurred on the first day, and the judges ruled it out of the competition. It ran on succeeding days, but with less than half its former load.

These trials have been very closely watched by a good many others than those actually present at them, and they seem to have demonstrated two things: first, that heavy mechanical traction on even bad roads is perfectly feasible, and can be carried on on commercial lines; secondly, that steam is the better motive power. As regards the first, it may be said that the experience gained by the English pioneers in automobolism had already proved this proposition. That is no doubt correct, but the experiment is none the less valuable on that account, as it showed what economy in weight and space has been effected since Hancock's time by the employment of much higher steam pressure and motors having a high piston speed. Comparing, say, the "De Dion" and "Scotte" motor-cars with those of Gurney, Hancock, and other pioneers, the difference is not so very marked, and may be said to consist in the higher steam pressure now used. So long ago as 1802 Trevethick used 60 lbs. per square inch and got a speed of 10 miles an hour. In the French steam motor-vans the pressure is a little more than three times this, or 14 kilos. per square cm. = 198 lbs. per square. So long ago as 1830, a Select Committee of the House of Commons had reported that carriages conveying 14 persons and upwards, and not weighing more than three tons, can be propelled on common roads at a speed of 10 miles an hour, and we are not aware that the Versailles trials have improved very much upon this, excepting, of course, in the directions stated. Indeed, as Sir David Salomons pointed out at the Society of Arts, the steam coaches of Hancock and of many former designers could be run to-day with perfect success, and they would not be so very obsolete after all. It must not be supposed that we wish to discount in any way these heavy motor trials that have been held in France; at the same time we would remark that the results attained with the steam motors were, after all, merely corroborative. Thus the "Scotte" omnibus weighs light—7,700 lbs.; it can carry 14 persons = say, 1,500 lbs. and 660 lbs. goods at a speed of 6½ to 9½ miles on a consumpt of 13 lbs. of coke per mile, and *assuming* that the motor was giving off 16 B.H.P., the consumpt is 4 lbs. of coke per B.H.P. per hour—not a very remarkable performance, and one which has been equalled, if not excelled, by James, Gurney, and Hancock in their motors. Similarly, the De Dion motor-car does not call for extravagant commendation. Weighing about 4,400 lbs., it will carry 2,560 lbs. of goods or passengers, it will maintain a speed of 8½ miles per hour over a difficult road. To do this requires a 30 B.H.P. engine, the consumpt was 8 lbs. of coke per mile or 2 lbs. per B.H.P. This, of course, is a good performance.

For hauling heavier loads it has been found convenient to employ a motor-car and a trailer, and it would seem that heavy goods can be very economically transported in this way so long as the speed is low. Judging from these trials we see no reason why those who are desirous of establishing a line of motor-vans between Liverpool and Manchester should not carry out their ideas without further delay. The roads between these two places are excellent and present none of the difficulties that characterised the Versailles routes. We trust, however, that those who are projecting the matter will not think it necessary to go abroad for their plant. Excellent as are the De Dion and Scotte tractors they present no novel or intricate details of construction, and similar tractors could be easily constructed by any engineering firm that possessed a reasonable amount of intelligence. Passing on to the oil motors, we need but remark that for vehicles ranging from the tricycle to the light omnibus and parcels vans oil motors may be usefully employed, but for vehicles intended to carry more than one ton they are distinctly unsuitable, at least in their present form. The great difficulty seems to be that as the power increases the weight increases in an increasing ratio, or, to use the language of mathematics, the

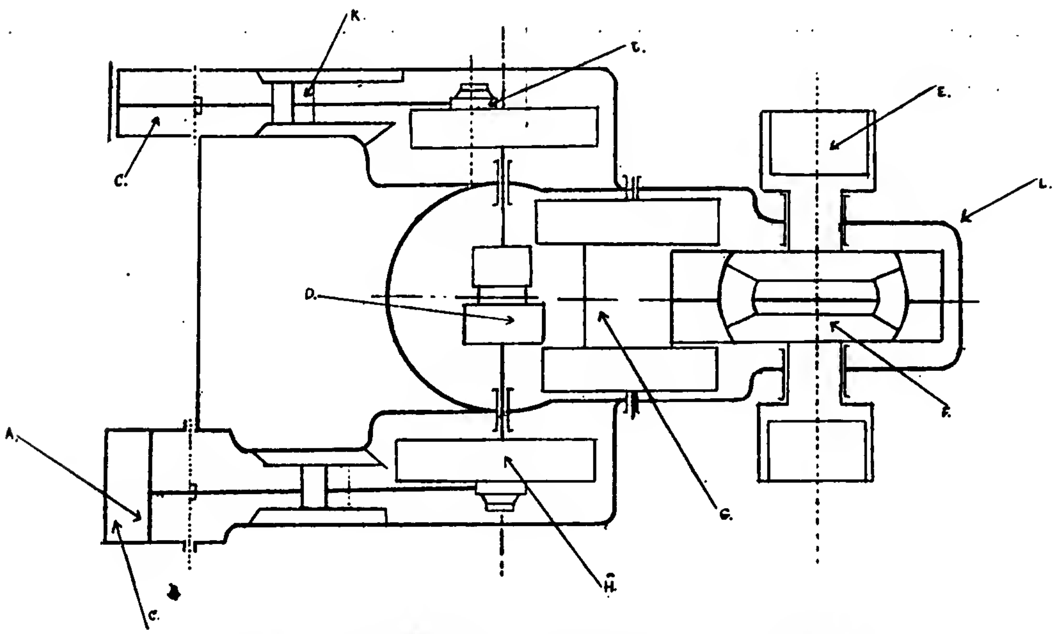
FIG. 4.—DE DION ET BOUTON STEAM TRACTOR.

FIG. 5.—DE DION ET BOUTON STEAM OMNIBUS.

weight does not follow a straight line law. In the matter of endurance it is difficult to express any opinion. In these trials there were not wanting signs by which it could be seen that most of the motors were being severely stressed. In our last month's issue we alluded to the strains produced on the wooden wheels. It is only right to say that in actual practice roads such as those around Versailles are the exception, and hence it is not altogether fair to regard them as typical. Finally another lesson taught by these trials is that the drivers in charge must be skilled men—not necessarily mechanics, but with sufficient *nous* to pack a gland, humour a feed-pump, and the like. A steam motor for road traction is after all but a modified locomotive and needs constant attention. Much of the success of the French trials was due to the watchfulness and technical knowledge of the drivers. On the whole the trials were a brilliant success, and all the arrangements were admirably carried out. We only hope that the British Automobile Club will before long furnish us with something equally instructive.

INSTITUTE OF BRITISH CARRIAGE MANUFACTURERS.

The Tenth Annual Autumn Conference of the above Incorporated Society was held at Southampton, on the 7th instant, under the presidency of Mr. Alexander Henderson, of Glasgow. In the course of his opening address the President said:—"The position you have placed me in is a very onerous one. However, having put my hand to the plough, I will strive to do my duty to the best of my ability in guiding the Councils of the Institute. I feel that the higher aims of our Institute can only be promoted by all of us becoming more closely and sympathetically bound in mutual intercourse, and by our working together as one body for a common cause, viz.:—'Carriage-building as a fine art and cultured profession,' and I shall, indeed, feel gratified if I can be the means of fostering such intercourse, and establishing a



Figs. 6 and 7.—Motor Mechanism, De Dion et Bouton Omnibus.

feeling of one interest and one cause among us. I would direct your attention for a few moments to one feature of our Queen's reign which is conspicuous to us all, and which has become an important factor in our daily lives; I allude to the great facilities for travel, due to the progress and improvement in locomotion of all kinds since the accession of Her Majesty. When Her Majesty succeeded her uncle, George Stephenson's immortal adaptation of steam to locomotion had been tentatively and successfully tried on various lines. Soon the capabilities and paramount advantages of the railway system burst upon the public, which, added to the ingrained desire of man to make money fast, speedily culminated in the great railway mania. Again, the rapid growth of London and our larger cities had stimulated the employment of street omnibuses, which appeared in great numbers, forming the basis of large companies and great proprietorships. Hansom's patent safety cab also came to stay, and, from its popularity, speedily became known as the hansom cab of the present day. By these means—suburban and underground railways, penny steamboats, and the omnipresent flitting cycle—our urban populations have such ready and cheap facilities as our forefathers never dreamt of.

"The question of technical education is, at the present time, receiving the careful attention of the Institute, for all interested in this most important subject feel that something must be done if we are to keep pace with our neighbours. I would suggest that we should, when taking on—employing—apprentices, bind them to attend technical classes, when such are available. It is, I say, the rising generation that is to stimulate us in our craft, and it behoves us to dower them with a sound technical, as well as a good general, education, if the carriage industry is to be one of prosperity and increase. Art and science must both be studied and introduced into our work, and by these factors we will produce more economically, more expeditiously, and more artistically, and will be enabled to compete with greater success in the open markets of the world. I wish very strongly to draw your attention to the scheme for higher education of coachbuilders, and commend to your serious consideration the letter which the Council has issued upon this subject. The Council hopes to receive sound, good, and valuable information by this means, that will enable them to be in a position to know if the establishment of a technical school for higher education will be taken advantage of. It will be a very great pity indeed if the facilities that have been offered to us by the London County Council and various other public bodies are not appreciated and profited from. The Coachmaker's Company, the London Chamber of Commerce, and the City and Guilds of London Institute, are all ready to co-operate with us.

"With regard to the motor-car, I suppose I am expected to say a few words, but to all those who have heard or read the former President's remarks, it will be apparent that little remains, from a coachbuilder's point, to be said. Mr. Jacobs referred to a friendly contest, or rather association, with autocars, and I beg to confirm his opinion. We, as coachbuilders, should, in the first place, be prepared to build a carriage for any motor that may be introduced. In the meantime, we build carriages for the horse as motor, and are required to produce vehicles for any sized pony or horse, from the 10 hands pony to the 17 hands horse; and I am very strongly of opinion that we cannot very well curtail our present position by giving way to any other special motor that may from time to time be introduced to us. We know that the motor carriage has been tried and experimented with on many occasions, but on every one of the many varieties some objectionable feature has been found fatal to its success and adoption as a vehicle for private use. Possibly, in course of time these defects may be removed, and a perfect and satisfactory motor result. I have no doubt but many clever mechanists are eagerly studying and striving to effect this, yet, however perfect the motor may eventually become, in my opinion, most people will still prefer, for private use, the life-like, animated appearance of well-appointed horse traction, to any dead mechanism, however smoothly it glides along. We should remain neutral, and be in a position to supply carriages for any motor that is introduced or required by a customer."

DOINGS OF PUBLIC COMPANIES.

The Epstein Electric Accumulator Company.

UNDER the winding-up of this Company the statutory meetings of creditors and contributories were held on the 10th instant, at the Board of Trade offices, Lincoln's Inn, and the Chairman reported that the Company was registered on July 31st, 1891, with a capital of £101,000, divided into 100,000 ordinary and 1,000 founders' shares of £1 each. The ordinary shares carried a preferential non-cumulative dividend of 15 per cent. per annum, and the holders of the founders' shares were to receive half of any profits after payment of such dividend. The Company was formed to acquire certain patents and patent rights relating to inventions and improvements for the manufacture and use of storage batteries, and to carry on the business of electrical engineers, the purchase price being fixed at £71,000. For some time Mr. Epstein acted as managing director, but latterly he was appointed consulting engineer, with a remuneration of £400 a year and £25 per annum for each 1 per cent. paid in dividend to the shareholders. The Company appeared to have been in want of funds throughout, and in March, 1893, debentures to the amount of £6,000 were issued to Woodhouse and Rawson United (Limited). In April, 1894, an arrangement was made whereby £12,000 second debentures were created, and a sum of £1,000 paid to the liquidator of Woodhouse and Rawson (Limited), the latter relieving the Company of its indebtedness to the extent of £13,000. The accounts which had been furnished showed liabilities £25,973, of which £18,826 were expected to rank, and assets (absorbed by claims of debenture-holders) £6,520. As regarded contributories, a deficiency of £90,153 was disclosed. Sir C. W. F. Crawford and Mr. Epstein, directors, expressed their conviction that the patents were still very valuable, and the proceedings resulted in the appointment of Mr. Northby (the Secretary of the Company) as liquidator.

New Companies Registered.

[Under this heading we give a full list of new Companies registered which take power to make, deal, or become interested in any manner in automotor vehicles. We shall be pleased to reply with detailed particulars to inquiries through the "Answers to Correspondents" column. All communications should be addressed to the Editor. The only stipulation which we make is that where the inquiry involves a search of the records at Somerset House—as in the case of information on the subject of the holdings of shareholders—a postal order must be enclosed to cover the Government stamp of one shilling which is charged before a search is allowed to be made.]

	Capital.
Accessories Co., Ld.	£5,000
Acetylene Gaslight Power and Calcium Carbide Co., Ld.	80,000
Amalgamated Pneumatic Tyre Companies, Ld.	1,000,000
Automobile Club of Great Britain, Ld. (30, Moorgate St., E.C.)	100
Billnas Bruk, Ld.	93,000
Blackpool Motor-Car Co., Ld. (The Kiosk, Talbot Square, Blackpool)	25,000
Carmont's Noiseless Shielded Rubber Tyre Co., Ld.	10,000
Creanche Automobile and Cycle Syndicate Ld. (75, Queen Victoria St., E.C.)	4,000
Earle, Bourne, and Co., Ld. (Heath St., Birmingham)	100,000
Electric Extension Co., Ld.	50,000
Elieson Lamina Accumulator Co., Ld.	65,000
G. C. Allen, Ld. (Birmingham)	8,000
Industries and Inventions, Ld. (Liverpool)	50,000
James Keeves and Sons, Ld. (Boundary St., Shoreditch)	50,000
Johnson's Supplementary Steam Generator Co., Ld.	24,000
Lozier-Brigham, Ld.	50,000
North Worcestershire Cycle and Carriage Co., Ld. (The Works, Forge Lane, Halesowen, Worcestershire)	25,000
Quick Detachment Hub Co., Ld. (Leeds)	100,000
Wellington Works Co., Ld. (120, New Canal St., Birmingham)	25,000
Westminster Cycle Works, Ld. (Doris Yard, Doris St., Kennington)	20,000

THE Motor Development Corporation (Limited), of Tower Works, St. George's Square, Regent's Park, N.W., have secured the rights and obtained the services of Mr. F. F. Wellington and staff of the Indestructible Ignition Tube Syndicate (Limited) (now in liquidation), and is prepared to supply the Syndicate's customers with all goods as heretofore. We are informed that upwards of 9,000 of these ignition tubes have been sold.

Automobile Club of Great Britain.—A Company was registered under this title, No. 53,762, on August 16th, by Messrs. Lumley and Lumley, 37, Conduit Street, W., without articles of association, with a nominal capital of £100, in shares of £1 each. The Company is formed to establish and carry on a club, or clubs, in Great Britain, or other business calculated to directly or indirectly enhance the value of the Company's businesses, rights, or property; to sell the undertaking and property of the Company for such consideration as the directors may think fit; in particular for stocks, shares, debentures, or securities of any other Company having objects altogether or in part similar to this Company; to form any other Company for the purpose of acquiring all or any of the property and liabilities of this Company. The offices of the Company are 30, Moorgate Street, E.C.

Motor and Cycle Company of Ireland (Limited).

ON August 24th last, the directors and shareholders of the Motor and Cycle Company of Ireland (Limited) held an extraordinary general meeting at the offices, 10, Leinster Street, Dublin, for the purpose of considering and, if thought fit, passing the following resolution:—"That the Company be wound up voluntarily, and that Robert Gardner, Esq., be and is hereby appointed liquidator for the purpose of winding up."

The notice convening the meeting added that if the resolution were approved of it would be submitted for confirmation to a general meeting to be held at a future date.

The Right Hon. Alderman Meade presided.

The other directors present were—Right Hon. T. A. Dickson, Sir Howard Grubb, Mr. J. M. Inglis, with Mr. V. B. Dillon, solicitor to the Company.

Mr. R. M. MARTIN, the Secretary, read the notice convening the meeting.

The CHAIRMAN said:—Ladies and gentlemen, this is the first opportunity we have had of meeting those who were induced to apply for shares in the Motor-Cycle Company of Ireland. Before consenting to join the Company I had made inquiries as to the value of the Pennington motor, both as to its economical production, facility of working, and simplicity in action; and having inspected works at Coventry and also at Preston I was and am of opinion that it is the best motor in the market. I was also informed that large sums had been paid to Mr. Pennington for his patent rights in England, and on the whole I came to the conclusion that the securing for this country of the patent rights and the erection of a manufactory for the production in this city would be a desirable thing; that it would give considerable employment, and after a short time would be remunerative to the shareholders. The board was consequently formed, each member forming his own opinion, and not being influenced by any other. In making arrangements with Messrs. Pennington and Baines—Mr. Baines was joined in the scheme with Mr. Pennington—your directors made every arrangement for the safeguarding of the interests of the shareholders that they possibly could. It was stipulated that all the promotion money, advertising, and cost of registration—in fact, expenditure of any kind—should be borne and paid for by the promoters up to and including the allotment. It was also agreed that Mr. Pennington should act as managing director for three years, and it was arranged that he should reside here. It was also arranged that Mr. Pennington and the Pennington Motor Foreign Patent Syndicate should be paid in shares. On considering the amount it would be necessary to have in hand to build the factory and works, and equip them with the best machinery and plant, and have a sufficient sum for stock and opening business, £50,000 was considered adequate; and on April 7th we obtained a guarantee from Pennington and Baines undertaking to pay such a sum as would be required, in addition to the value of the shares applied for by the public, to make up the £50,000. Messrs. Pennington and Baines also handed us a written order from Mr. H. Lawson, of the British Motor Syndicate Company, for 500 motors at £150 each, and 500 motors at £110 each; thus for the 1,000 motors, about £130,000. We then issued the prospectus to the public, and as the result, 10,704 shares were allotted. Mr. Pennington had bought for the manufactory, tools and appliances in America, for which he paid 10,000 dollars. These, he informed us, he would have forwarded here as part payment of his first call on the 9,296 shares. We then went into the question of sites for the works, and, after exhaustive inquiries, selected one containing 27 acres of ground, facing London Bridge Road and the River Dodder, in the Pembroke Township, at a rent of £500 a year. As we were anxious to begin manufacturing at the earliest possible moment, we also made arrangements for the use of temporary works in which we could place the machines bought by Mr. Pennington, and we hoped that by this date we would have had motors completed and at work in the city. We had no reason to doubt this, as Mr. Pennington had attended all the board meetings, had inspected the sites offered, had acquiesced in the selection made, had given instructions for the plans of the new factory, had directed the alterations made at the temporary works, and had assured the board that he would have motors ready for work in 30 days after he could start at the temporary works. On May 22nd, for the first time, Mr. Pennington informed me that some difference had arisen between him and Messrs. Rucker and Lawson, to whom he had sold his patent rights, about the patents, and that his lawyers had the matter in hand. We have an agreement from the Pennington Foreign Motor Syndicate Company with an influential board, Sir Theodore Fry being chairman, to convey to us a license for Ireland of the patent rights under the two leading patents on or before June 30th; and as it was about these patents that the difficulties arose, I did not think but that the Company would have the licenses perfected in time. However, at a meeting of your board on June 1 a letter was read from Mr. Pennington stating that it would take some time to arrange the patent question, and that he had gone to America on private business, but would in five weeks' time be able to say when he would return. Needless to state your board was astonished at this communication, for at the time we had the plans nearly completed for the new factory, and were trying to arrange with the tenant in occupation of the ground at Sandymount for immediate possession. We held subsequently several meetings, at which Mr. Baines, and sometimes Mr. Carse, attended on Mr. Pennington's part, but ultimately they had to acknowledge that in the absence of Mr. Pennington they could not arrange matters. As up to this time the machinery had not been delivered, we pressed Mr. Baines for the payment of the £5,810 calls due on the 9,296 shares applied for by him and Mr. Pennington, but he did not lodge the money, and as we were always anxious that this matter should go through we consented to a delay for some time to give Mr. Baines an opportunity of going to America for Mr. Pennington, in consideration of which he (Mr. Baines) gave us an undertaking, in case the Company should be wound up voluntarily, that he would pay any liabilities the Company had incurred, so that the money could be returned to the shareholders in full. He went to the States and returned with Mr. Pennington. We had an interview with Mr. Pennington on the 6th inst., went through the whole matter with him, asked him was he then ready to pay in the £9,296, to hand us the license from the Pennington Motor Syndicate, and also the licenses from himself. He told us that he and Baines were equal partners, that he had his half of the £9,000 ready, but that he should see Baines about the other half, and that he thought there could be no difficulty about the patents. He asked us for another week to see Baines and arrange. We consented to this delay, and got an undertaking from him to pay the liabilities of the Company. We met again on the 12th inst., and as we had not had a satisfactory reply from Pennington we resolved to call you together. We have not lost faith in the future of the motor-cycle, which we feel will be successful, but we cannot recommend you to undertake the necessary expenditure required in building and equipping a factory and works for the manufacture of the Pennington cycle, under the conditions which now obtain. As regards the sums paid in by shareholders, the total amount lodged in the Hibernian Bank was £26,061, of which we have on deposit £24,500; to credit of current account, £1,459; and we have paid for office furniture, for a safe and sundries, £102; making in all £26,061. I have now, ladies and gentlemen, to move, which I do with very great regret, "That the Company be wound up voluntarily, and that Robert Gardner, of 40 and 41, Dame Street, be and is hereby appointed liquidator for the purposes of winding up."

Mr. J. MALCOLM INGLIS, J.P., in seconding the resolution, said under the circumstances he thought the best thing they could do was to wind up the Company.

Mr. ROBERT DUFF rose to move that the meeting be adjourned for a fortnight to enable them to inquire into the *modus operandi* in which the directors had conducted the business and whether Mr. Pennington was clever enough to put his finger in the directors' eyes. He (Mr. Duff) held over £1,000 worth of shares, and he submitted that the shareholders had a right to a fuller explanation than that vouchsafed by the chairman. He knew perfectly well that it was a Yankee dodge. (Hear, hear.) He wanted to know who was to pay the liquidator? Was it the shareholders? Did the chairman know anything at all about Mr. Robert Gardner, or how long it took to wind up a company and the expense of it? It was nothing less than culpable that information had been withheld from the shareholders—they had heard nothing. There had been inspired paragraphs in the papers with reference to the Company, and to Mr. Pennington living at the rate of a thousand pounds for a couple of months, and all this high-falutin talk. What was the result? Put your hands in your pockets and pay for it. What guarantee had they for Mr. Pennington that he would pay up? Had they any?

Mr. DUFF, who then explained that he was acting as chairman of the Shareholders' Protection Association, submitted to the chairman a copy of a series of questions he had prepared on behalf of the association, and asked was Mr. Pennington at that meeting?

The CHAIRMAN: He is not.

Mr. DUFF thought it would be better to form a shareholders' committee to liquidate and save the Company as much expense as possible, and finished by moving the adjournment of the meeting for a fortnight in order that a committee of shareholders should inquire into the affairs of the Company.

Replying to questions, the CHAIRMAN said there was a provisional agreement with the Company to take the Pembroke Township site for 56 years at £500 per annum and expend £2,000 on the buildings.

Mr. THOMPSON (Longford) said he did not think it would be desirable in the interests of the shareholders to either adjourn that meeting or postpone carrying out the recommendations of the chairman. There was no use in dragging the thing on. Their interests would be the worse off the longer they postponed the matter.

The amendment was not seconded.

The CHAIRMAN said there was nothing further from the wishes or desires of the directors than to withhold the slightest information from the shareholders. It came on the directors themselves like a bolt from the blue when they got Mr. Pennington's letter in June. Up to that Mr. Pennington showed himself to be a man of large and undoubted means—he had a large sum to his credit in one of the leading banks in Dublin, and it was only before leaving Dublin that he withdrew that sum. They believed the guarantee of these two gentlemen to be good, and they could not say more. Up to the present moment they had expended £102, and that was for the office and safe. The directors would be very glad indeed if the shareholders named two or three gentlemen to act with the board in getting the Company wound up most economically. (Hear, hear.) As to the cost of liquidation no one could do it so cheaply as Mr. Gardner, because he had all the documents in connection with the Company in his possession. He thanked the gentlemen who had spoken so well of the directors. They formed the best opinion and made the best bargain they could. The expenses that had to be met by Mr. Pennington and the promoters came roughly to between £9,000 and £10,000; the shareholders had not to pay one shilling of it, and any liabilities there were would be in connection with the field. The other liabilities were infinitesimal. He thought the amount of interest on the deposit account would cover everything, except what there might be for that field, and he (the chairman), knowing the neighbourhood of Sandymount so well, thought there was very little liability in that. (Applause.) They had done all they could, they had got a guarantee from Mr. Baines, who was a man that made in the last three or four years £30,000 in England, and Mr. Pennington was a man of means if they get hold of it. (Laughter.) He would ask them to adopt the resolution he had proposed. You will get the first payment in a month. We want the thing wound up. We feel that we have been "had." We feel very bitterly the position we have to occupy here before you to-day. Some of us thought we knew something about business, and that we were not so easily taken in as unfortunately we have been in this transaction. I need not tell you it is not a pleasant position for us to stand in now.

Mr. KINSELLA asked how Mr. Gardner came to have the documents in reference to the Company?

The CHAIRMAN: He has got the shareholders' lists and everything, because Mr. Gardner was retained by Mr. Pennington and paid by him.

Mr. GARDNER: No, unfortunately. (Laughter.) It was only a promise. (Laughter.)

The CHAIRMAN: Mr. Gardner was retained by Mr. Pennington and told he would be paid. Unfortunately, he says, he is not paid. He has all the books, the register of shareholders, and everything else, and. for all that, we have not to pay a penny, and we have the advantage and use of them. This is the reason I say no one can liquidate the Company so economically as Mr. Gardner, and, in addition to that, you have the amount of his remuneration in your own hands.

The resolution was put and carried, with one dissentient.

The CHAIRMAN then proposed, and it was resolved, that a committee be appointed, consisting of the following shareholders:—Mr. William Fry, Mr. Coleman, Sir Percy Grace, Mr. Ledwich, Mr. Thompson, and Mr. Kinsella, to act with two directors in the winding up of the Company.

The proceedings then concluded.

Electric Traction in Spain.—Although some of the Liverpool City fathers seem to think it necessary to engage an American traction engineer to lay and work some four miles of track, other, and possibly more enlightened, municipal authorities think, and rightly so, that British engineers can do all that American or other engineers can. We are glad to note that Messrs. Dick, Kerr, and Co. (Limited), have just contracted with the municipalities of Madrid and Barcelona to build and equip most extensive electric tramways for those cities. The contract runs into something like £160,000, and is said to be the biggest tramway contract ever yet made. We may be sure that before placing it the Spanish authorities satisfied themselves that the firm in question was quite competent to carry it through, both from the technical and commercial points of view.

British Industries and Foreign Competition.—It is rumoured that the London and North-Western Railway Company is in treaty for the delivery of 100,000 tons of steel rails from the United States, and, considering the low prices and cheap freights that rule at present, there appears to be nothing improbable, though there is a great deal that is disquieting, in this report. Our manufacturers have lost the large rail contracts for Canadian main railways, in which we appeared to possess a prescriptive right; and recently an order for 4,000 tons for this country, required by Mr. R. W. Blackwell, of 39, Victoria Street, was secured by an American firm by the right of price and promptness of delivery, the quality, of course, being secured by a rigid specification. Only a short time since another order for rails for an English line was also lost by our manufacturers, not to the United States, but to Germany; in this case, however, the rail-makers had to lower their price more than 20*s.* a ton to secure the contract; here price and promptness of delivery placed our manufacturers out of competition. But it is not only in rails that the war of competition—which, from a pessimistic point of view, may gradually develop into a war of extermination—is now raging. We appear to be growing (says *Engineering*) more and more dependent on American machine tool-makers; indeed, it is not an exaggeration to say that during the now vanishing period of depression in the United States many once prosperous engineers' works must have been closed but for the never-failing support from Europe. We are dependent on the United States to build the elevators for the Central London Railway, and we have to look to the other side of the Atlantic for the electrical plant with which the traffic is to be worked. It is notorious that we are unable properly to equip an electrically-worked tramway, and that until our manufacturers take the trouble to learn how, the large and increasing contracts for this new industry must be taken by Americans. Now that so many employers of labour are suffering from enforced idleness by a ruinous strike, they may find time to learn why we, who still blindly call ourselves the leading industrial nation of the world, are content to close our eyes to what is going on around us, and to realise our dangers before it is too late to recover, at least to some extent, the undoubted pre-eminence we once enjoyed.

CORRESPONDENCE.

*** *We do not hold ourselves responsible for opinions expressed by our Correspondents.*

*** *The name and address of the writer (not necessarily for publication)* MUST *in all cases accompany letters intended for insertion or containing queries.*

THE RULE OF THE ROAD.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

SIR,—In September last I wrote a letter to the *Times* regarding the "Rules of the Road," and I venture now to address you on the same subject.

I never "scorch" or "boast," nevertheless, when I am on my bicycle I find pedestrians my *bêtes noires*, for whether passing them or overtaking them there is a doubt to the last moment as to which side of the road they will take. This is all owing to uncertainty regarding "rules of the road." Pedestrian meeting pedestrian is, I believe, expected to keep to the right, but this rule cannot be general, for I have seen in London a notice in one place for pedestrians to keep to the right, and in another they were asked to keep to the left. At all events there is absolutely no rule whatever between pedestrians and riders, consequently when a man walking meets another riding neither of them know what to do. When the "rules of the road" were originated there may have been very good reasons requiring pedestrians to keep to the right and riders to the left, but it does not matter one brass farthing *now* how wise these riders were in antediluvian days.

What has to be considered is the present time, when vehicles have increased tenfold, or more correctly, perhaps, one hundred-fold, to what they were 50 years ago. It will be admitted as an axiom by everyone that it is easier to learn and retain in memory *one* "rule of the road" than *two*. Why, therefore, cannot one "rule of the road" be adopted for all? It would, I am sure, save many a coroner's inquest if one rule were adopted and instilled into the rising generation.

I was glad to see that Mr. A. R. Sennett in his interesting work, "Carriages Without Horses Shall Go," advocates one rule for all. As he is a distinguished civil engineer, and is on the Council of the Self-Propelled Traffic Association, no doubt his suggestion will carry weight, but when any evil has to be corrected or any arrangement adopted for benefiting the public, we Britons instinctively look to the Press to carry it out; therefore, if you, Sir, will take up the cudgels and insist on County Councils and others in authority adopting one "rule of the road" for *all*, with the circulation THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL has, success must follow.—Yours faithfully, J. R. MAGRATH (*Colonel*).

[We think that the rule of the road for all pedestrians and riders should be the same as the rule of the road at sea, that is:—"When meeting end on, or nearly end on, so as to involve risk of collision, each should direct their course to (the right) starboard." We are glad to see that the London County Council is trying to enforce this rule at the Blackwall Tunnel. —ED.]

Re THE BRITISH MOTOR SYNDICATE (LIMITED).

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

DEAR SIR,—I think it only courtesy to inform you that the shareholders I acted for in the above matter did not see their way clear to join the suggested combination (which I understand is now actively proceeding), but preferred to accept the Company's offer to take over half of their holding immediately at £2 10*s.* per share with an undertaking to take the balance in three months' time at £2 15*s.* per share.

Fortunately this arrangement was legally carried out, as although the first half was taken up at the smaller figure it required an enormous amount of leverage to induce the Company to take the remainder at the higher price, and it was actually not until proceedings were taken in some of the cases to compel them that the matters were settled.

Meantime I am sure my clients (one of whom you will be interested to learn is a school teacher, whose practically entire savings of a lifetime were represented in this, his first investment in stocks or shares) will be grateful to you for your crusade in the matter, as it is probably owing to that that they have been enabled to substantially minimise their loss. The shares I understand at the present moment stand considerably lower on the market.—Yours faithfully, EDWIN E. CLARK.

61, King William Street, London, E.C.

COUPLED WHEELS FOR ROAD ENGINES.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

SIR,—I should be glad if you could give an opinion in your next issue on the following points in reference to the use of coupled driving wheels for road locomotion :—

(1) Would the coupling of two pairs of driving wheels (somewhat as in a locomotive) interfere seriously with the steering of a road vehicle owing to the axles not being radial?

(2) How far would this depend on the speed of the vehicle?

In railway work the rigid wheel base may be considerable, and might not be objectionable *within reduced limits* for ordinary roads. See enclosed rough sketch of arrangement proposed, the car being long so as to give ample distance between coupled drivers and steering wheel. It seems to me a pity that experiments to investigate various points arising from the new conditions of locomotion have not been projected by any competent body, makers being afraid apparently to depart from horse-drawn lines. By throwing the weight of the engine and a good part of the load on to two pairs of driving wheels considerable adhesion will be obtained without undue clumsiness (*e.g.*, very broad wheels), a matter of some importance in view of the fact that on country roads (for farm work, &c.) a second laden vehicle will be required to be drawn.

Another field for heavy steam traffic seems to be the provision of passenger coaches to serve districts not traversed by railways, and it has occurred to me that much of the clumsy appearance complained of in steam cars would be relieved by the use of two axles in close contiguity.

The arrangement suggested would certainly prevent the use of very large driving wheels without, it is hoped, entailing the use of castors, which, to judge by this month's illustrations in the AUTOMOTOR, find favour with some manufacturers, I suppose on the score of strength.

In the sketch I have placed the steering wheels *behind*, not only because an obstruction in the road would be less likely to disconcert the heavily-weighted and less easily twisted driving wheels, but in order that the driver may be placed in front with the machinery under his observation. In this connection the question may be asked :—

(3) Would there be any difficulty in hauling a second vehicle with this arrangement (rear-steering)?

Apologising for troubling you at such length.—I am, yours very truly, LOCO.

[It would not be practicable to couple the wheels of a road tractor because (*a*) the connection could not be rendered sufficiently flexible to allow for inequalities in the road; (*b*) because such a vehicle could not be steered—at any rate round curves of small radius such as are found when turning a street corner, and also because, owing to the great adhesion on common roads, the slipping action of the inner wheels which takes place in the case of a locomotive would not occur. In our opinion a rigid wheel base for road tractors is utterly out of the question for the foregoing reasons. On a railway the vehicle is steered by the rails, and such steering or rather guiding can only be accomplished by using curves of large radius. Even as it is the arrangement is far from being a mechanically perfect one. With regard to the suggestion raised by our correspondent we agree that the subject of road traction might well be scientifically investigated. There is a deplorable absence of reliable data. Rear steering would not, we think, be mechanically or theoretically a good arrangement for tractors. Were it so, we might be sure that Aveling, Burrell, and other makers would have adopted it.—ED.]

SIR,—Excuse my adding a supplementary note to my recent communication. It has occurred to me that in assuming the two pairs of driving wheels to be coupled together *rigidly* (as in a locomotive) I was, perhaps, giving undue importance to simplicity of construction. Considering that the desirable arrangement of direct driving is out of the question, it seems possible that a slight radial play to, say, the rear-drivers, might be given without undue increase of complication—*rear* drivers, as it seems better that the wheels encountering any large obstruction should be rigid besides being furnished with a guard. If you could touch on this point in your answer I should be obliged.—I am, yours very truly, LOCO.

P.S.—The arrangement, as you will have noticed, is really nothing more than a locomotive and truck fused into one.

[We have replied to this in the former letter.—ED.]

PRESSURE IN GAS AND OIL ENGINES.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

SIR,—Can you oblige me with the following information, viz., What is the pressure in lbs. per square inch that the calculation of horse-power of a gas or oil engine is calculated by? I know this will vary according to mixtures and compression; but say about with the best and most perfect mixture with three and four atmospheric compressions. To make my request clearer I will put it another way :—What is the average pressure on a moving piston when an engine is working at its best? An answer in your next journal will suffice and oblige.—Yours truly, GAS.

[Taking a Crossley Otto gas-engine as a typical internal combustion motor, the mean initial pressure on full load was in a certain trial 196 lbs. per square inch; the mean effective pressure was 68 lbs. per square inch. Taking the Pristman oil-engine as a typical oil-motor, the mean pressure is about 55 lbs. per square inch.—ED.]

THE CHOICE OF A MOTOR-CAR.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

SIR,—I should esteem it a favour if you would kindly answer me a few questions with a view to guiding me in the selection of a motor-carriage. I am a country doctor of limited means, and shall probably remain in that undesirable condition until I can abolish an expensive stable. I am, therefore, *very anxious indeed* to try a motor-carriage. My work averages about 5,000 miles a year, and during four months the roads are smothered at intervals with broken slag or granite. I want an inexpensive carriage, to carry two, which will run at an average of 10 or 12 miles an hour and mount a hill of one in 10 with tolerable ease, and steeper one at a pinch.

(1.) What carriage do you advise? From inquiries I have made, already my choice appears to lie between a small Benz carriage and Bollée tandem (Coventry motette). I should prefer the former for comfort, inasmuch as one could wrap up in inclement weather and also because the tyres are not pneumatic and will probably stand the stones better, but I am told the electric ignition is a drawback and the motor is not sufficiently powerful for my purpose.

(2.) Am I right in choosing the Bollée in preference to the other on these grounds alone? I find that the Yorkshire Motor-

Car Company (Mr. J. E. Tuke) will sell a car on the hire-purchase system.

(3.) Do you advise me against this? They want £15 a month for any carriage. Now this would be a terribly heavy strain on me, nevertheless I will try it as it promises to repay me well if I get a carriage. This being the case—

(4.) Would you advise me to go in for one of the more expensive carriages at about £350 while I am at it, or shall I content myself with a cheaper one until I see what another year may bring forth?

(5.) Finally, would you advise me to wait until, say, next spring before purchasing?

I appeal to you, Sir, as an honest adviser who will give me a disinterested and candid opinion, and one which I may take as being final and which I intend to follow if I am able. Thanking you in anticipation and as an old subscriber to your paper.—I beg to remain, yours faithfully, NUMBER ONE.

P.S.—I enclose my card.

[(1.) To climb 10 per cent. gradients and over ou roads composed of slag and granite cubes at a fair speed means the employment of a powerful and substantial motor with iron tyres. As you will see, it would be invidious on our part to recommend any particular motor. Your best plan is to consult an engineer who makes these matters his business. (2.) The Bollée is a reliable motor, but would hardly stand prolonged wear on a slag and granite road. (3.) We see no reason to advise you against this course. (4.) Speaking generally, we should advise you to obtain good professional advice and purchase a motor-carriage with which the makers will give a guarantee. No great improvement in light oil motors is to be anticipated in the near future. (5.) We see no necessity.—ED.]

BENZINE.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

SIR,—Will you kindly answer in your next issue of the AUTOMOTOR and oblige:—

(1.) Does benzine require heat to vaporise it for use in oil-engines, or is it sufficient to have, say, two quarts of benzine in tank without any heat whatever?

(2.) Will a motor-cycle run (with benzine) without any water cooling to cylinder, the cylinders are steel tubing ⅛ inch thick?—Yours, &c., F. C.

[(1.) At ordinary temperatures benzine will slowly evaporate if exposed to the air. If in a closed tank partially filled, the space above the oil will consist of a saturated vapour. For use in an engine the evaporation must be very rapid and continuous, therefore great heat is necessary. (2.) Generally it will, providing the external temperature is low, and that the air is in motion; it is, however, best to provide radiators.—ED.]

LONDON ELECTRICAL CAB COMPANY (LIMITED).

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

DEAR SIR,—It may interest your readers to have a few particulars of the working of the electrical cabs since the inauguration on August 19th last.

I may say that so far everything has been most successful, and the fact that the Scotland Yard authorities, after having refused licenses to several other kinds of motor-carriages, have, after a severe test, duly licensed the cabs, is in itself a proof of their efficiency.

A part of the Scotland Yard test is to run each cab up and down the Savoy Hill, in the Strand, this hill being the steepest gradient in London.

At different times, and on several occasions, journeys have been made to and from Hampton Court, Kempton Park, Lewisham, Sandown Park, Norwood, Croydon, Crystal Palace, Crouch End, &c., and the steep hills to be met with on some of the roads running to these various places, such as Highgate Hill, Sydenham Hill, and Richmond Hill, have given no trouble whatever.

Further, twelve of the cabs have been plying for hire in and around the City and the West End of London, and the takings of the cabmen—amounting as they do to about 150 per cent. more than the takings of an ordinary hansom—show very well the public favour with which the cabs have been received.

With regard to the "opposition" of the London Cab Trade Council, which numbers some 50 or 60 members, we have to place side by side the fact that the great Cab Drivers' Union of London, numbering some 10,000 members, are distinctly in favour of the new cab.

Thanking you in advance for the courtesy which admits this letter to your valuable columns.—Yours faithfully,

WALTER C. BERSEY,
September 11th, 1897. General Manager.

Cabby on Motors.—For good undiluted fine old real-crusted conservatism you cannot possibly beat a London cabman. And just as his prototypes of the early days of the century denounced the locomotive because it would ruin the breed of "'osses," so the modern cabby denounces motor-cars, because he by some process of mental exercise has concluded that the motor-car will spoil his business. To tell cabby that by lessening the cost of working a vehicle it will be more used and yield more profit, is to preach to ears hopelessly closed by preconceived assertion and unintelligent dogma. Hence it is not surprising to find the London Cab Trade Council in a recent meeting fully acting up to their natural instincts. One gentleman is reported to have said that "at the present moment the price of a cab had reached the maximum, and it was impossible for cab drivers to bear any further burden in the shape of enhanced prices, as would be the case if drivers entered into even the mildest form of competition for the new cabs." Now, as a matter of ordinary supply and demand, it would follow that the introduction of better vehicles would be followed by a reduction in the price of the hire of the ordinary cabs, and this would be most likely followed by better profits being earned by cabmen generally, simply because their prices are fixed by authority and cannot be altered. Hence the motor-cab is really a friend to the cabman, but hardly so to the ordinary cab proprietor. Ultimately the following resolution was passed:—"That this Council meeting views with disapproval the introduction of electric cabs on the streets of London, and urges all cab drivers, in the interests of the cab industry, to discourage any further development of public vehicles driven by motive power." We do not think that this resolution means anything more serious than the sounding brass and the tinkling cymbals of the uninstructed. It has pleased these gentlemen to pass it, but that it will in any way hinder the development of a promising industry we do not for one moment believe. There is no doubt a good deal to be said from the cabman's point of view against the introduction of horseless vehicles, but much more in favour of the innovation. The new vehicles will require a more careful and intelligent body of drivers, a thing desirable in itself. At present the London cabby is not a favourite with the public. Long association with horses does not, as a rule, tend to that suavity of manners so desirable in those who serve the public, and in this respect it must be confessed that the cabby is deficient; whereas under the new system it will be possible to ensure civility and strictly legal charges. The better class of cabmen recognise that the new cabs will benefit them. Mr. W. Bersey says, in a letter to the Press:—"We have spoken to hundreds of cabmen on the subject, and have always understood they were most anxious for the change, as it would shorten their hours—by saving the time wasted in changing horses—and also save them the unpleasantness of frequently having to drive tired and undesirable horses. I may add that we have no intention of charging the drivers more than the prices they now have to pay."

REVIEWS OF BOOKS.

"The Motor-Cycle and Component Parts Official Intelligence." (London: Effingham Wilson and Co., Royal Exchange.) Price 5*s*.

THIS is a kind of cycle "Burdett," and, looking through it with some knowledge of the trade, one can gather some curious and possibly useful information. The particulars are taken from official sources, and include authorised capital, shares, purchase money, form of transfer, method of voting, date of making up accounts, latest price up to time of going to press, list of directors and officers, address, &c. As we say, this information is in some cases decidedly curious, and one realises how tremendously large is the capital sunk in the cycle industry, although it is disheartening to see how few cycle companies' shares stand at even par value. It would seem that directly any intelligent mechanic or clerk who rides a "bike" to his shop, and discovers that by twisting a bit here and adding a piece there, or putting in or taking out a screw he effects what he calls an "improvement," he forthwith proceeds to patent his "invention" (*sic*), and the public gives him anything from £5,000 to £50,000 for it, of which he may possibly get £500 as his share of the spoil. As for the silly investors, they deservedly lose by the precious "investment." This book contains many such instances of cycle companies whose shares are all but worthless, and whose property in patents is valueless. While the information given is good so far as it goes, we would suggest that the public and private addresses of directors should in all cases be given, together with any other information, such as their ostensible position, business, &c. As regards the particular industry which we represent, viz., the automotor industry, our previous remarks apply, with the exception that a number of omissions might be pointed out. At the end of the work is a list of names of dealers, agents, and manufacturers—a somewhat superfluous addition, and of little value, as it is not classified. The book is decidedly useful, notwithstanding its shortcomings. It needs extension.

"The Calculus for Engineers." By PROFESSOR PERRY, M.E., D.Sc., F.R.S., &c. (Edward Arnold, 37, Bedford Street, London, and 70, Fifth Avenue, New York.)

PROFESSOR PERRY occupies such a deservedly high place as an exponent of the science of engineering that a criticism of any work he may publish is, to all but the most advanced and captious critics, supererogatory. It is sufficient to say that the work in question is by one of the half dozen or so really scientific engineers that we know of. When we studied the calculus under the rigorously academic system of Todhunter we often asked ourselves *Cui bono?* In that classical work, which by the way is by no means superseded by that before us, the student rarely saw the end of his labours, and although a study of Todhunter rendered him a good mathematician, it did not give him much assistance in solving the problems of professional practice, whether this took the shape of civil, military, marine, or nautical engineering; we use the latter term advisedly. There is hardly any profession involving the use of figures to which a knowledge of the calculus may not be usefully applied. The accountant for instance, who analyses balance sheets, is not usually aware that the calculus would enable him to, in many cases, greatly facilitate his work. Similarly the navigator is not aware that he daily employs it. Professor Perry has attacked his subject in a decidedly original and successful manner. As an instructor in engineering at the Finsbury Technical College, he has had abundant opportunities of knowing the difficulties that students experience when taking up the calculus for the first time and hence the present work is largely explanatory and this gives it its great value, which is not lessened by the colloquial style adopted. Commencing with graphics the Professor shows how to put such equations as $y = ax^n$ and $y = a \sin (bx + c)$ in the form of curves. Professor Perry attaches very great importance to the employment of curves as representing the law governing some phenomenon and we quite agree with his view. Indeed the calculus can hardly be appreciated without the aid of graphics; squared paper is as the Professor points out only sevenpence a quire (our stationer charges us more). From these introductory exercises we are led up to a consideration of that rock of offence to so many students $\frac{dy}{dx}$; this is carefully explained as a rate or slope, and it may be as well to point out that it does *not* mean $\frac{d \times y}{d \times x}$, neither does δt mean $\delta \times t$.

In our author's hands the doctrine of limits is lucidly explained. In studying, he gives this advice, "Get as little help from teachers as possible, but help from fellow-students will be very useful, especially if it leads to wrangling about the subject." All who have had class or lecture-room experience will recognise the truth of this. The subjects of slope and speed, acceleration, and motion generally are ably and interestingly handled, and many practical examples of the application of this elementary part of the calculus are given. We notice that the Professor does all his thinking in ordinary units, such as pounds, feet, and seconds; the poundal is an abomination to him as to us. By easy and pleasant stages we are shown how to differentiate ax^2, and are then introduced to that terror of our student days, $\int x^m . dx$. In the Professor's hands this formidable symbol becomes quite harmless and turns out to be nothing more than a useful little dodge of performing difficult addition. We then come to maxima and minima, and it is surprising to learn to how many problems in daily life the calculus can be usefully applied. For instance—What is the largest sized box that may be sent through the Parcels Post? The regulations merely say that the length *plus* girth must not exceed six feet; this can, of course, be solved by a trial and error process of arithmetic, but it really is an example of maxima and minima, as is the somewhat analogous problem of finding the best conductor for a given current of electricity. The areas of curves and the application of the calculus to geometry are then dealt with, and this is succeeded by some useful sections dealing with the strength of cylinders, beams, bending, girders, &c. In all these the engineer will find many obscure things elucidated. Chapter II commences with an exposition of what is known as the Compound Interest Law, which, as the Professor points out, has a very wide application throughout Nature. He illustrates it by the leakage of an electric condenser and the slipping of a belt on a pulley. Space forbids us to dwell longer on this, to us, fascinating book. Professor Perry combines what is very rarely the case, the academic and the practical; his range of knowledge is immense, and there seems to be hardly a problem in physics that he cannot solve with the aid of the calculus. At the same time the Professor, with all his learning, is still very human, and throughout this work there runs a vein of latent humour which gives it an additional interest. For instance, what student will not rejoice to be told that "he may skip judiciously," and that he is to work up no problem in which he has no professional interest; and again, "men who think they know a little about this subject already, will not care to take the trouble, and if you do not find yourself interested, I advise you not to take the trouble either." We are pleased to hear that the Professor has another work in hand dealing with engineering problems of a higher order than is treated of in this book. We can only recommend the latter as being not only a useful tool in the hands of the intelligent engineer, but also as an elegant mental tonic for everyone who has a natural taste for mathematics.

"Cassier's Magazine."

OF the vast number of magazines that are published, few, if any, can claim to equal, either in bulk, illustrations, or intellectual value the marine number of *Cassier's Magazine*. Magazine! Why, it is more properly a treatise on Naval Science brought up to date, and yet not so scientific but that its contents can be read with advantage by any intelligent person who takes an interest in marine affairs. In the present number are 17 articles, all the writers of which are acknowledged experts in their various ways. Sir W. H. White, R.N., F.R.S., our Chief Constructor, contributes a gracefully-written essay on specialities of warship design. In this he traces the evolution of our navy, and describes the nature of the problems that the naval architect has to solve. Not a small part of Sir W. H. White's literary work has been devoted to correcting popular errors about our warships. In the House of Commons and on the Press are numbers of persons who have never designed, nor could design, anything, and who have never kept a watch in charge of a vessel. These persons are, therefore, authorities on naval matters, and it is they who oracularly say, "She is too short," or "too long," or too anything. In the present paper Sir W. H. White deals with these critics kindly but effectively. Thus :—"In some quarters, whatever length may be decided on, it is pronounced to be '50 feet too short,' as a rule, without any investigation of what such an addition would involve. Where criticisms have been associated with alternative proposals—and such cases are few—it has been the writer's task to investigate them. In no single case so treated has it appeared that the proposals made would have given the gains in propulsion anticipated in association with other supposed advantages. As a rule, the proposals made have been proved to be incompatible with a due provision of stability." The article abounds in figures and data which, considering the position of the writer, may be accepted as official. To all interested in naval affairs we strongly recommend a perusal of this and the succeeding article on fast torpedo-boats by Mr. A. F. Yarrow, the well-known builder, and, let us add, one of the pioneers of automobilism. This article is also historical and descriptive, technical enough to supply some useful data, and popular enough to make interesting reading. The speed and power curve is distinctly useful. Thus a first-class torpedo-boat requires about 450 I.H.P. to drive her at 15 knots ; 1,050 to drive her at 20; 2,150 to drive her at 25, and 4,400 to drive her at nearly 30 knots. In other words, to double the speed of 15 knots requires roughly 10 times the power.

The "Problem of Steamship Design" has occupied the pen of Mr. H. H. West, M.I.N.A., of Liverpool, a well-known naval architect who is the designer of the new Isle of Man steamer, one of the fastest paddle-boats in the world, and who attended with us the Paris heavy motor-car trials as a delegate from the Self-Propelled Traffic Association. Mr. West confines his attention chiefly to the larger class of merchant ships, of which he has designed a great many. He, like his more distinguished colleague, Sir W. H. White, has often cause to complain that the scientific disposition of weights is sadly interfered with by the necessities of the case. His article forms a useful account of modern shipbuilding.

Of a more scientific character is the article by Mr. R. Caird, on the "Launching of a Ship." Mr. Caird is a member of the historic firm of Cairds, of Greenock, who have built nearly all the P. and O. steamers. Launching a vessel is a process that involves tremendous responsibility, great anxiety, and months of careful preparation, and great cost ; a bad launch may ruin a firm. Instances are not lacking. The writer of this review could mention a few. The process of launching occupies less than a minute, but during that time a very interesting dynamical problem is being solved.

"Principles" affecting a floating ship, by Mr. F. P. Purvis, is an extremely useful essay which we can recommend to the student and seaman, and even to the professional naval architect. We have never seen the obscure laws of ships' resistance so ably put forth and explained as is done here. His remarks on the cutical speeds of steamships seem to us to be especially valuable. Mr. Purvis is or was, if we mistake not, a member of the scientific staff of that very scientific firm of shipbuilders, Messrs. Denny, of Dumbarton, one of whom, Mr. A. Denny, contributes a capital article on the "Design and Building of a Steamship." Needless to say that this is worth more than hasty reading. The whole process of building, from the ordering of the plates to the trial trip, are pleasantly explained. Naturally Mr. Denny has a shot at his old enemy the Admiralty Constant, and he quietly bewails how the hands of the advanced shipbuilder are tied by unsympathetic and prosaic bodies like Lloyd's.

"Marine Boiler Furnaces," by Mr. D. B. Morison, is an account of the manufacture of this important part of a cylindrical or Scotch boiler. As is well known, Mr. Morison is the inventor of a furnace which is an evoluted Fox's flue. He has a good deal to say about the operation of the Board of Trade rules, and points out their unscientific character. We should like to hear Mr. Morison on water-tube boilers.

Mr. John Thornycroft contributes an article on "Steamers for Shallow Rivers," and in this he explains the advantages of the turbine propeller.

So far we have only gone a third through the magazine, and consideration of space compels us to bring our remarks to a close. Other articles and their writers are :—"Water-Tube Boilers for War Vessels," by Walter M. McFarland, U.S.N. ; "The Naval Weakness of Great Britain," by Sir Charles W. Dilke, Bart., M.P. ; "The Modern Marine Engine," by Charles E. Hyde ; "American Sound and River Steamboats," by Leander N. Lovell ; "The Auxiliary Machinery of an American Warship," by F. Meriam Wheeler ; "Shipbuilding and Transportation on the Great American Lakes," by Joseph R. Oldham, N.A. ; "Steel for Marine Engine Forgings and Shaftings," by R. W. Davenport, M. Am. Inst. M.E. ; "The Coaling of Steamships," by S. Howard Smith ; and "Submarine Navigation," by John P. Holland.

Each and all these articles are more than good, they are worth careful study. We can only congratulate the proprietors and the editor of *Cassier's* on the production of a magazine that is simply brimful of the best information. It is a wonderful production, and no writer on naval or marine matters can afford to miss this work. Not only are the literary contents of the highest value, but the illustrations are extremely good, while the paper and printing leave nothing to be desired. We should not omit to mention that the likenesses of the writers of the articles are excellent and worth preserving.

Catalogues.

The Worthington Pump Company, of New York and London send us an exceedingly well illustrated handbook descriptive of their well-known pumps, condensers, &c. Probably no steam motor is more widely used than the Worthington pump. It was the "master" duplex pump, and although it has been widely copied and imitated both in England and America, we, who have used pumps a good deal, are not aware that the Worthington has been much, if at all, improved. In the present catalogue will be found many new variants and modifications of the original type. There is a good descriptive letter-press and telegraphic code list ; the latter enabling a purchaser to state in a single word what would otherwise occupy reams of specification paper.

Messrs. Chas. Burrell and Sons (Limited), of Thetford, send us their illustrated catalogue of road locomotives. We need hardly say that this old-established firm (it dates from 1770) has gained a world-wide reputation for high class mechanism. In the present catalogue, which, by the way, is copiously illustrated, the farmer, contractor, municipal or military engineer will find many examples applicable to their special requirements. We observe that a unique speciality of this firm is the supply of tractors for hauling the plant of circus proprietors. It is not generally known that the country circus proprietor is a good customer to the engineer, and much money is spent in this direction. Messrs. Burrell make an excellent road engine, which not only drives the circus, but supplies the electric light, and, when the show is over, hauls the whole concern to the next town. Among other machines we may mention portable and semi-portable engines which burn either coal, wood, or straw ; ploughs for English, Indian, or colonial requirements ; traction trucks, threshing machines, &c. In short, this is an excellent catalogue and contains an abundance of really useful information—the result of this firm's extensive experience.

The Clayton Air Compressors.—We have received from the Clayton Company, of New York, a well got up and well illustrated catalogue, or, rather, handbook of their specialities in air-compressing machinery. Compressed air as a motive power has so much to recommend it that it is surprising it is not taken greater advantage of in this country. In the United States, compressed air is used for mining, tunnelling, bridge building, for pumping water, operating hoists, cranes, lifts, drills, caulking tools, for stone carving, for operating petroleum oil burners, for inflating cycle tyres, and a score of other purposes. The Clayton Company manufacture plant for all these special purposes, including car propulsion. This catalogue is really a well-written treatise on air compression, and may be studied with advantage. The prices for the various descriptions of plant appear to us to be very reasonable and compare favourably with English lists.

PROCEEDINGS OF SOCIETIES.

The Transmission of Power.*

The section of the subject of the transmission of power upon which I have been requested to address a few remarks to the Section is one with which I find it extremely difficult to deal. All other methods of transmitting power than by electricity and water is an extremely large subject which it is really impossible to handle in ten minutes. Further, it is a subject which is very old and trite, and upon which it is impossible to say anything at all of an original character. In fact I may say that to Messrs. Preece and Ellington have been allotted in this matter the cream, and to me has been allotted the skim milk. That being so, even though the time during which I shall have to occupy you is so short, I shall venture to touch upon their subjects as well as mine; in fact to improve the quality of my skim milk by stealing a little of their cream.

The methods of transmitting power which are well known to all of us other than by electricity and water power appear to be those of ordinary gearing and shafting, of transmission by ropes, and of transmission by compressed air or by steam. Consider for a moment the broad characteristics of these five modes of transmission. The losses of energy in four of them are, in fact, very similar, and closely analogous to the ordinary well-known losses by friction. This is obviously the case in water-power transmission, in transmission by gearing, in transmission by ropes, and it is, I think, also the case in transmission by electricity, for the loss by electrical resistance is closely analogous to the loss by frictional resistance; and in the transmission of power by electricity the main source of loss is really by resistance. On the other hand, the losses in the case of transmission by compressed air belong to a totally different class. When the air is compressed it is inevitably heated, and when it expands, doing work at the receiving end of the system, it is inevitably cooled. The heat of the compressed air cannot practically be retained, but it is lost by conduction through the containing chamber and through the pipes which convey it. Again, in expansion the heat of surrounding bodies cannot be kept out of the cool air, and hence results a loss of power which is not analogous to a frictional loss. The methods of diminishing these losses are totally distinct in kind from those which would be adopted in the other four methods of transmission. We must look for them in the direction of avoiding as far as possible the conduction of heat to and from the working material through surrounding bodies, or in some system of regeneration having the same end in view, viz., avoiding the equalisation of temperature by conduction. This peculiarity of transmission of power by compressed air, although it involves very serious losses when applied in unsuitable cases, possesses also particular advantages for particular purposes. I refer to such work as that of tunnelling in such situations as the St. Gothard, the Vorallberg, or the tunnel about to be made on the Simplon route. Here the air which is forced into the tunnel for the purpose of propelling the drills is afterwards used for ventilation, and the fact that it is cooled in doing its work is an additional advantage in cooling the end of the tunnel. These are advantages which are absent from the other four methods of transmitting power, and render it, I think, certain that for this particular purpose compressed air is the method which will be universally employed in the future.

Comparing now the other methods of transmission one is at once struck by the great flexibility of transmission of power by electricity. The electrical conductors can, of course, be taken through all sorts of positions without trouble or inconvenience, and are very easy to repair. Further, transmission electrically can be effected at very much greater distances than can be conveniently done by any other method. It would seem that electricity must be the agent when transmission is to be made to long distances, as from where there exists a great water-power to the points at which that power can be used, and in very many cases where it is advantageous on account of its convenience. One sees electricity coming into competition with transmission by ropes or cables, both for tramways and in its use for cranes. For tramways there is no doubt that electricity has practically taken possession of the field on account of its cheapness in all cases except those where the traffic is extremely heavy or where the gradients are extremely severe, so that there are points at which there would be insufficient adhesion between the wheels and the rails. With regard to cranes, of course all of us are familiar with the type of rope-driving which was in use 20 years ago in which a high-speed rope was used for driving cranes by means of friction wheels. The far greater convenience of electric transmission will, I think, entirely supersede the rope-crane.

Comparing electrical transmission with the use of shafting and gearing, we already see that in many factories power is transmitted electrically, and a large amount of gearing is rendered unnecessary. It has there the advantage that buildings may be constructed and machinery arranged without regard to gearing and shafting. For many purposes, however, electrical transmission has a formidable competitor in transmission by water-pressure; each has its own field. It is inevitable that with electrical transmission of power high speeds of rotation must be used, and for many purposes this is inconvenient; for example, for lifts and cranes working at a slow speed. But notwithstanding the fact that there seems undoubtedly to be many places where hydraulic transmission will permanently be better suited to the purpose than electrical transmission, there can be no doubt that there are many cases in which at the present day hydraulic transmission is used which will ultimately be effected by electrical transmission of power. Consider, for example, the case of transmission upon our ships of war. Here we have at the present time, as a rule, transmission of power either by means of water-pressure or by means of steam-pressure. The consequences of the destruction of a steam-pipe by a projectile would be extremely serious; and in any case the destruction either of a steam-pipe or of a water-pipe would involve a very considerable amount of trouble in repair, whereas the breaking of the continuity of an electrical conductor would be easily and quickly made good. In conclusion, I would remark that in transmission of power electricity acts really as a mechanical gearing. As I pointed out at the outset, the losses are essentially of the same kind as frictional losses, and quite distinct from the losses in transmission either by compressed air or by steam, which depend essentially upon thermodynamic laws.

* Paper read at the Institution of Civil Engineers by John Hopkinson, Jun., M.A., D.Sc., F.R.S.

French Electric Traction.

At a recent meeting of the Société Internationale des Electricians M. Lasnier read a paper on the system of electrical traction which is used on the lines from the Madeleine to Courbevoie, Neuilly, and Levallois. This system has been in service for the last few months, and comprises three lines, one from the Madeleine to Courbevoie and Neuilly (6·7 kilometres), the second from the Madeleine to Courbevoie (6·6 kilometres), and the third from the Madeleine to Levallois. The system of traction used is by accumulators, with charging stations at the extremities of the lines; the charge is very rapid, being effected in a few minutes. The generating station contains three Babcock and Wilcox boilers, giving 1,800 kilogrammes of steam per hour at 16 kilogrammes per square centimetre, three Willans steam engines of 200 H.P. at 460 revs. a minute, each driving directly a Brown four-pole dynamo of 200 ampères and 660 volts. The distribution board is divided into three distinct parts, each part relating to one engine. Each division comprises the fusible circuit breakers, a bi-polar interrupter, a Hartmann and Braun ampèremeter, and an excitation rheostat. The feeders taken from the terminals of the board are five in number, two being used for the charging at the depôt and the lighting, and three for the lines at the termini. The charging stations are at the extremities of the lines, of which we have already spoken. The first two have a section of 150 square millimetres, and the third a section of 250 square millimetres. At the starting point of each line on the distribution board are a lever interrupter and an automatic interrupter serving as disconnectors, and also circuit breakers and an ampèremeter. At the various charging stations is a terminal which includes a board containing a circuit breaker, an interrupter, and an apparatus giving notice of the end of the charge. At the moment it stops, the driver has only to put the wires of the car into communication with the wires of the charging station and to wait for the bell to ring. The end of the charge is then announced.

The cars are very comfortable. They seat 52 persons. The Tudor accumulators, 200 in number, weighing altogether 3,600 kilogrammes, are placed under the seats. The cars themselves were constructed by the firm of David and Desouches. The electro-motors are two in number, of 25 H.P. each, and have four poles with carbon brushes. A special controlling apparatus enables all the necessary operations to be effected for starting or stopping the car. On each car are little ventilators for letting out the gases given off by the accumulators. The results obtained have up to the present been very satisfactory, the maintenance of the accumulators has been almost nil, the cars have made journeys of 6,000 kilometres. The expenditure has been estimated at 860 watt hours per car-kilometre, and at 2,591 kilogrammes of coal per car-kilometre. The electrical efficiency of the accumulators amounted to 71 per cent.

This was followed by a paper by M. E. Hospitalier on electric motor-cars. First he reminded his hearers that in 1881 he expressed the opinion that accumulators would be improved, and would be rendered suitable for electric cabs. This prediction is already partly fulfilled, and it is probable that in a year's time electric cabs will be running. He then discussed the powers attributed to the horse. This power is variable; it may, however, be estimated that a horse can produce 500 watts and 3 kilowatt hours per day. If this power and this energy is expressed by weight, we get only one watt per kilogramme and six watt hours per kilogramme. These figures are certainly below those given by an accumulator. In the case of the horse, the rein is sufficient for its guidance, it can produce at each pull a traction effort of 100 kilogrammes. Its speed is very variable.

As regards electric motor-cars we can only depend upon accumulators with a motor and controlling apparatus. These cars are supplied with all the modern improvements—the jointed axle, ball bearings, and the pneumatic tyre. With regard to the latter point, M. Hospitalier referred to M. Michelin's recent experiments and showed the advantages of the pneumatic tyre.

Accumulators have now made great progress. In 1881, we reckoned ·6 watt per kilogramme; a few years later we obtained 2 watts per kilogramme and 12 watt hours per kilogramme. In 1897 the Fulmen accumulators furnish 30 watt hours at the output of 1·5 watt per kilogramme, 25 watt hours at the output of 5 watts per kilogramme, and 20 watt hours at the output of 10 watts per kilogramme. As regards the duration of accumulators, special experiments would have to be made. But briefly, we may say that in 1881 1,000 kilogrammes of accumulators were required to produce 1 kilowatt, and 100 kilogrammes to produce 1 kilowatt hour; in 1897, 200 kilogrammes are required to produce 1 kilowatt, and 50 kilogrammes to produce 1 kilowatt hour.

Electromotors have also made very great progress. In 1881 their efficiency was barely 60 per cent., and their weight from 30 to 40 kilogrammes per kilowatt. In 1897 the efficiency amounts to 80 per cent., and their weight is reduced to 15 or 20 kilogrammes per kilowatt. Electromotors have the great advantage of supplying automatically a couple which increases as the speed diminishes; they are self-regulating. This is not the case with the petroleum motors, which produce a constant motive couple. The principal advantages of electric motor-cars are the following:—Safety, absence of jerking and shaking, stoppage of mechanism during stoppages of the vehicle, absence of heat, absence of smell, cleanliness, simplicity of construction, facility in starting and stopping. All the modern cars at the present day present almost equivalent advantages as regards elegance, economy, and inexpensiveness.

The inconveniences attached to electric motor-cars are as follows:—A charging station is required for the accumulators, the weight of the motor and the accumulator is considerable; in an ordinary vehicle, however, we must take into account the weight of the horse, which is no little. The cost is rather high. Objections are also raised against electric motor-cars on the ground that acid is used, but this liquid is placed in closed accumulators.

As regards the re-charging of the electric batteries, there are three solutions of the problem:—(1) Rapid charging at the station; (2) the replacement of the batteries after discharge; (3) charging during the night.

Rapid charging at the station would be somewhat difficult, especially if there were many cars. The replacement of the batteries would offer certain difficulties. It seems, therefore, that charging during the night would be the best way of meeting the case; 44 to 45 elements would be required, which would be charged from the distribution lines at 110 to 1,120 volts. The charging would be almost automatic; ·4 francs the kilowatt hour would probably be the price asked by the electrical companies. Lastly, various other systems have been proposed for electric motor-cars. Amongst the principal we may mention a proposal to place the whole of the Hellmann system on a car and the employment of a petroleum engine of low power driving a dynamo for keeping the accumulators charged. Lastly, portable kilowatt hours can also be used. Boxes giving car kilowatt hours could be bought. M. E. Hospitalier then briefly reviewed the chief systems of car that have been constructed. In 1881 M. Trouvé constructed an electric tricycle; various cars were brought out by Mr. Ayrton in 1882, by Mr. Magnus Volk in 1887 and 1888, by M. Carli in 1893, by M. Bouchain d'Armentières and by M. Jeantaud in 1894. In 1894 and 1895 various experiments were made in America by MM. Morris and Salom. In 1897 M. Krieger constructed a car that has already been described. To these various types we may add the Riker car of New York, Darracq's electric hansom, the Ward omnibus of London, &c.

It may be asked, What is the energy required for starting? Messrs. Morris and Salom have made several experiments with regard to this point. They found that a car weighing 900 kilogrammes, to seat two persons, would expend 83 watt hours per kilometre ton at a speed of 8 kilometres per hour, 84 watt hours per kilometre ton at a speed of 19 kilometres per hour, and 95 watt hours per kilometre ton at a speed of 32 kilometres per hour. We must, therefore, reckon about 100 watt hours per kilometre ton. A car weighing one ton will contain 400 kilogrammes of accumulators; we can, therefore, obtain runs of 60 kilometres. This would be a very satisfactory length for a journey.

The cost of charging would be about 3 francs to 4 francs per charge. In fact, in the above case for eight available kilowatt hours, the cost of the charge must be estimated at 10 francs. For maintenance and the sinking fund we must reckon 3 francs a day, or about 1,000 francs a year. Altogether, therefore, we must estimate that 60 kilometres a day would cost from 7 francs to 8 francs a day. To make a fair comparison, we must take into account such items as forage, diseases of horses, stabling expenses, &c. In conclusion, M. E. Hospitalier said that electric cars and cabs are on the eve of taking up an important position in practical traction. He hoped that Paris would cease to be an inferno of horses, and would become as soon as possible a paradise of accumobiles.

Working Tramways by Alternating Currents.—At the British Association meeting at Toronto, Professor J. Perry gave a description of an interesting method of working street tramways by alternating currents devised by himself. Between the two rails of the tramway line are placed a series of pieces of sheet iron of channel section. Each piece is placed vertically in the roadway, its plane being at right angles to the line of rails. The pieces are placed near together, magnetically insulated, forming an iron channel along the whole length of the line. The upper surfaces of the pieces are in the road surface. A flat slip conductor is laid along the channel thus formed and the whole filled in with cement. When an alternating current is passed through the conductor the pieces of sheet iron become magnetised, but in a continually changing direction. The car carries an armature, wound with a coil, having projecting pole-pieces presented to the alternating electro-magnet in the bed of the roadway. The current induced in the coil is employed to drive the motors. No illustrations were given of this apparatus beyond a rough sketch on the blackboard, but it was explained that the arrangement has been satisfactorily tested on the full-size scale on a very short line. The cost of constructing such a line had been estimated, and was calculated to be much below the cost of a conduit line.

End of the Irish Motor and Cycle Company (Limited).—An extraordinary general meeting of the Motor Cycle Company of Ireland was held on the 9th inst. at the offices, Leinster Street, Dublin. Alderman Meade, who presided, proposed a motion, which was seconded by Mr. Malcolm Inglis, confirming the resolution passed at the meeting of August 23rd, which authorised the voluntary winding up of the Company. The resolution was unanimously passed.

A BELGIAN ELECTRIC CARRIAGE.

L'Electrique (Société Anonyme) of Brussels has for some time past been studying the question of electric traction, and has designed and built the car of which we give an illustration. As will be seen, the vehicle can seat four persons. The battery is placed under the seats, and consists of 48 cells, the plates being of the Planté type. The total weight of the battery is 950 lbs., and it is charged by a current of 25 ampères at 110 volts, the time occupied being about 3½ hours. The capacity i about 86 ampère hours at a discharge of 18 ampères. The current actuates a series-wound motor, which runs at 1,750 revs. and weighs 275 lbs. At each end of the armature spindle is a pinion which, by means of a chain, transmits motion to the rear wheels. The ordinary differential gearing is, of course, being interposed. The total weight of the car, with motor and battery, is 2,420 lbs., and it can be driven, at the rate of 10 miles, a distance of between 40 and 50 miles without recharging. It will be seen that the performance is very good.

A Belgian Motor-Carriage.

Gas-Engine for Traction Purposes.—Gas engines are steadily coming more to the front in America. One is described in the *Street Railway Review* that is driving the power plant of the Traction Company of Lancaster, Ohio. This Company works from three to five cars over four miles of line with some 8 per cent. grades. The engine was put in about a year ago; it is known as the American Kilmarnock, being a single cylinder double-acting engine, and it develops 130 I.H.P., or 110 B.H.P., its rated size being 100 H.P. The speed is 180 per minute, and it drives an 80 kw. Thomson-Houston 6-pole generator. The following are the leading dimensions:—Cylinder, 16 inches diameter; stroke, 20 inches; piston rod, 3 inches; shaft, 7 inches. Two 8 feet fly-wheels with 16 face for belts. Overall length, 15 feet 11 inches; width, 6 feet 10½ inches. The total weight is 34,000 lbs. of which the wheels make up 13,500 lbs. It is to be noted that the bearings are of phosphor bronze without babbit. The engine has the porcelain ignition tube, and natural gas under high pressure is used. The load diagram shows great and sudden variations, and varies from 0 to 180 ampères. The gas consumed is 16 feet per B.H.P.

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Semi-Official Journal of the Association	THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

SELF-PROPELLED TRAFFIC ASSOCIATION.

LIVERPOOL AND DISTRICT CENTRE.

AT a Council Meeting of the above Association held on the 31st ult. it was resolved not to arrange an Exhibition in 1898 as originally contemplated, but it was determined to hold trials for heavy vehicles similar to "Les Poids Lourds" about May or June next year. A strong sub-committee was appointed to frame the conditions, including Messrs. Alfred Holt, M.I.C.E., Alfred L. Jones, J.P., John A. Brody, A.M.I.C.E., M.I.M.E., Everard R. Calthorp, C.E., Henry H. West, M.I.C.E., M.I.N.A., and E. Shrapnell Smith (Honorary Secretary). We hope to give full particulars in our next issue of the conditions of these important trials.

WE are glad to announce that the Second Session of the Liverpool Branch of the Self-Propelled Traffic Association will be opened early in November, when an Address will be given on the subject of "Self-Propelled Vehicles, 1896-1897," by Mr. W. Worby Beaumont, M.I.C.E., M.I.M.E.

Report of Paris Deputation on the Heavy Motor Vehicle Trials at Versailles, and on the Serpollet Tramway System (Paris).

The deputation was appointed on July 13th, 1897, under the following resolution :—"That a deputation of the Council be appointed to attend the trials of heavy motor vehicles at Paris, and to report generally upon the position on the Continent, with a view to advising the Council as to the conduct of the proposed Exhibition."

The report of the deputation, dated September 15th, commences with the trials, gives the duration of the trials, and general details of the conditions, the list and particulars of entries, the performance of the vehicles during the trials, &c., all of which has already appeared in the columns of the AUTOMOTOR. The conclusions arrived at by the Committee are then recorded as follows :—

De Dion and Bouton's System.

On Thursday, August 5th, shortly after 11 a.m., we were accorded seats in the De Dion and Bouton Omnibus (No. 14), for the run over Route A. Twenty persons were on board, inclusive of the driver and stoker. The 25·5 miles of this course were accomplished in 3 hours 22 minutes, inclusive of stoppages, or at an average speed of 7·6 miles per hour. The journey was completed without any *contretemps* more serious than a brief stoppage to tighten a joint of one of the feed-pipes. The rest of the course was accomplished with due observance of the stipulated halts, and without any special incident.

A noticeable feature in the running was the practical uniformity of speed, whether up-hill or down.

In this vehicle the motive power is steam, provided by a De Dion boiler carried on the front platform. The boiler consists of an outer double shell, containing an annular water-space, with a similar internal double shell containing another annular water-space; the two water-spaces being connected by radiating tubes. The firing is effected from the top, through the internal shell of the inner section of the boiler. It appeared to be a good practical boiler and, considering its small capacity for water, the feed-service was kept well under control. The feed-water tanks hold about 100 gallons.

A horizontal compound engine is used, and provision is made for the admission of high-pressure steam to the low-pressure cylinder, for hill-climbing and emergencies. The gearing consists of spur wheels, two ratios, which may be applied as the work to be done requires, being provided. The rear road-wheels run loose on the axle, each being driven by means of four steel arms which extend from the axle and are secured to four of the spokes at points about mid way between the boss and the rim of the wheel.

The consumption of coke and water was:—

Coke	7·6 lbs. per mile.
Water	4·4 gals.

The tare of the omnibus is 4 tons.

On the road we were able, for a short time, to observe the working of No. 13—a De Dion tractor, hauling a large covered char-a-banc for 40 persons, running on two wheels at the rear, and coupled to the tractor with a lynch-pin and locking. This tractor is fitted with mechanism and boiler similar to No. 14, of which the engines are designed to give 35 H.P. at 600 revs. per minute.

Although De Dion's have not yet built a goods motor-wagon, they claim that their tractor is suitable for attachment to ordinary wagons.

The De Dion and Bouton system, whilst exceedingly ingenious, is, in our opinion, open to the practical objection that it would require a skilled attendant and an assistant for each motor. The attention of the driver is so much absorbed with the control of the machine that, unless he had another man with him on the look-out and to sound the alarm-signal, especially in crowded thoroughfares, we think it would be difficult to secure safe driving.

	£
Price of tractor (No. 13)	580 at works, Paris.
Price of omnibus (No. 14)	880 ,, ,,

Scotte's System.

The vehicle which had the heaviest load was Scotte's "train demarchandizes (No. 2). It was said to be drawing a net load of 5 tons 9 cwt.—40 cwt. on the motor-wagon and 69 cwt. on the trail-wagon—and appeared to be a practical machine, both in its design and in its behaviour on the road. The tare of the motor-wagon is 3 tons 6 cwt., and of the trail-wagon, 1 ton 15 cwt.

"Scotte's" system may be briefly described as follows:—The front part of the motor-wagon carries water-tanks, coke-bunkers, and boiler. The boiler, which is a modified "Field," works at pressure of about 150 lbs to the square inch. The engine is of the vertical, two-cylinder type. The power is transmitted from the crank-shaft to the counter-shaft by means of sprocket-wheels and chain gearing; this second motion shaft carries the compensating gear and sprocket-wheels for driving the rear road wheels by means of pitch chains.

The three Scotte vehicles (Nos. 1, 2, and 3) ran throughout the trials with good results and remarkable regularity, but the remarks as to the necessity for a skilled attendant and an assistant apply to this system as much as to that of De Dion and Bouton.

Omnibus No. 1 returned the following consumption over Course C:—

Coke	13·0 lbs. per mile.
Water	9·8 gals. ,,

	£
Price of motor-wagon (No. 2)	880 at works, Paris.
,, trail-wagon	600 ,, ,,

For more than six months a regular daily service of their omnibuses has been conducted between Courbevoie and Colombes in the suburbs of Paris, with satisfactory results. The distance between these places is almost three miles. The fares are 4½d. first class, and 3d. second class. Two omnibuses (similar to No. 3) work the route, one plying each way every three quarters of an hour. The owners of these vehicles state that, compared with horse omnibuses, a very considerable economy has been realised.

Scotte's Company—La Société des Chandières et Voitures à Vapeur, 56, Rue de Provence, Paris—has already turned out a considerable number of motor-wagons (with and without trail-wagons) which are running in the Meuse and elsewhere. We were informed that road-traction companies have been formed for establishing services on this system at Lyons, in the Ardèche, Rhône, and Côte d'Or, in which districts the traffic is insufficient to admit of the expenditure involved in laying down rails for tramcars. The distances between the points to be served vary from three to 16 miles.

M. Scotte furnished us with the following working costs:—

Length of route, 6½ miles.
Motor-car and trail-car carrying 38 passengers.
Two machines, each making four double trips per day.

	£
CAPITAL OUTLAY—	
Three road-trains (one in reserve)	3,120
Depôt	200
Total	£3,320

ANNUAL WORKING EXPENSES—			£
Depreciation at 10 per cent.			332
Interest at 5 per cent.			166
Total			498
		£	
600 kilos. coke per day at 3 francs		263	
Oil and grease		58	
Two drivers at 4*s*. 9*d*. per day		175	
Two stokers at 4*s*. per day		146	
One attendant at depôt		73	
Repairs and sundries		234	
			949
Total			£1,447
Cost per car-mile			9·5*d*.

All the machines exhibited very great ingenuity of design and construction, one of the most interesting being Panhard and Levassor's Omnibus (No. 10). This vehicle is fitted with a four-cylinder vertical oil-engine carried in front under the box seat. The crank and counter-shafts are longitudinal with four sets of spur-wheels for variable speed, motion being imparted by a bevel-wheel to a transverse shaft which carries the compensating gear and sprocket-wheels for driving the rear road wheels by link chains. This vehicle consumes only about $1\frac{1}{2}$ pints of petroleum spirit (0·680 S.G.) per mile but, in common with all oil-motored carriages, has the serious disadvantage of very considerable vibration when standing or running at a low rate of speed.

Before leaving Versailles, on August 6th, arrangements were made with Mr. Arthur Hopkins and M. Serpollet to inspect the Serpollet tramway system on the following day (Saturday), and Count de Dion extended an invitation to us to visit his works at Puteaux.

Serpollet's Instantaneous Steam System.

The report gives a very full description of the details of this system, mostly taken from the pamphlet issued by M. Serpollet, of which particulars have some time since appeared in the pages of this journal. In regard to driving the tramcar the report continues :—

Four appliances only have to be attended to by the driver, so that his attention may be devoted largely to the road, and to his action dependent upon the obstacles, if any, in his path :—

1. The hand-pump for starting.
2. The pass-valve or balance-valve for regulating the speed.
3. The reversing lever.
4. The brakes.

M. Serpollet is then quoted as follows :—"When it is necessary to leave the depôt, the driver, having shut the pass-valve, gives a few strokes to the hand-pump, and in half a minute sufficient pressure is obtained to start the car. After this the necessary variations of speed are obtained solely by manipulating the pass-valve, opening it to reduce speed, and *vice versâ*. For ordinary stops it is not necessary to work the hand-pump at all, for, after putting his foot upon the pedal brake, the driver moves over the reversing lever to the mid position. In this position of the gear, the ports of the cylinder being closed, although no more feed-water is being supplied, the boiler remains under pressure for a few minutes. Under these circumstances, in order to start the car again, the driver has only to take his foot off the brake pedal, and to place the reversing lever in the forward position."

The advantages of the modifications now being introduced are at once manifest. Before starting, the balance-valve is adjusted to a pressure of, say, 100 lbs. per square inch, such pressure being constantly maintained even during a protracted stoppage. The steam being cut off from the engines, there is no necessity to place the reversing gear in the mid position. The facility with which these tramcars stop, start, slacken speed, and climb moderate gradients is remarkable.

In Paris, an ordinary driver is entrusted with a Serpollet car after a week's teaching by one of his mates.

Weight of 50-seated motor-car (with water and fuel)	10 tons.
" " trail-car	$3\frac{1}{2}$ "
Minimum radius of curves on Paris lines	83 ft.
Wheel base of cars	6 ft. 4 in.
Diameter of car wheels	2 ft. 8 in.

There are now 60 of these cars working in Paris, and 40 more are to be added within the next few months, when the 100 cars will replace 1,500 horses, and provide a more satisfactory service in many respects. We understand that about 500 additional cars are to be built as quickly as possible.

M. Serpollet informed us that an experimental oil-fired car (créosote brute) had just been completed for La Compagnie Générale des Omnibus de Paris, and that its trials had given every indication of success. It is expected that this car will begin to run in Paris about the end of the present month.

Advantages.

We consider that the Serpollet system is at present the only steam system that can be entrusted to the care of an unskilled driver. The boiler is practically inexplosible.

No gauge-glasses, safety-valve, boiler-mountings, or pressure-gauges are required.

As a matter of fact, pressure-gauges are used but only for the secondary purpose of seeing what power, roughly speaking, is being exerted.

It is never necessary to blow off steam.

The steam pressure can be rapidly varied from zero to a maximum, which "flexibility" of power is a great desideratum in tramcar propulsion.

The steam is provided in a highly superheated state and also discharged as a practically invisible vapour with the hot fire gases.

No appreciable noise arises from the exhaust.

Possible Disadvantages.

TUBES BURNING OUT.—Experience appears to have shown that the only risk is with the bottom row which is nearest to the fire. The "life" of these lower tubes depends very largely upon the careful attention of the driver when the car stops at each end of the route. By closing the ashpit door, so little air is admitted that the fuel is burnt only to carbon monoxide (CO), and this, being a reducing gas, does not burn the iron tubes which in the bottom row may last 12 to 18 months and the others some years.

INCRUSTATION.—This seems to be much less than might have been anticipated. The reverse scouring action of the steam when the pass-valve is opened for a stoppage appears to carry back into the feed-tank much of the deposit. In practice the tubes are cleaned by forcing through them a couple of gallons of kerosene once a fortnight.

The largest deposit is in the tubes through which the feed-water first passes. These lower tubes, however, are of a different section to the others, there being a narrow annular space for the water to pass through, and their ends are specially constructed in such a way as to permit of their being easily cleaned out.

LOW EVAPORATIVE POWER OF BOILER.—Where fuel and water cannot be obtained at comparatively short intervals, this might be a source of trouble by reason of excessive storage being required on board, but in the case of a tram-service this objection would not signify.

It must not be overlooked that, although the actual evaporation is only 6 lbs. of water per 1 lb. of coke, the steam is highly superheated. The evaporation is probably equal to about 10 lbs. of water per 1 lb. of coke from an ordinary tubular boiler.

THE SERPOLLET CARRIAGES are fitted with similar arrangements on a reduced scale. We examined some in course of construction and noted that their boilers are oil fired. Two oil-tanks are provided: one as a reservoir, the other for air-compression and delivery of the oil. In one carriage the latter has a capacity of three gallons; two gallons of oil are pumped into it by hand from the reservoir, and so pressure is obtained to feed the burner. This consists of a spiral terminating in a tube fitted with five jets and bye-passes. A cupful of methylated spirit is required to start vaporisation, which is maintained by the burning oil. Ordinary kerosene (about 0·800 S.G.) is used.

The introduction of oil fuel has permitted a considerable reduction to be effected in the thickness of the tubes, on account of the readiness with which the supply of heat can be regulated.

The two-seated three-wheeled carriage weighs 10 cwt., inclusive of $5\frac{1}{2}$ gallons of kerosene (enough for a run of 90-95 miles), and 16 gallons of water (enough for a run of about 40 miles). The four-seated four-wheeled carriage weighs 18 cwt. inclusive of fuel and water. Unfortunately, we did not see these carriages working, but learnt independently that the experimental vehicles already tried have given satisfaction.

We append the working costs per car-mile of Serpollet's 50-seated during the year 1895, as divided by La Compagnie des tramways de Paris et du département de la Seine :—

Production of steam (coke and bonus to driver)	2·67*d*.
Running expenses (driver, conductor, lubrication, &c.)...	1·59*d*.
Maintenance of cars, engines, and boiler	2·09*d*.
Total	6·35*d*.

It will be remarked that the first item is excessive, but M. Serpollet pointed out to us that they then had no data to guide them in economical firing or advantageous disposition of the elements; a liberal supply of fuel was given to each driver, with the offer of a considerable premium for low consumption. On a straight run, the cars use now only 4 to 4·5 lbs. of coke per mile, the average for a daily mileage of 75 miles being about 7 lbs. per mile throughout the day, inclusive of consumption while standing at termini.

After several years' experience, the cost of working has been considerably reduced, and M. Serpollet furnished us with the following details as representing the present cost per car-mile of a 50-seated car :—

Coke—7 lbs. at 32*s*. 6*d*. per ton	1·24*d*.
Running expenses (driver, conductor, lubrication, &c.)	1·59*d*.
Maintenance of cars, engines, and boiler	1·61*d*.
Total	4·44*d*.

When correction has been made for reduced expenditure on fuel in this country, the cost per car-mile is not more than 4*d*.

Both the above sets of costs refer to 50-seated cars hauling similar trail-cars on Sundays and Fête days.

The price of Serpollet's 50-seated motor-car varies from £1,310 to £1,420 (at works, Paris), according to the system of brakes, the nature of fittings, and other details.

Reviewing the numerous systems and vehicles that came under our notice, we are of opinion that—

1. Scotte's and De Dion's vehicles are the only ones we saw capable of dealing with loads such as we in Liverpool require to move.
2. Serpollet's system has been admirably worked out for tramcars, but, owing to the demand for these, not much has yet been achieved in its application to ordinary road vehicles.
3. Oil-engines (internal combustion), using petroleum spirit, are developed to a high degree of lightness and economy for pleasure carriages and vehicles of a small gross weight.
4. There can be no doubt as to the popular feeling in France, where the liveliest interest is evinced in all matters appertaining to automotors, but it is more from the point of view of pleasure-seekers with a novelty than of business men with work to do. At the same time, the practical carrying aspect of the question is attracting attention, and efforts are being made to produce vehicles for the transport of goods. No thoroughly satisfactory vehicle for really heavy traffic was, however, produced at these trials.
5. As our investigations show that no heavy vehicle in France has yet reached such a stage of development as to appear to be suitable for the requirements of this district, we are of opinion that the public trials which the Association proposes to hold next spring should be proceeded with, in order to ascertain the actual position of English effort to produce self-propelled vehicles for heavy traffic on common roads.

6. As now constructed, neither Scotte's nor De Dion's vehicles would be of any use in this country, owing to the tare weights being in excess of those allowed under the provisions of the Locomotives on Highways Act, 1896. These machines unquestionably have in them the elements of practical success.
7. Whilst our conclusions are not entirely favourable to the motor-wagons put forward on this occasion for the transport of heavy goods, there is no doubt that Scotte's and De Dion's systems are efficient and economical for passenger services, and that Serpollet's tramcar system is a proved success.

[This has only come to hand at the time of going to press, and hence there is not time for detailed criticism. With one remark in the report we must entirely dissent. The report says:—"No thoroughly satisfactory vehicle for really heavy traffic was, however, produced at these trials." This is simply not so. Considering the state of the roads, the performances of the De Dion and Scotte motors were remarkable, and there cannot be the slightest doubt that either of these systems, so far as reliable mechanism is concerned, is quite capable of dealing with the Liverpool and Manchester route. We regret that such (to us) erroneous estimate should have been formed.—Ed.]

Is Saul also amongst the Prophets?—In our last month's issue we had an article criticising, we admit somewhat severely, the General Post Office and its methods. We showed how high-class monthly publications, or even, for that matter, any kind of monthly paper, was severely taxed in its postage as compared with the rates levied on ordinary newspapers. That our comments should have attracted attention was, of course, only natural, especially from those who constitute the grade known as the "higher official." One does not write for the purpose of uttering vain nothings; but we certainly rubbed our eyes to find that the *Electrical Review*, of all papers, was acting as the champion of the Post Office. Says our contemporary:—"The Automotor and Horseless Vehicle Journal seems to have gone a little out of its legitimate line in writing on the above subject Like many other journals, the paper in question assumes that because nothing is said, therefore nothing is done; in other words, that because the scientific exploits of the engineering branch of the Post Office are not blazoned abroad, that therefore they do not exist. It would probably be an eye-opener to our contemporary if it were allowed to inspect the records of work done in the engineering branch of the Post Office. No doubt it is perfectly true that 'one sees but little evidence of acquaintance with the latest advances in telegraphy,' but with some people only seeing is believing. We have before pointed out that the Post Office is not a public laboratory, whose chief function is to carry on original research; it has quite enough, we expect, to do in developing and improving existing forms of apparatus, and in keeping these up to modern requirements. Those whose ideas of telegraphy consist in the notion that a telegraph is simply a wire on a number of poles, worked by a single-current key and a Morse sounder, may be excused if they think the work being done by the Post Office engineering officials is of a trivial nature; but no doubt the officials will manage to survive the contempt with which they are looked upon." In the first place we "assumed" nothing, and we are as likely to imagine vain things as the *Electrical Review* is to "assume" the medical properties of so called electric belts; secondly, we claim to have some knowledge of what the Post Office has achieved and attempted in telegraphy, and especially in submarine telegraphy, and we are glad that the *Electrical Review* agrees with us that it is perfectly true "that one sees but little evidence of acquaintance with the latest advances" in that branch of applied science. We have not said that the Post Office is a public laboratory. We know it is not; but we do know something of its experiments with the sea as the laboratory. We drew attention to certain anomalies in the postal service which even this latter champion of the G.P.O. cannot deny exist and which we submit are evidences of incompetency, and this incompetency we believe to be due to the vicious system of selection and promotion that obtains. We remember the time when the *Electrical Review* was not slow in detecting and exposing those who preyed upon the public, whether they were high officials, quack doctors, or dishonest exploiters of primary batteries; and our contemporary rendered yeoman's service in this connection. Yet, because we remonstrate with the higher officials of the Post Office about these anomalies, our contemporary pours out the vials of its wrath upon us. *Et tu, Brute!*

NEW INVENTIONS.

Claiming particularly to apply directly or indirectly to Motor Vehicles, &c.

Compiled for "The Automotor and Horseless Vehicle Journal" by Herbert Haddan and Co., Registered Patent Agents, of 18, Buckingham Street, Strand, W.C., London.

*** *At the request of a number of subscribers we are pleased to announce that for the future we have arranged to more thoroughly cover the field of completed Patents referring to the Motor-Car Industry, by reproducing the latest Specifications and Diagrams.*

Patents Applied For.

Abbreviations: Impts., Improvements in; Relg., Relating to.

1897.			
Aug.	3.	18,061.	W. H. Denison. Improved gearing.
,,	3.	18,081.	D. Doig. Hydraulic driving power.
,,	4.	18,185.	J. G. Glover. Propulsion and steerage of autocars, &c.
,,	6.	18,322.	J. M. Collins. Impts. crank driving mechanism.
,,	10.	18,513.	A. Kohn. New motor-car system for vehicles of various kinds.
,,	10.	18,583.	F. Schäfer. Speed regulating, reversing, and driving gear.
,,	12.	18,730.	S. H. Short. Motor vehicles for electric railways, &c.
,,	14.	18,851.	F. E. Jones. Two-speed gear.
,,	14.	18,865.	Hon. R. T. Brougham and W. C. Bersey. Safety device for motor-cars.
,,	16.	18,837.	F. R. W. Parnell and E. Bailey. Production of gases for propulsion of motor-cars, &c.
,,	17.	19,023.	W. G. Freeman. Impts. driving mechanism.
,,	18.	19,118.	P. L. Goldschmidt. Dynamo-electric driving apparatus.
,,	21.	19,371.	M. Crawford. Impts. motive-power engines.
,,	24.	19,541.	C. D. Abel (Gasmotoren Fabrik Deutz). Driving gear for motor-cars with reversal of motion.
,,	24.	19,554.	W. Auerbach. Chainless driving gear.
,,	25.	19,569.	E. A. Allen. Manufacture of driving chains.
,,	25.	19,573.	A. Sowden. Apparatus connected with electric tramcars.
,,	25.	19,579.	W. J. Brewer and J. E. Cooper. Impts. automotor vehicles.
,,	25.	19,607.	F. M. Wakeman (G. A. Philipon). Impts. driving chains and gear.
,,	25.	19,616.	J. Browne. Impts. motor-cars.
,,	25.	19,625.	A. von Boustetten. Impts. relg. motor-cars.
,,	26.	19,661.	J. Waddell. Impts. relg. driving and braking gear.
,,	26.	19,686.	E. Taylor. Joints of cycle and motor-car frames.
,,	26.	19,693.	C. M. Johnson. Motor-car.
,,	27.	19,769.	C. Cox. Impts. relg. motive power for motor vehicles, cycles, &c.
,,	30.	19,932.	E. Taylor. Joining cycle and motor-car, &c., frames.
,,	30.	19,934.	W. Sebright. Twin-boiler and steam generator.
,,	30.	19,935.	J. P. O'Donnell (P. A. T. de Bouilhac). Impts. relg. motor-cars, engines, &c.

Specifications Published.

25,309. Rims and Tyres of Wheels. William Thomas Fitzgerald, Parkfield House, Maindy, Cardiff, Glamorgan. November 11th, 1896.

This invention relates to improvements in and relating to rims and tyres for wheels for carriages, autocars, motor-cars, and other vehicles, and has for its object the construction of a simple method, which does not consist of complicated mechanism, and has for its object the securing of sections of arched wood, leather, rubber, papier maché, composition, or any other suitable substance to act as a tyre which would grip the road, run quietly, reduce vibration and strain, and be economical in construction and repair.

The invention consists of two rims of angle iron, steel, flange, or other durable material, with half holes drilled to fit on tongues of spokes, right and left, filling between the angles of rims outwards, with sections of arched wood, leather, rubber, papier maché, composition, or other suitable material, and securing the same with bolts, or rivets, fitted in horizontally.

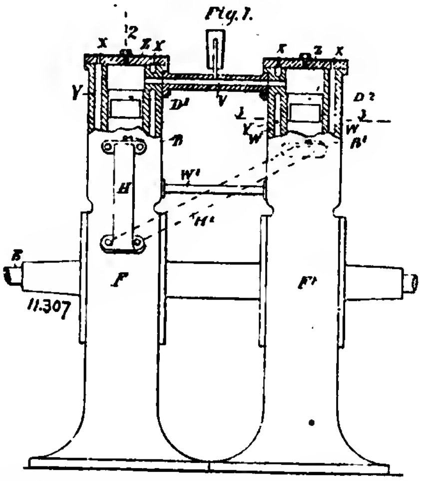
1,886. Transmitting and Regulating Motion. Charles Casman, 50, Rue de la Gaîté, Brussels, Belgium. January 23rd, 1897.

This invention relates to an apparatus for transmitting motion and for varying the speed of the motion imparted by a motor without varying the speed of motion of the said motor, and comprises a lever in which a longitudinal slot or groove is cut and to which an oscillatory movement about its axis is imparted from a motor, an endless chain passing over suitable pulleys and having its ends fixed to the ends of a rod, a triangular frame fixed at one side to the said rod and having a groove or slot parallel to one of its free sides, a cross having in its transverse bar a horizontal slot and in its vertical limbs longitudinal grooves or slots, a slide-block adapted to move at the same time in the slots of the aforesaid lever and frame, and in the said horizontal slot, two fixed pins engaging in the grooves or slots in the vertical limbs of the cross, and means for causing the cross to move up and down upon the said fixed pins.

11,307. Gas and Oil Engines. Joseph Day, Compton Villa, Paragon Road, Weston-super-Mare, Somerset. May 23rd, 1896.

The engines are constructed to work preferably with an impulse at each revolution and two or more are coupled together. The charge of air and gas or of air and oil is smaller than is usually the case, and after being compressed ignition takes place in a tube or chamber between the two cylinders, and consequently operates the pistons simultaneously. One engine is conveniently constructed to draw in and compress the air, and gas in the case of a gas-engine, or air alone in the case of an oil-engine for the purpose of charging the working cylinders, the connections between the air and gas or air and oil being suitably arranged for that purpose, so that as far as concerns the operations of charging, one engine performs double duty, the result being that increased expansion is obtained.

Fig. 1.



A further improvement consists in the method of and means for the utilisation of air instead of water to keep the cylinder or cylinders cool. The cylinders are provided with jackets and air is drawn through these jackets to be utilised eventually to form part of the charge for the engine. By this means the air is also warmed before it reaches the cylinder, which is an advantage. The air jackets may be of ordinary construction, but preferably the air should cover as large a surface of the outside of the cylinder as possible. For this reason the cylinder may be provided with a number of thin fins either vertical, helical, horizontal, or of other form.

2,595. Means for Exploding Combustible Mixtures, and Utilising the Explosive Force thereof for Driving Rotary-Engines. Maximilien Ringelmann, 47, Rue Jenner, Paris. Date Claimed, August 1st, 1896; Date of Application (in United Kingdom), February 1st, 1897.

This invention has for its object the application of explosive mixtures to the working of rotatory engines, the explosive mixture being composed of air added to combustible gas, or to a combustible vapour, or to an explosive body.

The essential principles of the invention are dispensing with compression previous to explosion, and dispensing with the use of cooling water, and the production of the "cycle" in a vessel or chamber separate from the engine.

It consists of a system of explosion generators into which an inflammable product is introduced, which, after mixing itself with the existing air is fired, and produces in the above-mentioned generators or vessels (which may be of any number) a pressure which is employed to turn a rotary engine, and thus this system dispenses with the necessity of cooling, and the explosion takes place without previous compression; and an arrangement by means of which the scavenging after each explosion is made; a fan or air pump for driving out (after each explosion) the products of combustion left in the generator and replacing them by a quantity of air sufficient for the succeeding explosion.

12,137. Horseless Carriages, and in Motors for Driving same. James Frederick Stilwell, 1, Victoria Park, Dover, Kent. June 3rd, 1896.

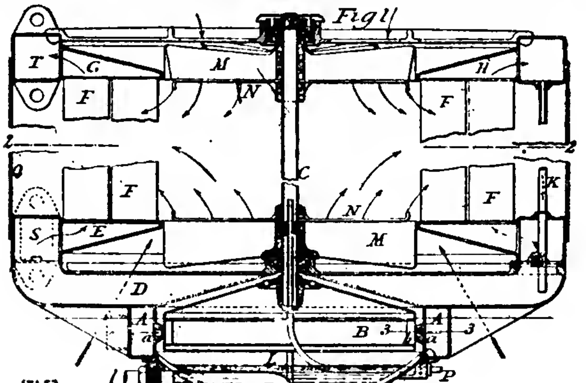
Consists in making the horseless carriage with a removable fore-carriage or bogey, which is provided with a suitable frame on which is mounted the motor in such manner that the whole fore-carriage containing the motor is capable of being easily attached to the carriage itself. The motor frame is mounted on one, two, or more wheels, one or all of which is or may be a driver or drivers. The wheels (when there are two or more) are mounted in such manner that the wheels on the same shaft shall both act as drivers, but both may revolve at different velocities when turning corners and the like.

The vertical pivot on which the motor frame turns is preferably made hollow so that the rods or handles for starting, stopping, or otherwise effecting the working of the motor all lead to or near one spot convenient to the hand of the operator. If an electric motor be used it is evident that some or all of these rods or handles may be replaced by wires and switches. The steering may be conveniently effected by a spur wheel on the hollow pivot and by a pinion mounted on a spindle, at the other end of which is a hand wheel or handle or in any other convenient manner.

13,452. Condenser for Motor Vehicles. Henry Percy Holt, No. 22, Chancery Lane, London. June 18th, 1896.

Relates to a light, compact construction of condenser for the steam or vapour used for propulsion of a motor vehicle.

The exhaust steam or vapour from the engine is supplied to an annular horizontal tube or conduit, A, from which it issues by a number of inclined nozzles, *a*, in jets, playing upon the blades, *b*, of a turbine, B, which is mounted on a vertical axis, C, concentrically within the conduit. The steam, after passing the turbine blades, flows by passage, D, into a segment, E, of another circular conduit, from which it rises through a number of flattened tubes, F, which may be corrugated as shown, or otherwise shaped to a conduit segment, G, above. From this upper segment, G, it passes into other segments on the same level at each side of G, and thence descends another set of the tubes, F,



13452.

to other conduit segments at each side of E, thus circulating in an up and down zigzag course to the last of the upper segments, H, whence the liquid of condensation passes down by pipes, K, to a central well from which it is led by a pipe, *l*, to the feed supply of the engine. On the axis, C, of the turbine there are fixed two fans or air propellers, M, M, the one on the level of the lower conduit segments, such as E, the other on the level of the upper segments, such as G.

These fans draw air into the central space and propel it in all directions outwards as indicated by the arrows between the corrugated tubes, F, cooling them so that the steam or vapour passing up and down through the tubes becomes condensed. To the fans, M, are fixed revolving pipes, N, N, each like a Barker's mill, so as to throw out fine water spray to mingle with the air currents as they pass onwards. Water for this purpose is supplied by a pipe, P, to the interior of the shaft, C, which is hollow, and with which the pipes, N, communicate.

The air, after passing the condensing tubes, is collected in the space outside the tubes, F, within the casing, and led by a conduit to mingle and pass away with the products of combustion from the boiler.

3,562. Steering Mechanism for Autocars and other Vehicles. Nicholas Vincke, 78, Rue Léopold, Malines, Belgium. February 10th, 1897.

Relates to a steering mechanism for vehicles of all kinds and more particularly or autocars.

The two front wheels of the vehicle turn upon journals formed on the outer sides of intermediate parts, which are pivoted to the axle by means of a hinge or other suitable joint or connection which allows of their movement in a vertical plane. Behind or in front of these parts there are arranged two arms, which are inclined towards each other. A bar is pivoted to the arms directly at one end, and indirectly at the other end by means of a sleeve.

To this sleeve there is jointed a rod, which is also jointed at its other end to an arm pivoted on the central part of the axle. Upon this arm there is provided a double-arched or curved spring, above which there is mounted an operating rod, around which is coiled a helical spring. The operating rod is provided with a toothed sector gearing with a pinion driven by means of a second pinion, which is mounted on the end of the shaft of the operating hand wheel.

12,157. Improvements in Road Motor-Cars. John Brown, of Longhurst, Dunmurry, near Belfast. June 3rd, 1896.

Consists in motor-cars having exterior covers for the wheels and low centre of gravity, the use of spring wheels, the axles of which are connected directly, or by means of gearing, to the prime motor and revolve in bearings rigidly.

16,716. Motor Road Vehicles. Hurbert Charles Baker, No. 30, Main Street, Hartford, Connecticut. July 28th, 1896.

Consists of the combination, with a driving and a driven shaft supported in axial alignment, of two conical friction-drums of relatively different diameters, one of which is fixed to the driving-shaft and the other of which is journaled for rotative movement on the driving and driven shafts, with its diametrically-reduced end adjacent to the diametrically-reduced end of the other drum; a differential train of gears connecting the adjacent ends of the driving and driven shafts, and embodying driven gears controlled in their movements by the rotative movement of the last-mentioned drum; two friction-rolls of relatively different diameters in peripheral engagement, respectively, with the two conical drums and one of which rolls is driven by the other through the medium of the fixed drum, and hand-operated means for shifting the friction-rolls longitudinally of said drums to increase or decrease the rotative movement of the gear-controlling drum with relation to the fixed drum and arbitrarily stop or reverse the direction of rotation of the driven shaft.

13,559. Motors for Motor Vehicles. Walter Harris Knight, New Brighton, New York, United States of America. June 19th, 1896.

The invention relates, first, to controlling mechanism for fluid-pressure motors, and, secondly, to certain improvements in details of mechanism.

A suitable engine cylinder is supported from the car, and the piston working in the cylinder is connected through the sliding cross-head and connecting-rod with the crank of the car axle. A reservoir for compressed air is also supported upon the car and communicates through a suitable passage with the fluid supply chest of the motor, in which supply chest operates the distributing valve which also operates as a cut-off valve. A suitable link mechanism for operating the distributing valve is provided, said link mechanism being operated as usual by means of the eccentrics mounted upon the crank axle. For controlling the action of the distributing and cut-off valve, the link mechanism is connected to a suitable operating crank, which is in turn connected to a controlling rod.

In the passage leading from the compressed-air reservoir to the distributing chest of the motor is provided, first, a high-pressure throttle valve, next, a reducing valve, next a low-pressure reservoir or heater, and, finally, between the heater and the motor-cylinder, a low-pressure throttle valve. The reducing valve is automatic in its operation, but the high-pressure throttle valve and the low-pressure throttle valve must be opened and closed by hand. The low-pressure throttle valve is necessary in the system to completely cut off any

MISCELLANEOUS ADVERTISEMENTS.

supply of fluid to the engine from the heater, while the high-pressure throttle valve is necessary to prevent the leaking of fluid through the reducing valve to the heater. To operate the throttle valves suitable toggle link-levers are provided, which are connected to the controlling-rod before referred to. The controlling-rod is operated by a single hand lever, whereby the two throttle valves and link mechanism can be simultaneously operated for controlling the action of the distributing and cut-off valve and the supply of fluid to the reducing-valve and motor. Modifications are described.

12,539. Fly Wheels for Motor-Cars. Arthur Paget, 2, Harcourt Buildings, Temple, London. June 8th, 1896.

For electric motors the fly wheel is constructed of a thin cylindrical shell of copper or other material adapted to be filled with water and which may either be divided into chambers or compartments or fitted with a vane or vanes so as to ensure the water partaking of the movement of the fly wheel, so that when the wheel is charged it is sufficiently heavy to serve as a fly wheel, while, on the other hand, when it is empty, the wheel adds little to the weight of the carriage.

For oil or explosion motor-cars the fly wheel is kept charged with water and serves as the reservoir from which the water for cooling the engine is obtained, the circulation of the water being maintained in any suitable manner. A convenient way is to cause the water to circulate from the fly wheel to the cylinder through the crank shaft and bearings. Holes are bored through the crank shaft communicating with the interior of the fly wheel, and suitable connections are made with the water ways in the crank shaft through the bearings fitted with stuffing boxes. However little water there may be in the wheel, such water will by centrifugal action be found at the rim, and consequently the connections should be adapted and arranged so as to collect the water at the periphery. The return pipe by which the water is collected is so arranged as not to partake of the movement of the fly wheel, being carried on a bearing at the outer side of the fly wheel fitted with a stuffing box.

10,345. Stopping Apparatus for Motor-driven and other Road Carriages. Walter Woolidge, Strand, Southampton. May 14th, 1896.

Relates to a stopping apparatus or mechanism for road carriages or road motor-carriages, consisting of one or more projections or recesses formed on or in or attached to one or more of the wheels of the vehicle or some revolving part contiguous thereto; of a shape suitable to impart a reciprocating motion to a pump, rod, or lever engaging therewith; a brake or brakes operated thereby; a lever or rod, or levers or rods, operated by the said projections or recesses for forcing the brake into action, and provided with non-return checks or clutches, means for releasing said clutches by manual power, arranged so that unless held out of action by the person in charge, the vehicle is certain to be stopped after travelling the distance to which it may be set, and means for setting to stop at any desired distance.

11,506. Railway and Road Vehicles Driven by Oil Motors. John Magee, 38, Pembroke Street, Glasgow. May 27th, 1896.

The motor is so constructed that the cranks revolve in a closed chamber. The motor is geared to the driving axle of the vehicle by means of ropes or belts, or by means of chains and pulleys. The brake for road vehicles consists of two bars or brushes, one at each side of the vehicle, which are brought into contact with the road. The wheels of the vehicle are so constructed that the spokes act as springs. This is accomplished by bending or coiling the spokes in a peculiar manner so as to give sufficient strength and at the same time considerable elasticity. An alarm whistle may be provided which is actuated by the burnt gases from the motor.

To enable the vehicle to turn in a small space, any of the wheels can be allowed to run loose on the axles. The brakes can be operated by means of the exhaust gases acting on a piston or diaphragm connected with the brakes. The vehicle can be reversed by simply reversing the engine, or by means of the chain, rope or belt gearing, the engine running in one direction only.

To keep the cylinders cool a small tank is employed with water in it; also a pump to force or exhaust air from the jackets of the cylinders. The exhaust gases may also be employed to assist in cooling the cylinders. A pump exhausts the air from the cylinder jacket, then a small jet of the exhaust gases at a high pressure is projected into the jacket, a partial vacuum being in the jacket the sudden expansion of the exhaust gases lowers the temperature. The exhaust gases can also be utilised to give a constant feed of oil to the motor by being allowed to act on the surface of the oil and subject it to compression, or to act on a piston or pump for forcing the oil.

12,109. Carburetting Apparatus. Prosper Hérens, 113, Rue Royale, Brussels, Belgium. June 3rd, 1896.

The object is an apparatus for the carburetting of hydrogen, produced by the process of chemical decomposition of water by means of the reaction of an acid on a metal, or by any other process, as well as for the carburation of common coal or illuminating gas.

The reservoir, which may be cylindrical or of any other suitable form, is made of copper, iron, aluminium, lead, or other metal, and may be covered outside with cement. It is surmounted by a lid, fastened by means of bolts and winged screws to the collar of the reservoir. This lid is furnished with a tubulure, having a screw-threaded capsule for the introduction of the liquid, with a tubulure having a tap as an outlet for the carburetted gas, and with an opening for the introduction of a pipe for the passage of the gas, it being also provided with a tap. This pipe plunges to near the bottom of the reservoir and is terminated by a recipient which may be cylindrical or of any other suitable form, perforated in all its walls.

The reservoir is provided laterally with a level-indicator, and, in its lower part, with a discharge-tap to regulate the level of the carburetting body.

SUPPLEMENT TO "THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL," OCTOBER 15, 1898.]

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A RECORD AND REVIEW OF APPLIED AUTOMATIC LOCOMOTION.

Circulates amongst Makers and Users of Motor-Cars, Cycles, etc., in the United Kingdom, the Colonies and the Continent.

VOL. II. NO. 13. OCTOBER 15TH, 1897. PRICE SIXPENCE.

CONTENTS.

KELVIN'S LAW OF ECONOMY.

It is within the common experience of all who purchase and operate plant of any description that some machines are dear as regards first cost, but cheap to run and maintain, while others are cheap in the first instance but very expensive to work. This is such a truism that instances will occur to everyone, from the manufacturers of the ocean steamship to the housewife who uses a patent mangle. In purchasing plant our object is to associate small first cost and small working cost, but rarely is this attained. Now it is evident that between a high prime cost with small working cost on the one hand, and low prime cost and high working cost on the other, there must be some particular prime cost at which the annual working expenses, together with the interest on the prime cost, must be a minimum. What this cost is can be determined by the aid of Kelvin's Law of Economy. Briefly, this law states that *the most economical design in any case is that in which the annual interest on the cost of an increment of material is equal to the saving in annual expenses which results from that increment* This law has the widest possible application, but is hardly known outside the higher engineering circles, yet it is one that the manufacturer, the tradesman, and the housewife might with advantage study; as has been very truly said by a well-known engineer, "it is eminently a shareholders' law"; and were it better understood many mistakes in business would be avoided. Although known as Kelvin's law, yet it was first enunciated by the great French mathematician, Fourier. By the application of this law the manufacturer can say with certainty whether it would pay to put down any given piece of mechanism. It determines the most suitable piston speed of an engine, and the most suitable boiler pressure; it also determines the most suitable speed, and therefore weight of machinery of steamships. It enables a butcher to say definitely whether it will be more economical to use a gas-engine or an electromotor to cut up his sausage meat. It likewise enables the city clerk to determine at what distance he must live from his office in order that his rent and travelling expenses may be a minimum. In applying the law it must, however, be clearly understood that it involves stated conditions only; there may be other circumstances which may render a departure desirable; for instance, we might determine that a steam motor was the most economical for a given purpose, but if our next door neighbour carried on a business involving the use of naphtha or other volatile or inflammable substances, the County Council and the fire insurance companies would very properly interfere. Such circumstances do not, however, invalidate the law, which is rigorously true within its own limits. It is because this law is so little known that we see so much tentative experiment going on around us. Thus Regent Street is being paved with Jarrah wood; Fleet Street with pine. Both kinds cannot possibly be the most economical, and the ratepayers' money is unquestionably being wasted by one or the other of the authorities concerned. Similarly the Chiswick Local Board is, we are told, bumptiously "experimenting" (*sic*) with a Thornycroft dust collector. Really there is no "experiment" needed. Kelvin's law enables us to say definitely what, if any, the economy will be, only it is more than probable that the Chiswick Board knows nothing of the law. Similarly we are told that Shoreditch is also making an "experiment" in obtaining power from burning the voluminous refuse of that dirty and dingy district, and when members of other vestries are asked why they do not go and do likewise they assume a profoundly ludicrous air of superior wisdom and tell you that "they are watching the experience at Shoreditch"! When really the reason is that they never heard of Kelvin's Law of Economy.

A 2

One more example. We Londoners are as regards street traction hopelessly behind many third-rate provincial and continental towns. We tenaciously adhere to the obsolete, costly, inefficient, filthy system of horse traction, and were it not for the aid of an army of sweepers the street would reek, as indeed they often do, with horse-filth. Why is not mechanical traction of some sort adopted for trams and omnibuses? Simply because those who manage these things know nothing of Kelvin's Law of Economy, and so the long-suffering and patient public incurs needless inconvenience and expense through the ignorance of tram and omnibus directors.

What deters many people from mechanical traction, who would otherwise employ it, is the difficulty of ascertaining whether the change "will pay." Kelvin's Law of Economy enables us to say definitely for any given set of conditions to which it is applicable, whether it will or will not pay to employ a mechanically-propelled road carriage. As this question is frequently addressed to us, and as a correspondent has asked our advice, we will give the application of this law.

We will consider the case of a tradesman in good circumstances who, as our correspondent, for purely business purposes, and for no love or interest in horseless traction, finds it necessary to add to his stock of conveyances. We assume, as a basis of calculation, that an average horse and van costs £90, and that a 3½ B.H.P. heavy oil motor-van of the same capacity costs £220, that the working year consists of 313 days of 10 hours each, and that the annual charges of working are as follows:—

Horse and Van.

	£
Carman's wages at 25*s*.	65
Depreciation at 10 % on £90	9
Horse food, straw, &c.	30
Rent of stable, gas, water, implements, and utensils	15
Veterinary and farrier	1
Cost of working per year	120

Motor Van.

	£
Driver's wages at 25*s*.	65·00
Depreciation and repairs at 10 %	22·00
Petroleum at ·5*d*. per pint per B.H.P. per hour	22·82
Lubricating oil, waste, &c.	5·00
Total cost of working motor-van per year	114·82
" " horse and van per year	120·00
Saving in annual expenses by adopting motor-van	5·18

Now, the difference in the prime cost is £130; that is, the motor-van costs more by this amount, but, according to the law, economy will be effected when the interest on this equals the saving in annual expenses. Now, £5·18 is the interest at 4 per cent. on £130. Hence, in this particular case it would be distinct economy to employ a motor-van. As a matter of fact, the figures we have given are capable of much modification. As regards the horse and van expenses, they represent fairly enough the charges that are incurred by a tradesman in an expensive neighbourhood. They, of course, are not applicable to a coal hawker, for instance, who is his own carman, and whose expenses for fodder, stable rent, &c., are perhaps not more than 15*s*. or 20*s*. per week. Also these figures are no indication of the cost of working a horse and van in the country, where pasture and stable-rent are merely nominal items. Clearly in these cases there might be no saving in annual expenses, and hence the motor-van is so far only economical in the wealthy shopping districts of London and other large cities, where rents are high.

Let us now take another business case. A country doctor has a horse and gig or other conveyance, which he can sell for, say, £100. Will it pay to replace this by a motor-dogcart of 3½ B.H.P., and costing, say, £250 prime cost? Now, in a country town the expense of a horse and gig will certainly be not less than £100 per year, and the expense attending a motor-car on the basis of six hours per day for 365 days will be £85, or the saving in annual expenses will be £15. Supposing our doctor sells his horse and gig for £100, and borrows £150 at 5 per cent., he will effect a most advantageous economy. In this latter calculation depreciation and repairs have been placed at 12½ per cent. and wages at £50, but while an experienced coachman is necessary for a valuable horse, an intelligent youth could easily manage a motor-car, and so in this particular case it would be sound economy to purchase one.

We should point out that, although we have allowed for depreciation in the motor-van and in the horse-drawn vehicle, yet this is hardly fair, simply because the ordinary cart owner does not, as a rule, set aside either anything for depreciation or for insurance; wealthy firms, owning large numbers of vehicles, of course do. We should also say that our figures are merely indicative, and if they applied to one particular instance they would not necessarily apply to another. Each case must be decided on by its own data. It also must not be forgotten that, when necessary, the motor-vehicle can be worked continuously, and can travel almost an indefinite distance. Running a coach is, on the other hand, very expensive.

We think that enough has been said to show that in any given case in which the data are known with tolerable accuracy Kelvin's Law of Economy enables us to say whether or no it would pay to replace a horse-drawn vehicle by a mechanically-propelled one. In the instances we have given we have said nothing about insurance. This, of course, is a factor depending upon local conditions. Neither have we considered the question of gradients. This also is a local question, and an important one, too. A hilly district might imply the use of a more powerful motor, which would exceed the limit of economy.

G. H. L.

MESSRS. THORNYCROFT'S NEW AUTOMOTOR BOILER.

The object of this invention has been to produce a light, compact, and efficient steam generator such as may be advantageously employed in motor-propelled vehicles or for other purposes. A generator according thereto comprises upper and lower annular chambers connected by water-tubes arranged to form walls of a fire-box adapted to be supplied with fuel through an opening bounded by the upper annular chamber, which opening is furnished with a suitable fire door, and a fire grate being located with its upper surface above the lower annular chamber, below which there is a casing or chamber furnished with a removable ash pan; the flame and products of combustion from the burning fuel on the grate ascend within the fire-box, then proceed laterally through openings left for the purpose between the upper portions of the water tubes of the inner row, then descend between the inner and outer rows of tubes and pass out through spaces left for the purpose between the lower portions of the water tubes of the outer row and thence into a space between the outer row of tubes and an external casing which is or may be in communication with the chamber of an exhausting fan whereby the gaseous products are caused to pass, it may be, into an uptake, or it may be into a funnel or passage leading either to the external atmosphere or elsewhere. The lower side of the upper annular chamber and the upper side of the lower annular chamber constitute tube plates, and the alternate tubes of each row are bent so that their respective ends are at a greater distance radially from the vertical axis of the fire-box than the corresponding ends of the tubes juxtaposed to them. This arrangement obviates excessive weakening of the tube plates by forming the holes therethrough unduly close to one another; it also provides the openings where necessary for the passage of the hot gases between the tubes. Where the gases are not to pass through openings formed in the manner described, rings are provided which form closures to the openings in question. In communication with the upper annular chamber there may be provided a steam dome and separator comprising a vertical steam pipe that is in communication with the steam space of the annular chamber, and has arranged centrally within it a relatively small open-ended pipe, the lower end of which is below the level of the water in the upper annular chamber. This small pipe is perforated at intervals of its length and has attached to it a corresponding number of separating devices, each comprising a lower funnel or cup-shaped part of less diameter than the steam pipe and adapted to conduct any water flowing into it towards one of the perforated parts of the central pipe and preferably provided with a separator of this kind of considerable height.

Referring to the accompanying illustrative drawings—

Fig. 1 shows in central vertical section a steam generator according to this invention.

Fig. 2 shows a plan of the generator, partly in section.

Figs. 3 and 4 are a vertical section and a plan respectively of a steam dome and separator, and Fig. 5 is a developed face-view of the upper part.

The upper annular steam and water chamber is represented as being constructed of two main parts, namely, an annular part, 1, of U section with outward flanges, 2, which may be of cast metal or may be of pressed steel, and an annular tube plate, 3

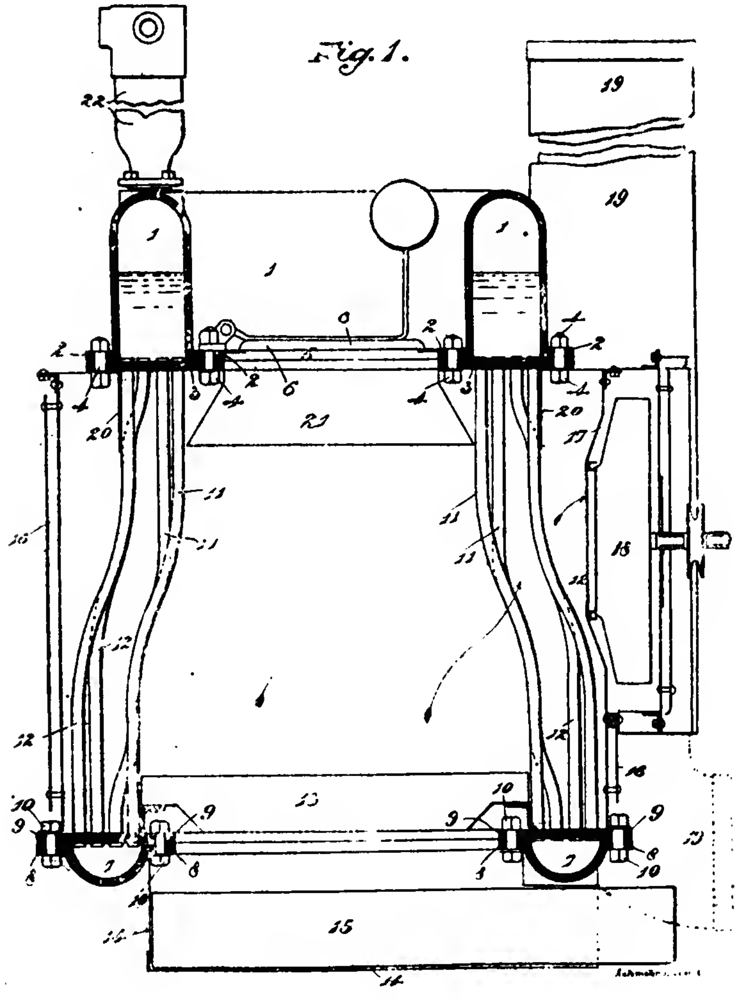


Fig. 1.

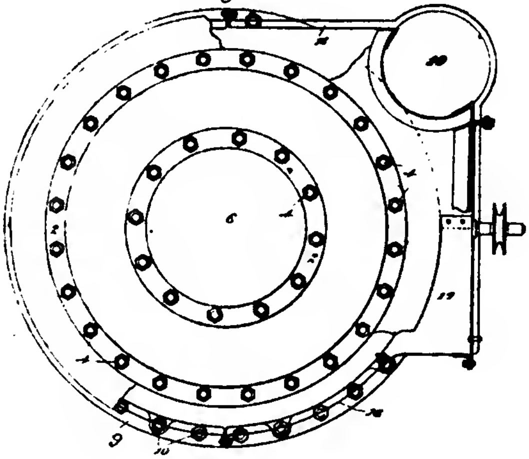


Fig. 2.

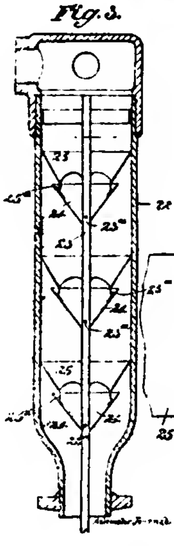


Fig. 3.

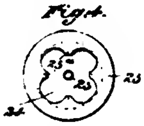


Fig. 4.

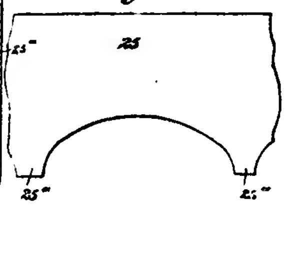


Fig. 6.

an upper truncated cone-shaped part, the upper edge of which is in contact with the wall of the steam pipe and the lower edge of which is somewhat above and of less diameter than the upper edge of the lower part; the upper part is supported on the lower by legs preferably so formed as to form guides down which the water flows. With this arrangement the steam and water is deflected by the lower part of each separating device against the wall of the steam pipe and the back or outside of the upper part, the steam passing under the lower edge of the latter, whilst the separated water flows down the back of the upper part into the lower part, whence it passes through the perforations into the central pipe back to the water space of the upper annular chamber. For use on a vehicle the generator is to which the part, 1, is connected by bolts, 4, passing through its flanges; 5 is the opening through which fuel is fed, and 6 the fire door, which is counter-weighted, so that it will remain open without being held.

The lower annular water chamber resembles the upper annular chamber, but is much shallower, and comprises an annular part, 7, of U or channel section, with flanges, 8, and an annular tube plate, 9, these being secured together by bolts, 10.

The upper and lower annular chambers are connected by water tubes, 11 and 12, the construction and arrangement of which will be understood from the description already given, aided by reference to the drawings.

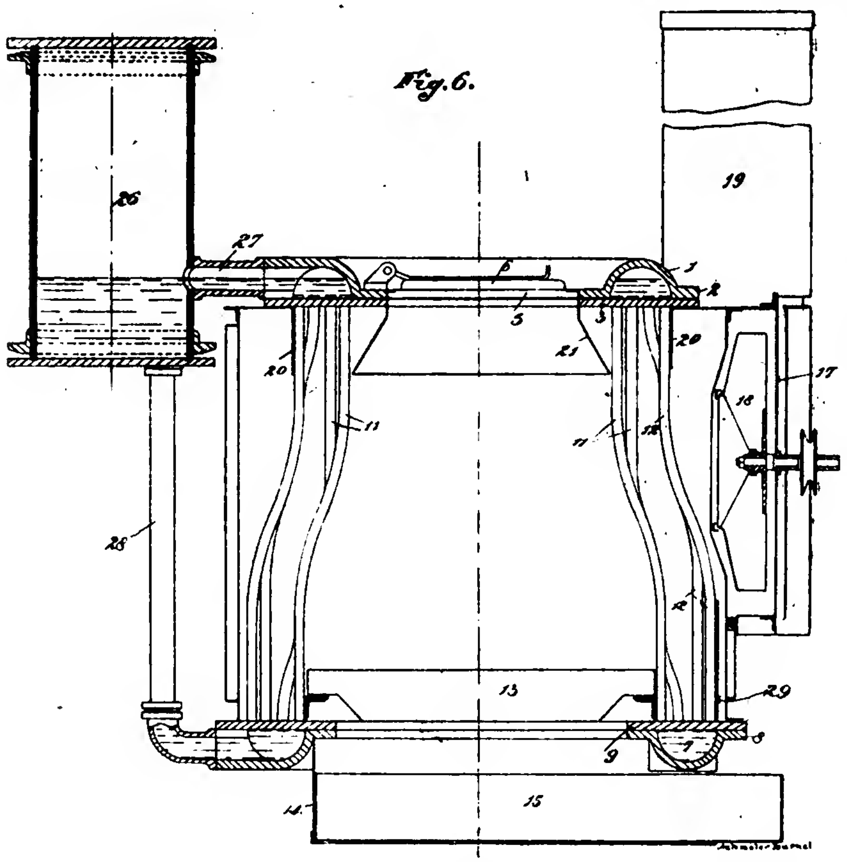
In the example the tubes, 11, constitute the inner row, and the tubes, 12, the outer row, but there might be more rows; 13 is the fire grate, and 14 the chamber or casing below it; 15 is the movable ash pan; 16 is the outer casing of the generator; 17 the fan casing; 18 the fan, whose blades are or may be, as represented, straight and radial, so as to have an exhausting action whether driven backwards or forwards; 19 is the funnel, which may be connected to the fan casing in full lines in Fig. 1, or the fan may discharge the products of combustion downwardly into a passage or flue as indicated by dotted lines. The course of the products of combustion is indicated by arrows; they ascend to the upper part of the firebox, pass outward radially through the spaces between the upper parts of the tubes, 11, then descend through the space between the two rows of tubes, from the bottom of which they again pass outward radially through the spaces between the lower parts of the tubes, 12, into the space between them and the casing, 16, whence they pass to the funnel or flue. If a fan be employed, as in the example, which is necessary when the funnel cannot be made high enough to create sufficient draught, the products of combustion are drawn through the fan casing and discharged either into a funnel or downwardly to a flue; 20 is a ring arranged opposite to those portions of the tubes of a row between which there are openings through which the passage of hot gases is to be prevented. In the case of a boiler with more than two rows of tubes other rings, 20, would be provided where necessary; 21 is a baffle plate for preventing the flame coming directly into contact with the tube plate, 3.

22 is the steam pipe forming a steam dome and containing a central open-ended pipe, 23 (*see* Figs. 3 and 4) (which may be of larger diameter than the drawings indicate); it is perforated at 23ᵃ; to it are attached separating devices, each comprising a lower part, 24, and an upper part, 25, that is formed with legs, 25ᵃ, and has the portions of its lower edge that are between the legs suitably curved (*see* Fig. 5), for the purpose of causing the separated water to flow towards and down the said legs, thereby leaving a free passage for the separated steam and obviating liability of the steam and water to become again mixed. The legs, 25ᵃ, may, if desired, be formed with external grooves, which serve as channels for the water.

The fire bars may with advantage be riveted together in separate groups, so that when it is necessary to clean the fire the central group can be removed, by pulling it out with a firing tool, and the clinkered fire be pushed through the opening thus formed in the grate and allowed to fall into the ash-pan.

Fig. 6 is a view, corresponding to Fig. 1, of a modified construction of generator, in which the capacity of the upper steam and water chamber is comparatively small, and a steam and water cylinder or drum, 26, in connection therewith, is provided. It is in communication through a pipe, 27, with the steam and water chamber, and through a downtake tube, 28, with the lower annular water chamber. In this case a steam separator may be dispensed with, steam being led away from the upper part of the cylinder or drum, 26. In order to ensure as far as possible that the passage of the products of combustion shall take place evenly around the fire-box and not by a short course to the fan or chimney, a plate, such as 29, Fig. 6, may be arranged to extend partly along the outer row of tubes.

Fig. 6.



The following claims are made in the Patent, which is numbered 8326 of 1897:—

(1) A steam generator in which an upper annular combined steam and water space, with steam dome and annular tube plate, opening for feeding fuel, fire door and baffle, a lower annular water chamber with tube plate, connecting walls of water tubes, a fire grate, a chamber or casing below it, an ash pan, an outer casing and hot gas arresting ring or rings, are constructed, combined and relatively arranged substantially as hereinbefore described and illustrated in the accompanying drawings, whether a funnel or fan arranged in a suitable casing be employed for producing the requisite draught, as set forth.

(2) The improved steam generator shown in and described with reference to Fig. 6 of the accompanying drawings.

(3) A steam generator of the kind referred to in Claim 1, provided with combined steam dome and separator, substantially such as hereinbefore described and illustrated more particularly in Figs. 3, 4, and 5 of the drawings.

AT a recent meeting of the directors of the Midland Cycle and Motor-Car Exhibition Company (Limited), it was decided to hold the second show in Bingley Hall, Birmingham, from January 20th to January 29th, 1898. The management intends making great efforts to gather together a goodly number of motor vehicles and thereby make this exhibition a bigger success, if possible, even than last year.

THE motor-car is an accomplished fact in the streets of London, but why have the builders designed the cabs on the pattern of the abominable four-wheeler? Originality is certainly not the quality of our times. Before long, now that Englishmen have taken the first step which they are invariably so slow to take, a multitude of private motor-carriages will come upon the streets, for the saving as regards horses and the keep of horses must be considerable. For whom is reserved the distinction of being the first to attend a Drawing Room in a motor-carriage?—*Graphic.*

SIR CHAS. DANCE'S STEAM CARRIAGES, 1831.

IN view of the present development of automobilism, and having regard to the recent French trials and the report thereon by the Self-Propelled Traffic Association, the following article by Mr. W. Fletcher, the well-known writer on horseless traction, and which appeared in the *Mechanical World*, on November 22nd, 1895, will be of interest :—

We purpose in this article, says Mr. Fletcher, to chronicle Sir Charles W. Dance's achievements with steam carriages on common roads more than 60 years ago.

In 1830 Sir Charles Dance ordered three steam drags of Mr. Gurney. These locomotives were completed and ready for the road at the beginuing of the following year. The engines made to Sir Charles's order were very different machines to those that Mr. Gurney constructed for his own experimental purposes.* In all cases Gurney made his steam carriages self-contained—the coach, the engine, the boiler, and the rest of the apparatus were all mounted upon the same frame and travelling wheels.

The steam drags made for Sir Charles Dance are shown in Figs. 1 and 2. From these illustrations it will be seen that the double-cylinder engine was placed under the body of the machine, and acted direct on to the cranked hind axle. The slide valves were actuated by eccentrics, and the steam pressure employed was 70 lbs. per square inch. One writer of that period, when referring to the question of separate steam drags, said : "When steam conveyances become the regular means of inland communication we may expect the public to prefer travelling by a distinct carriage attached to the steamer, and to seek for the greatest expedition which may be maintained with safety and economy." The owners of such conveyances can more readily carry a greater number of passengers. The coach can be varied in size, but the steam drag must all be of one size and pattern, which is a matter of great moment where repairs are requisite.

In February, 1831, Sir Charles Dance commenced running a steam carriage between Gloucester and Cheltenham, and continued to do so daily for several months, with a fair amount of success and regularity. There were three drags employed, which ran between the places named four times a day for four months, from February 21st to June 22nd, 1831, during which time they conveyed nearly 3,000 passengers, and travelled about 4,000 miles. They performed the distance (nine miles) in from 40 to 50 minutes. There were sometimes delays owing to defective tubes in the boiler, which prolonged the time, but no accident or injury ever happened to any person whatever ; the engines were never out of order, and showed little signs of wear. Sir Charles Dance said : "Steam carriages can be worked profitably so as to carry passengers for one-half the price at present charged by horse coaches." Obstacles are generally thrown in the way of a new invention, particularly if it is likely to produce important results and affect the interests of some individuals by its success. Many objections were raised by many classes of people. Some persons said the steam carriages would injure agriculture, destroy the roads, and that removing horses would ruin the farmers. To which Sir Charles replied that "the land which is used to keep one horse would keep eight people, and, consequently, that the removal of 1,000 horses would feed 8,000 people ; that the cheap and expeditious mode of conveying passengers and carrying everything to market would tend to the welfare of all classes." The trustees of the Cheltenham and Gloucester road were urged by steam carriage opponents to concoct such measures as would put an end to the running of the steam road conveyances. In compliance with this request, large heaps of stones were laid across the road about four miles from Gloucester, 18 inches deep. The steam-carriage passed over these twice with considerable difficulty. The steamer was, in consequence of this obstruction, 80 minutes in making the journey from Cheltenham to Gloucester with 17 passengers. In crossing the stones the third time, with 16 passengess behind, the axle of the drag was broken. Not only were the steam

FIG. 1.

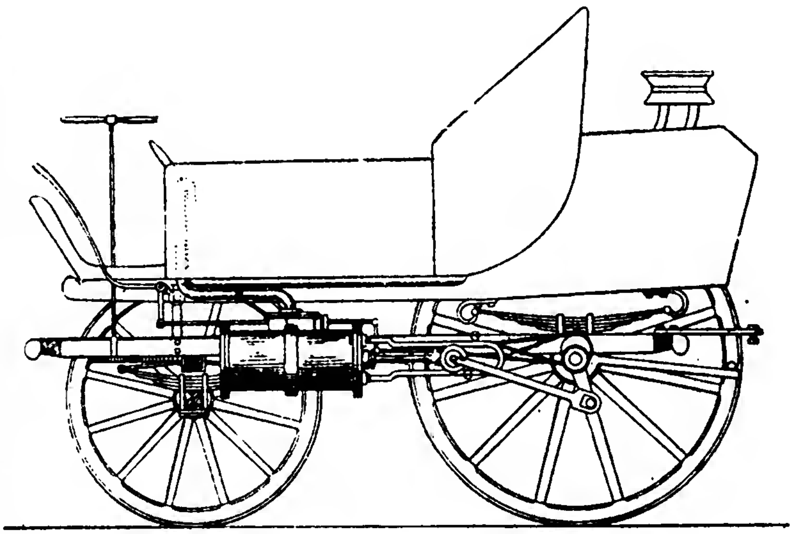


FIG. 2.

carriages delayed and injured by this deliberate and hostile proceeding, but the horse-drawn coaches were stopped in the stones, the mail coach was delayed, and a fine four-horsed coach was brought up, and, in whipping to get through, broke the harness. In the meantime a number of turnpike bills were rushed through Parliament granting tolls upon steam carriages, which were intended to be a complete prohibition ; and the Cheltenham Trust was one of the number. Sir Charles Dance relinquished the steam carriage business in that part of the country, and took his carriages to London.

In Gordon's work on locomotion a tabular account is given of the 315 journeys made by the carriages between Gloucester and Cheltenham, which we have not space to print.

The disappointment to Sir Charles occasioned by an ignorant

* Two of Gurney's steam coaches are illustrated in "Steam on Common Roads," by W. Fletcher. (London : E. and F. N. Spon.)

and prejudiced party who had opposed him in every way, was sufficient reason for his retirement from the field for some time.

In April, 1832, he patented a boiler consisting of coils of drawn iron tubing placed above the fire in a horizontal direction. The firebars were also formed of tubes; the ends of the tubes were joined to a water space placed all round the fire. The method of obtaining a good circulation of the water in the tubes is explained in the Patent Specification.

In 1833, Sir Charles Dance sent one of his steam carriages to Messrs. Maudslay, Sons, and Field's works to be altered, and as Gurney's boiler was about the only mechanical trouble he had to encounter, we are not surprised to find another boiler patented in August, 1833, by Sir Charles Dance and Joshua Field. This new boiler was composed of 30 sets of tubes enclosed within a wagon-headed boiler having a short vertical chimney. The lower portions of the water loops are horizontal, and form the bars whereon the fuel is laid. The tubes are suitably bent for forming the sides of the fireplace, and crossing in an inclined position above the fire, the products of combustion pass through the spaces between the tubes in their exit to the chimney. Each pipe opens at its upper and lower ends into horizontal tubes, and the water in the bent pipes has free communication throughout the series.

After the new boiler had been fitted to the steam drag, and the engine altered in some minor particulars by Messrs. Maudslay and Co., a short experimental run was accomplished at the rate of 16 miles an hour on September 18th, 1833. A trip to Brighton and back was afterwards undertaken. The outward journey of 52 miles took about 5¼ hours. The return journey was run in less than five hours. The following persons rode in the coach:—Sir Charles Dance, Mr. Field, Mr. Maudslay, Mr. A. Gordon, Mr. Carpmael, five other friends of Sir Charles Dance, Mr. Ricardo, and Mr. Busby; other individuals were taken up and put down on the road. In October, 1833, several other runs were made at 11 miles an hour. An improved locomotive and carriage were put upon the road between Wellington Street, Waterloo Bridge, and Greenwich, where they continued to run for a fortnight, with a view of showing the public in London what could be done. There was never any intention on the part of the owner of making it a permanent mode of conveyance, and therefore he kept the company select by charging half-a-crown for tickets each way.

Several engineers were anxious to have the carriage tried on the Holyhead line of turnpike road to Birmingham. The following report was the consequence:—

Report of the Result of an Experimental Journey upon a Mail-Coach Line of the Holyhead Road, in Sir Charles Dance's Steam Carriage, on November the 1*st*, 1833.

"Public attention having been attracted with the practicability of travelling with locomotive engines upon ordinary roads, by a report of a Committee of the House of Commons, 12th October, 1831, stating that, in the opinion of the Committee the practicability of such mode of travelling had been fully established, we were desirous of personally making an experiment of the facility with which a carriage of the above description could perform a journey of considerable length, and having selected the mail-coach line of the Holyhead road for the purpose of such experiment, we made an arrangement with Sir Charles Dance for the use of his steam carriage on the 1st November. Before the carriage had proceeded six miles one of the tubes of the boiler was found to leak so fast as to render repair necessary. It was also apparent that the size of the engine was not sufficient to carry so great a weight along a heavy road at any high velocity.

"The weather was by no means favourable, there having been much rain, so as to make the road heavy, added to which the winter coating of new materials had in many places been laid upon the road. Notwithstanding these obstacles, upon our arrival at Stony Stratford, 52½ miles from town, the average rate of travelling had been seven miles an hour. There can be no doubt that with a well-constructed engine of greater power, a steam carriage conveyance between London and Birmingham at a velocity *unattainable by horses*, and limited only by safety, might be undertaken with great advantage to the public, more particularly if, as might obviously be the case, without interfering with the general use of the road, a portion of it were to be prepared and kept in a state most suitable for travelling in locomotive steam carriages. Signed by eleven engineers, six of whom were Thomas Telford, President of the Institution of Civil Engineers; Bryan Donkin, Timothy Bramah, Joshua Field, Alexander Gordon, Wm. Carpmael. London, November 1833."

We may add a few particulars. The drag had two cylinders 7 inches in diameter and 16-inch stroke. The boiler pressure was 100 lbs. per square inch. The weight of the drag was 3 tons 5 cwt. The omnibus and load weighed 2 tons 15 cwt., making the total load 6 tons.

After the trial on the Holyhead road Sir Charles Dance and his carriages appear to have vanished. We have no tidings of any work done later than 1834. With such a heavy engine and coach the wonder is that Sir Charles succeeded in running at 11 miles an hour. Their great weight must have interfered in many ways with a longer and more successful career.

THE NEW FRENCH REGULATIONS FOR AUTOMOTORS.

The Prefect of Police for Seine, M. Lépine, has recently signed an ordinance regulating the circulation of automobiles in the Seine Department. The document examines "the use, on the public way, of vehicles worked by motor power, and also of those which are used for the making of railroads."

Section I.

Art. 1.—No vehicle worked by motor power or those which are used for making railroads can be set or maintained in use without our authority, which the owner must ask for. The owner must understand that this authority can be cancelled at any time on the motion of the engineers.

Art. 2.—This authority will be written out on a stamped paper. It is worded thus:—

1st. The principal dimensions and weight of the vehicle, the weight of the luggage, and the maximum charge per axle.
2nd. Description of the motor system, the materials for working it must be specified, conditions for use, definition of the appliances for stopping and warning.
3rd. The names and residences of the constructors of the vehicle, its motor machinery, and its appliances for stoppage.
4th. The proofs and verifications of the persons who have constructed and examined it.
5th. Its number (vehicles made by the same firm should have a special numbering for this firm and stating each machine clearly).
6th. The use to which it is to be put.
7th. The public ways on which it will run.
8th. The name of its depôt or where it is kept.

The application must be accompanied by complete drawings of the vehicle, of the motor system, and the machinery for operating the brakes.

Art. 3.—This application must be sent to the chief engineer, who inspects steam machinery for the Seine Department. He will himself inspect the vehicle thoroughly, so as to be quite satisfied, according to Section II, that there will be no danger in using it. He will have several experiments made to test the working of the motor and to verify the efficacy of the brakes.

Art. 4.—The authority will be set forth on a special certificate worded like the present document. Special instructions for heavy carriages (3,000 or 4,000 kilos.) will be added, if necessary.

Art. 6.—The authority will also fix the maximum speed for in Paris and outside, especially paying regard to the means for stopping. This maximum speed will not exceed 12 kilometres per hour in Paris and in peopled thoroughfares; it can rise to

20 kilometres in open country, but the latter maximum will only be allowed on straight, level, broad roads, which are little frequented. These maximums cannot be surpassed, but the driver of the vehicle may reduce the speeds of the above maximums at any time when circumstances require it.

Art. 7.—In case of a change of ownership, of non-execution of proofs or verifications prescribed by the regulations, the authority is voided, and the vehicle cannot be maintained in use without a new authorisation.

SECTION II.—*Dispositions relating to the Machinery.*

Under this clause are grouped some articles relating to safeguards which ought to be made on the vehicles :—To ensure stoppage of the motor in case of accident ; facility for working the machinery and directing it ; existence of two independent checks, kept in a good condition. Permission will be granted for periodical alterations, and for the necessary verifications to effectuate this. The periodical alterations and repairs to be noticed will be inscribed in detail on the certificate specified in Art. 4.

Art. 17.—Every vehicle worked by motor power must have a metal plate, on which must be written in legible letters the name and residence of its owner and the number accorded by the authority. This plate should be placed on the left side of the vehicle, and must not be covered up.

SECTION III.—*Regulations relating to the Keeping and the Working of Carriages.*

Art. 18.—No one will be allowed to keep a vehicle worked by motor machinery specified by the present document if he does not possess a certificate for competency issued by us to that effect, and stating the kind of motor-vehicle. No one of 21 years of age or under will be allowed a certificate. The candidate must produce his certificate of birth and two photographs (each photograph must be 2 centimetres broad and 3 centimetres long), also an authentic certificate of residence. One of these photographs will be annexed to the certificate. Every candidate must show a proof to the chief engineer or his delegate (1) that he possesses the necessary experience for the prompt and sure use of the machinery in motion and at rest, and for the direction of the vehicle ; (2) that he is capable of knowing if all the machinery is in a good condition, and of taking every precaution against explosions and other accidents; (3) that he could, if necessary, repair a slight damage while travelling.

The certificates thus delivered are revocable. For vehicles worked by steam these certificates take the place of those set forth in Art. 12 in the document of January 3rd, 1888, referring to the working of steam machinery on the public way.

The driver of the vehicle must conform to some of the regulations which regulate the drivers of horse-carriages, especially those relating to the precautions to be observed when in motion and at rest ; to keep to the right, &c. ; to go slowly in crowded thoroughfares ; to be provided with a horn or trumpet. Vehicles should also have bells. Vehicles are not allowed to remain stationary on the public way. A vehicle worked by motor machinery will not be allowed to tow other carriages.

In case of accident to persons—a notable material accident or explosion—the owner of the vehicle or the driver must immediately inform us and the Commissioner of the Police. The damaged machinery and its fragments can only be displaced by major force, or by permission of the Commissioner of the Police, before the close of the inquests.

SECTION IV.—*General Regulations.*

Art. 32.—Vehicles worked by motor power should have everything that is applicable to them submitted (1) to the dispositions of the laws and regulations specified in Sections I and III in the decree of the 10th August, 1852 ; (2) if the motor is a steam motor, to the dispositions of the laws and regulations on steam machinery in the decree of the 30th April, 1880, and the document of the Prefect of the Police of January 3rd, 1888 ; also to the Articles 14 and 15 of this document.

Such are the principal prescriptions of this document, which at present only applies to the Seine Department. The Minister of the Public Works can make it a general rule for all France.

REPORT OF THE SELF-PROPELLED TRAFFIC ASSOCIATION ON THE FRENCH TRIALS.

THIS report only came to hand on the eve of the publication of our last number, and hence we had not time to examine it critically. Having since had the opportunity we may say at once that on the whole it is a fair and unprejudiced account of what occurred at the trials, and many of its conclusions will very generally be concurred in. The deputation that attended the trials on behalf of the Liverpool branch of the S.P.T.A. included a well-known engineer and naval architect, who, from his long connection with the construction and classification of shipping, was not likely to be impressed with machinery of any sort that was not solidly and substantially built. After giving a "log" of the performances of the various motors, the report discusses De Dion and Bouton's system. Speaking of the boiler it says :—

It appeared to be a good practical boiler and, considering its small capacity for water, the feed-service was kept well under control. The feed-water tanks hold about 100 gallons.

and of the engine :—

A horizontal compound engine is used, and provision is made for the admission of high-pressure steam to the low-pressure cylinder, for hill-climbing and emergencies. The gearing consists of spur wheels, two ratios, which may be applied as the work to be done requires, being provided. The rear road-wheels run loose on the axle, each being driven by means of four steel arms which extend from the axle and are secured to four of the spokes at points about mid way between the boss and the rim of the wheel.

The consumption of coke and water was :—

Coke	7·6 lbs. per mile.
Water	4·4 gals. „

The tare of the omnibus is 4 tons.

The De Dion and Bouton system, whilst exceedingly ingenious, is, in our opinion, open to the practical objection that it would require a skilled attendant and an assistant for each motor. The attention of the driver is so much absorbed with the control of the machine that, unless he had another man with him on the look-out and to sound the alarm-signal, especially in crowded thoroughfares, we think it would be difficult to secure safe driving.

As regards the prices of these vehicles they are stated as being £580 for the tractor, No. 13, and £880 for the omnibus, No. 14, at works. The report then deals with the Scotte system. After describing the machinery the report continues :—

The three Scotte vehicles (Nos. 1, 2, and 3) ran throughout the trials with good results and remarkable regularity, but the remarks as to the necessity for a skilled attendant and an assistant apply to this system as much as to that of De Dion and Bouton.

Omnibus No. 1 returned the following consumption over Course C :—

Coke	13·0 lbs. per mile.
Water	9·8 gals. „
Price of motor-wagon	£380 at works, Paris.
„ trail-wagon	60 „ „

Speaking of the other motors the report says :—

All the machines exhibited very great ingenuity of design and construction, one of the most interesting being Panhard and Levassor's Omnibus (No. 10). This vehicle is fitted with a four-cylinder vertical oil-engine carried in front under the box seat. The crank and counter-shafts are longitudinal with four sets of spur-wheels for variable speed, motion being imparted by a bevel-wheel to a transverse shaft which carries the compensating gear and sprocket-wheels for driving the rear road wheels by link chains. This vehicle consumes only about 1½ pints of petroleum spirit (0·680 S.G.) per mile but, in common with all oil-motored carriages, has the serious disadvantage of very considerable vibration when standing or running at a low rate of speed.

It was an instruction to the deputation to inspect the Paris tramways, and the next part of the report is occupied with a description of the Serpollet system. We reproduce this elsewhere. Passing on to the conclusions, the report says :—

Reviewing the numerous systems and vehicles that came under our notice, we are of opinion that—

1. Scotte's and De Dion's vehicles are the only ones we saw capable of dealing with loads such as we in Liverpool require to move.
2. Serpollet's system has been admirably worked out for tramcars, but, owing to the demand for these, not much has yet been achieved in its application to ordinary road vehicles.

3. Oil-engines (internal combustion), using petroleum spirit, are developed to a high degree of lightness and economy for pleasure carriages and vehicles of a small gross weight.
4. There can be no doubt as to the popular feeling in France, where the liveliest interest is evinced in all matters appertaining to automotors, but it is more from the point of view of pleasure-seekers with a novelty than of business men with work to do. At the same time, the practical carrying aspect of the question is attracting attention, and efforts are being made to produce vehicles for the transport of goods. No thoroughly satisfactory vehicle for really heavy traffic was, however, produced at these trials.
5. As our investigations appear to show that no heavy vehicle in France has yet reached such a stage of development as to be suitable for the requirements of this district, we are of opinion that the public trials which the Association proposes to hold next spring should be proceeded with, in order to ascertain the actual position of English effort to produce self-propelled vehicles for heavy traffic on common roads.
6. As now constructed, neither Scotte's nor De Dion's vehicles would be of any use in this country, owing to the tare weights being in excess of those allowed under the provisions of the Locomotives on Highways Act, 1896. These machines unquestionably have in them the elements of practical success.
7. Whilst our conclusions are not entirely favourable to the motor-wagons put forward on this occasion for the transport of heavy goods, there is no doubt that Scotte's and De Dion's systems are efficient and economical for passenger services, and that Serpollet's tramcar system is a proved success.

It will be observed that the report, in discussing the De Dion and Scotte systems, condemned these motors because each "would require a skilled attendant and an assistant." Yet conclusion No. 1 admits that these are the only ones the deputation saw capable of doing such work as is required in Liverpool. Admitting for the moment that a "skilled" (*sic*) attendant is necessary, is it a logical and economical proposition to advance, viz., that because by this machine economical transport is effected, yet it must not be used because it requires a skilled attendant? The fact is that far too much stress is put upon the question of skilled attendance, and to pine after the ideal motor which can be handled by a person devoid of any skill is like sighing after the Elysian Fields. What is meant by a "skilled attendant"? Skill is required to work a sewing machine, a quick-firing gun, an automobile torpedo, or a coster's barrow. The amount of intelligence required to work a steam boiler is really very little, especially when there is trained supervision. Sometimes the driver of an express locomotive is termed a skilled man, but given ordinary intelligence and the least mechanical perception and a Chinese coolie or a half-caste nigger is as good on the foot-plate as anyone. If this assertion is questioned, it is only necessary to mention that in Central Africa, and America, in the East Indies the drivers of the automotors, whether these be steam launches, locomotives, or agricultural machines, are "natives," who have merely natural common-sense to guide them. Again, consider the large fleets of fishing automotors, *i.e.*, the steam trawlers; the boilers and engines of these vessels are handled by the least trained (in a mechanical sense) of our workers. A fisher-lad, with absolutely no mechanical training whatever, will get up steam, handle the winch, and maintain the feed with no other instruction than that which he gets by knowing that he has got to do it. We must protest against this bogey of the skilled attendant. In such machinery as torpedo-boat engines and boilers, skill in firing and handling is unquestionably necessary, but agricultural labourers find no difficulty in managing portable engines and boilers, and we cannot admit that anything more than a fair share of ordinary common-sense and clear-headedness is required of the driver of an automotor carriage. As touching upon this question of skill, the report mentions that in Paris an ordinary driver is entrusted with a Serpollet car after a week's teaching by one of his mates. For the report, then, to condemn the De Dion and Scotte motors because of the skilled attendant seems to us hardly logical.

After having expressed itself as it has on the merits and objections to the De Dion and Scotte systems the report says in paragraph 5:—"No thoroughly satisfactory vehicle for really heavy traffic was, however, produced at these trials." If satisfaction is dependent upon the amount of weight moved at a certain speed and with the expenditure of a certain amount of energy, then we think the conclusion arrived at is not a sound one, as it is at variance with facts. Both these motors have abundantly demonstrated their ability to handle heavy loads with great economy. If, however, satisfaction hinges upon the skilled attendant the conclusion is also erroneous, because as we have shown the skill required is of an exceedingly elementary kind. Certainly the attendants at Versailles were skilled mechanics, and as we remarked in our last issue, not a little of the success was due to their efforts, but we saw nothing about any of the steam motors that would deter us from entrusting them to any intelligent ploughman or fisherman. We would remark that to be a good ploughman or fisherman requires good intelligence and skill, but we have yet to learn that a steam motor-car requires skill of a superior degree.

As showing that our criticisms are shared by others, we requested two eminent engineers, both ardent automobilists, to express their opinion on the report before us; the one cordially endorses every word of it, and the other writes:—"I do not agree with the conclusion (No. 4). It is too general . . . . . . that they will not do for the Liverpool requirements I quite agree, but is it desirable that the denunciation of the vehicles 'for really heavy traffic' should have been accompanied by the admission that for loads of from 3 to 5 tons, or at all events 3 to 4½ tons, motor-wagons were exhibited by Scotte, which are of a really useful and practical kind. Of course they are susceptible of improvement, if it be only the means required for making a gear case possible, but even as they are, they would in many cases conduct a traffic at a cost considerably under that for horses."

With the other conclusion we quite agree, and we hope that the Self-Propelled Traffic Association will by next spring succeed in evolving the "really satisfactory motor."

SOUTHALL'S PATENT "IDEAL" OIL-ENGINES.

Among the many varieties of oil-motors few can compare with the Southall for simplicity in design and efficiency in action. This motor, which we illustrate, is made by Messrs. Hardy and Podmore (Limited), of Worcester Foundry, Worcester. It is a heavy oil-motor, using ordinary lamp oil, a fact which will at once commend it to automobilists, and works on the Otto cycle. No spirit is either required for starting, which is another good point in its favour. These motors start easily and with certainty, have no pumps or other fine parts, and are thus specially suitable for use by ordinary unskilled persons. The chief features in them are:—

1st. The patent wick feed, giving an absolutely regular supply, not of liquid oil but of oil-gas or very fine oil-spray.
2nd. The ignition of the charges by a piece of metal isolated by non-conducting material, which, after the engine has run a few minutes, becomes heated to a higher temperature than the rest of the engine, thus allowing the vaporiser to remain at a lower temperature than would be practicable if its heat had to perform the ignitions.

Referring to the accompanying drawings:—

Fig. 1 is a part longitudinal section.
Fig. 2, a back elevation.
Fig. 3, a back elevation of the wick.
Fig. 4, a part plan, explaining the governing.
Fig. 5, a part sectional elevation, explaining the governing.

To start the engine, fill the reservoir, A, with oil and screw down its inlet cap absolutely air-tight, then open the tap, B, which allows the oil to enter the trough, C, until it has reached the level of the inlet, at which level the oil in the trough, C, will automatically maintain itself.

See that the two stoppers, D and E, are removed, then having trimmed the lamp, F, with loose cotton waste saturated with petroleum, light it and by means of the fan provided for the purpose, blow same fiercely from four to six minutes.

This operation causes the flame to pass round an annular flue, G, formed round the vaporiser, L, heating it and at the

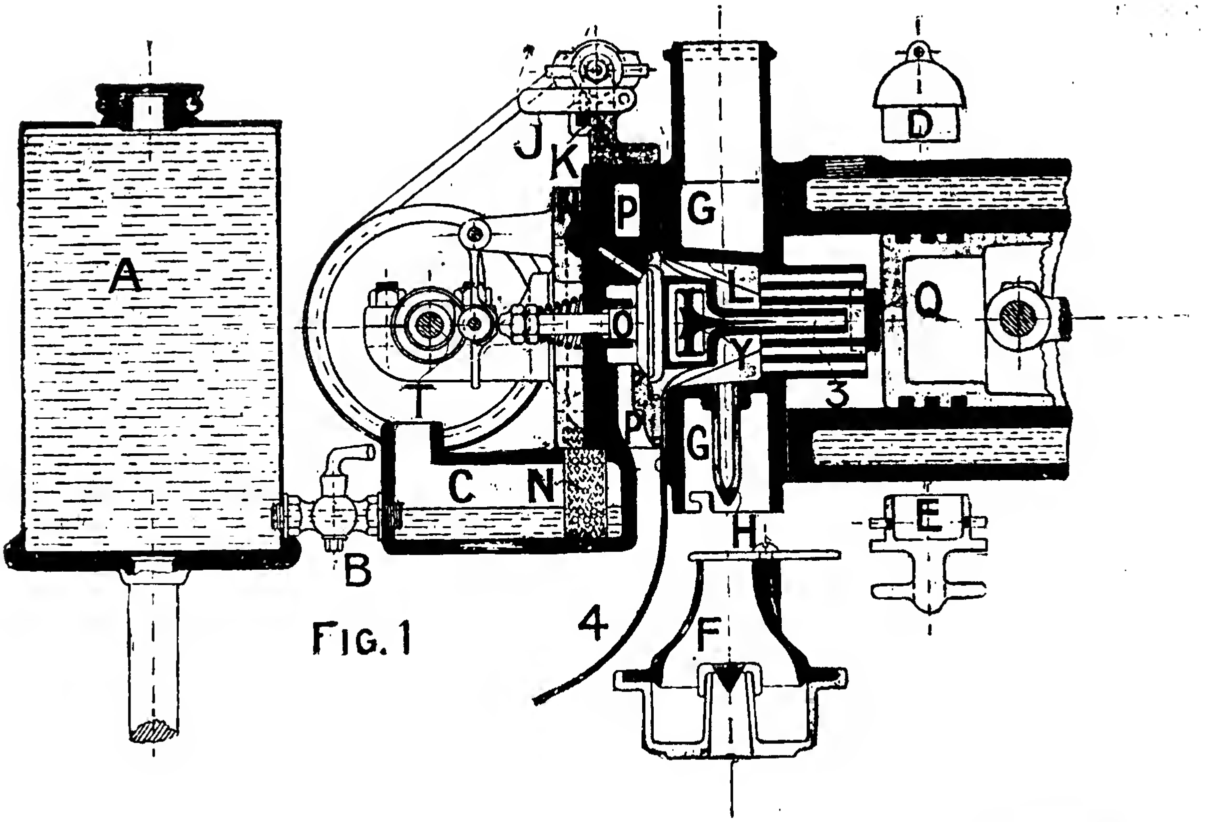


FIG. 1

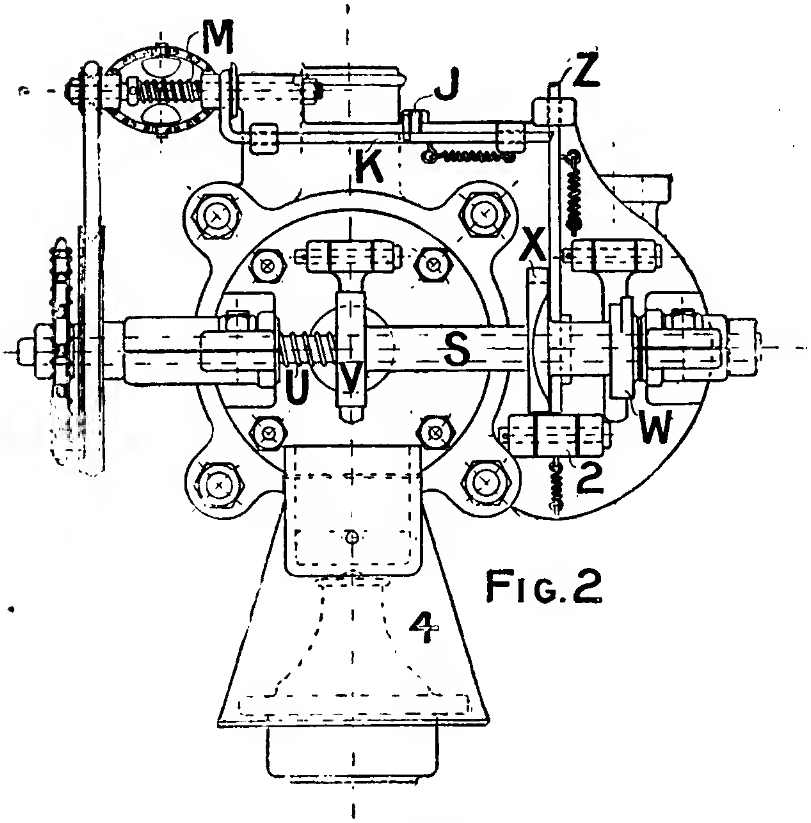


FIG. 2

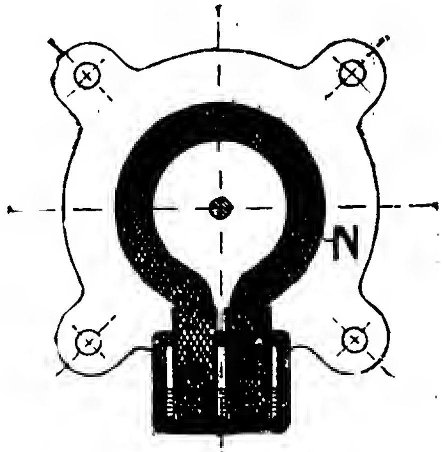
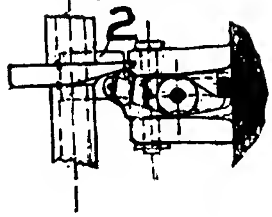


FIG. 3

FIG. 4

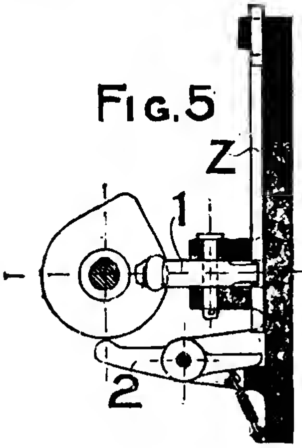


SECTIONAL VIEWS OF SOUTHALL'S PATENT "IDEAL OIL-ENGINE.

same time a tube, H, which serves to perform the ignitions for a short period at starting.

Whilst blowing see that the small lever, J, is turned down behind a small pin projecting upwards from the governor bar, K, as this puts the governor in continuous action and reduces the compression for starting. After blowing for the above period give the fly-wheel a few rapid turns, then throw the lever, J, up and ignitions will commence. Continue to operate the fan for a few minutes so as to get a good start, after which extinguish the lamp, F, closing the inlet and outlet of the flue, G, with the stoppers, D, E, the engine will then continue to run as long as there is any oil in the reservoir, A. The speed of the engine can be varied within considerable limits by simply putting the spring on the governor, M, in a state of greater or less compression. N is the wick serving to convey the oil from the trough, C, to the vaporiser, L. O is the supply valve controlling the simultaneous admission of air from the passage, P, and oil gas or fine spray from a number of rather long holes, R, connecting the wick, N, with the seat of the valve, O. Q is the exhaust port, controlled by a valve with which the supply valve, O, is operated by cams on a long sleeve, S, carried on and driven by a shaft, T, revolving in suitable bearings at half the speed of the crank shaft, the sleeve, S, being arranged

FIG. 5



Sectional View of Southall's Patent "Ideal" Oil-Engine.

on a feather key, so that when required it can be moved laterally along T, compressing a light spring, U. The cam, V, operates the supply valve, O, cam W the exhaust valve, and cam X, which has cams formed both on its edge and one side, assists in the governing of the engine, which is accomplished by entirely cutting off the charges when the engine exceeds the speed it is set to run at. The governor, M, which is driven from the shaft, T, when the engine exceeds its speed, draws over the bar, K, against the energy of a light spring allowing a spring-urged bar, Z, working in guides to descend into the path of the inner end of a short lever, 1, so pivoted that during the nominal working of the engine it rocks freely backwards and forwards, its outward end urged by a spring weaker than the spring, U, pressing lightly against and following the cam face on the side of the cam, X.

The lever, 1, when its inner end meets the bar, Z, is prevented from rocking, causing the sleeve, S, to move laterally along T, compressing the spring, U, the cam, V, thus misses lifting the supply valve, O, and a different face of the cam, W, acts on the exhaust valve in such a manner as to hold it open during the next out and instroke, thus preventing any suction from being exerted on the supply valve, O. The edge of the cam, X, comes into operation with each revolution of the shaft, T, causing a small lever, 2, to lift the bar, Z, up into its original position, where, if the speed of the engine has been sufficiently reduced, the bar, K, engages in it, holding it up and allowing the sleeve, S, to return by aid of the spring, U, laterally to its normal position, where the cams, V and W, will again perform their normal operations.

The igniter, Y, is a piece of pointed metal isolated in a box casting on non-conducting material, such as asbestos, and having an inlet pipe, 3, the length of which influences the moment of ignition. A baffle, 4, is provided to keep the lamp flame from the trough, C. On a suction stroke occurring, a charge of air and oil-gas or fine spray is drawn into the vaporiser and cylinder through the valve, O, forming an explosive charge which, when compressed, is ignited for a short period at starting by the tube, H, and afterwards by the extra hot piece of metal, Y.

SIGN-POSTS FOR AUTOMOBILISTS.

The Automobile Club of France is nothing if not thorough on all questions relating to automobilism. In order to assist travellers, tourists, and others, it has had erected at various points on the principal route sign-posts, one of which is shown in the accompanying illustration, and which is placed in the village of St. Maclou on the road to Trouville. Information of this kind is calculated to be a great service, especially in cases where fuel or water is running short or night coming on. Similar sign-posts might with advantage be placed on English roads by the county and municipal authorities, but notwithstanding their obvious utility we entertain little expectation of this being done, as it would encourage motor-cars and cyclists to use the roads!

A COVENTRY BOLLÉE.

Mr. T. Hyler-White, of Coventry, sends us an account of the performance of one of these excellent motors. The weight is about $3\frac{1}{2}$ cwt., and is of about $1\frac{1}{2}$ H.P. There are three speeds, viz., 5, 10, and 16 miles per hour. The cost of running is said to be $\frac{1}{4}d.$ per mile. A run was recently made from Coventry to Cheltenham and back, a distance of 116 miles, which was performed in $10\frac{1}{2}$ hours' actual time (including time for meals, &c.). This gives an average speed of a little over 11 miles, but of course the real average speed is much higher, being, we understand, 12·3 miles. The machine is remarkably easy to manage, the steering, starting, and stopping being absolutely controllable, while rough roads and hills are negotiated with no difficulty whatever.

Mr. Hyler-White concludes :—"For a light and handy pleasure vehicle the machine is almost all one could desire, though a little more room, to carry, say, a portmanteau, would be a useful addition. Luggage at present has to be carried on the front footboard."

METHODS OF OBTAINING MOTIVE POWER FOR MOTOR-CARRIAGES.

THE following is a free translation of an article on this question by M. Marcel Deprez, and which recently appeared in the *Génie Civil*:—

It seems at first sight that the only applicable force for automobile vehicles should be the petrol motor, but after looking more deeply into the question it is found that this is not so safe as it seems, and it will be seen in the course of this article that at present steam has great inherent advantages, and that it is of very great use to automobilism. Three years ago, at the first exhibition of automobile carriages, steam was beaten by petrol, and it has been up to the present day. This defeat of steam is very surprising, for it is both powerful and pliant, capable of towing at a speed of 120 kilometres on a level more than 150 tons.

Use of Metal and Indiarubber Springs.—Their "specific power" (*sic*) is really very small, metal springs store work at the rate of 20 kilogrammetres per kilogramme, and indiarubber springs 250 kilogrammetres per kilogramme.

Use of Compressed and Liquefied Gases.—There are special points to notice about compressed air, among these are cleanness and facility to set in motion, &c.; but in order to store a large amount of energy very heavy reservoirs are necessary.

Below is a tabular statement compiled by M. Barbet on the Mékarsky system:—

Particulars of the Compressed Air Locomotive.

Steel reservoirs.
Initial pressure of air: 60 atmospheres.
Elastic strength of the steel employed: 15 kilogrammes per square millimetre.
Weight of reservoir per kilogramme of air: 12 kilogrammes.
Theoretical work indicated by 1 kilogramme of air in the receiver: 20·765 kilogrammetres.
Theoretical efficiency per cent.: 0·65 per cent.
Practical „ „ 0·33 „
Weight of air at 45 atmospheres per kilogramme for a carriage of 12 tons: 12 kilogrammes.
The compressors of the Parisian Company for compressed air give 6·35 kilos. of compressed air at 49 atmospheres per H.P. hour. One kilogramme of air compressed to 45 atmospheres costs ·0072 franc.
The consumption of coal per H.P. hour of the automobile carriages running through the streets is 4·5 kilos.

It is thus seen that a kilogramme of compressed air at 45 atmospheres can supply a theoretical work equivalent to 20·765 kilogrammetres; this air ought really to be compressed in a reservoir to three times the density that it is, which would increase the disposable work per kilogramme of air to only 169·0 kilogrammetres, whilst a kilogramme of petrol would practically produce 750·000 kilogrammetres.

By this rendering it is seen that the necessary work for compressing a kilogramme of air to 45 atmospheres is 39·335 kilogrammetres, corresponding to a theoretical rendering of 65 per cent. M. Barbet admits a practical rendering of 50 per cent.; approximately the final rendering is equal to 33 per cent.

It has already been stated that compressed air to 45 atmospheres cost ·0072 franc per kilo. But following M. Barbet's system, the figure should be doubled in order to allow for fluctuations, for the interest and redeeming of the mortgaged capital; it is also necessary to reckon from the result thus obtained 30 per cent. for the work of lading, re-heating the air, and a possible increase in the initial pressure; therefore the price for a kilogramme of compressed air should be ·020 franc, or 20 francs per ton.

From data obtained on the different tramways worked on the Mékarsky system, the following results have been obtained for the weight of compressed air consumed per kilo-car to seat 10:—

	Kilogrammes.
Paris-Ville-Errard Line	10
St. Augustin-Vincennes Line	12·5
Nantes Tramway	7

This can be rated at the following expense per kilo-car:—

	Francs.
Compressed air	0·200
Fares....	0·074
Maintenance, oil, and coal....	0·071
Total	0·346

Lastly, the consumption of coal per kilo-car is 20 kilos. for a heavy carriage of 12 tons, which is equivalent to an initial consumption of 4·5 kilos. of coal by an automobile carriage per H.P. hour.

Finally, in order to solve this problem of mechanical traction, it will be noticed that compressed air is a very convenient source of power, but at the same time it is the dearest, and its specific power is very small.

Use of Liquefied Gases.—The amount of energy necessary for confining a liquefied gas is proportional to the quantity of heat required to liquefy it, but gases do not possess a heat for evaporation to be compared with water, which for this reason is much preferred for storing heat. Besides, as heat cannot produce so much work from a warm body as a cold, the allowance has to be continually raised, for heat cannot be transformed while working, and this can only be obtained by two methods: either by cooling, by means of a condenser, the gas or steam after having been used in the motor, or by discharging the gas or steam in the atmosphere, which is only allowable for water-steam and those gases from the combustion of coal or petrol. Consequently, not only do liquefied gases, like compressed gases, involve the use of very heavy reservoirs, but they are very inferior in every way to water for using in motors.

Use of Hot Water under Pressure.—This process consists of heating the water in a closed vessel to a temperature of 200° C., this corresponding to a pressure of 15 atmospheres; this storage reservoir supplies heat to a smaller boiler, the steam so produced passing into the cylinder, where it acts on the pistons. This steam is formed at the expense of stored heat in the water of the boiler, which thus serves as a heat reservoir. The temperature of water in the reservoir progressively decreases to 150°, whilst its pressure simultaneously decreases to 5 atmospheres. It can go below 150°; on the other hand it can rise above the initial pressure, 200°. But it is very difficult in this way to store more than 75 available calories per kilo. of water in the reservoir. The weight in kilogrammes of a steel reservoir of 1 cubic metre in capacity is given in the following formula, in which P represents the pressure, and F the stress per square millimetre.

$$W = \frac{P}{F} \times 16{\cdot}000.$$

In the following table are given the weights for reservoirs having a capacity of 1 metre cube for various pressures:—

Temperature of Water under Pressure.

—	200°	225°	250°	275°	300°
Absolute pressure in atmospheres	15	25	39	59	86
Actual pressure in atmospheres	14	24	34	58	85
Weight of reservoirs in kilos. ...	224	384	608	928	1,360
Quantity of heat in calories, in water above 150°	50·000	75·000	100·000	125·000	150·000
Quantity of heat in calories contained in metal	1·340	3·460	7·300	13·900	24·500
Quantity of total stored heat ...	51·340	78·460	107·300	133·900	174·500
Total weight in kilogrammes ...	1,224	1,384	1,608	1,928	2,360
Quantity of stored heat in kilogrammes	42	57	66·6	72	75
Energy practically available in kilos. for total weight, supposing that work is equal to 10 per cent. of stored heat ...	1,785	—	—	—	—

From the above data it will be seen that a kilogramme of total weight (water and reservoir) heated to an initial temperature of 250°, stores a quantity of work equal to $66\cdot6 \times 425 \times 0\cdot10 = 2\cdot830$ kilogrammetres.

The theoretical work stored in a kilogramme of total weight (reservoir and air) is equal to $\frac{20\cdot765}{12+1} = 1\cdot597$ kilogrammetres only. Hot water can store more work than compressed air, and the work thus stored by a unit of weight increases at first with temperature, then remains stationary, and finally decreases. But the special point to notice is that this way of storing energy, though possessing good qualities, is in certain respects the same as compressed air; for instance, very limited in power.

Lastly, it should be noticed that whereas superheated water can be produced from a simple boiler, compressed or liquefied gases require special machines, which are very dear and complicated.

Use of Chemical Actions; Combustion.—The chemical action which can produce, with equal weight, the most work is combustion. The calorific power of certain combustibles is very great; 8,000 calories for wood and coke, from 8,000 to 9,000 calories for oil, from 10,000 for petrol, and from 11,700 for acetylene; lastly, a cubic metre of gas gives in burning 5,500 calories. Coal possesses a very great specific power, for in burning, 1 kilogramme of coal can produce a number of calories which, being entirely changed in working, would at length be theoretically raised to 3,400 kilometres. Also, in spite of the considerable loss of work which is involved in its employment, coal must be considered as being destined to be used in everything worked by motor force; moreover, contrary to petrol, its production is unlimited, whereas that of petroleum is very limited and is only to be found in certain parts of the globe. The calorific work of coal in mechanical work is to impart the disengaged heat caused by its combustion to an intermediary body alternately heated and cooled.

Work of the Boiler.—The best boiler is the tubular, which possesses the great qualities of being light and economical. MM. Noze and Geoffroy have made experiments on a boiler of the locomotive type, the tubular part of which was divided into a certain number of compartments and which give the following results. The proofs mentioned in this table took place in a boiler, half of the tubes of which had been stopped up by stoppers placed by the side of the boiler, so as the total production of steam per hour was the same as in the original boiler. The boiler produced 6·93 kilogrammes of steam per kilogramme of coal, whilst the production of steam per square metre attained the large total of 116 kilos. per hour, corresponding to the work of 10 horses:—

No. of Compartment.	A.	B.	C.	D.	E.	F.	G.	H.
1	6·37	6·37	1,390	1,390	218·0	218	3·61	3·61
2	8·31	14·68	852	2,242	102·0	152	2·21	5·82
3	8·31	23·00	431	2,673	52·0	116	1·12	6·93
4	8·31	31·30	263	2,936	31·7	94	0·68	7·63
5	8·31	39·60	193	3,129	23·2	79	0·50	8·13

A is the surface of the considered compartment.
B, the total surface of *n* 1st compartment.
C, the weight of steam produced in an hour by the considered compartment.
D, total weight of steam produced by the *n* 1st compartment.
E, the weight of steam produced in an hour on a square metre, on the surface of the considered compartment.
F, the total weight of steam produced in an hour on a similar square metre by the *n* 1st compartment.
G, the weight of steam produced by 1 kilo. of coal in the considered compartment.
H, the weight of steam similarly produced by 1 kilo. of coal by the *n* 1st compartment.

A locomotive boiler, capable of resisting the strongest pressure used, weighs from 100 to 120 kilos. per 1 sq. metre of heating surface.

Another experiment made by M. Henry on a locomotive boiler, the tubes of which were 3 metres long, with an interior diameter of 46 millimetres, and an exterior diameter of 50 millimetres, gave the following results:—

Pressure in Millimetres of Water.

—	Ordinary Grate.			Tembrinck Grate.		
	25	45	75	25	45	75
Coal burnt per hour in kilos.	466	650	863	446	607	780
Water evaporated per hour in kilos.	3,667	4,907	6,136	3,844	5,150	6,341
Co-efficient of economy ...	7·87	7·55	7·11	8·62	8·48	8·18

M. Baudry has also made similar experiments on an engine provided with ribbed tubes, 2 metres long and 50 millimetres in diameter. The total number of tubes was 185; their interior diameter 46 millimetres, their interior surface was 52·50 sq. m., and the whole total surface 93 sq. metres; the grate area, provided with a Tembrinck boiler, was 14·2 m. The weight of this boiler was much reduced, as the cylindrical part was only 2 metres long. The weight of the water did not exceed 400 kilos., however the force and economy of this boiler was greater than the boiler 3 metres long. The results obtained are given in the following table:—

Pressure in Millimetres of Water.

—	25	45	75	100	120
Coal burnt per hour in kilos.	428	565	715	828	907
Water evaporated per hour in kilos.	4,019	5,254	6,585	7,535	8,181
Co-efficient of economy	9·39	9·30	9·21	9·10	9·02

A tube with ribs 2 metres long is more economical and has more heating power than an ordinary tube of the same diameter but twice as long. Tubular boilers are not safe for automobile carriages; they enclose a great quantity of water at a high temperature. The boiler being able to contain so much water saves a great amount of work caused by refilling, but, on the other hand, it may become very dangerous in the event of an explosion. On railways, where the inspection of boilers is perfect and they are worked by thoroughly competent men, the danger is almost *nil*, but this state of affairs does not obtain with automobile carriages.

Acetylene.—The Explosives Department of the Home Office has recently had under consideration the question of the restrictions to be applied to the manufacture and keeping of acetylene gas, and has conducted various experiments with the object of gaining information on this matter. The results show conclusively that acetylene gas *per se*, when under a pressure of something less than two atmospheres, is violently explosive; whereas at a pressure of less than $1\frac{1}{2}$ atmospheres it appears to be reasonably free from liability to explosion, provided it is not admixed with oxygen or atmospheric air. For commercial and practical purposes it is considered sufficient to allow a pressure of 20 in. of water above that of the atmosphere (*i.e.*, roughly about $1\frac{1}{20}$ atmospheres), and it is accordingly proposed to draw the safety line at this point, and to declare acetylene when subject to a higher pressure to be an "explosive" within the meaning of the Explosives Act, 1875. In France and Germany, the authorities have fixed the limit of danger at $1\frac{1}{2}$ and $1\frac{1}{10}$ atmospheres respectively, and have imposed prohibitions or restrictions on the keeping or manufacture of the gas when it is at a higher pressure.

THE DAIMLER MOTOR COMPANY (LIMITED).

BALANCE SHEET.

MAY 31ST, 1897.

Submitted at the Second Ordinary General Meeting, held at the Holborn Restaurant, Thursday, October 14th, 1897.

DR.

	£	s.	d.	£	s.	d.
To Share Capital—						
Authorised, Subscribed, and Issued 10,000 Shares of £10 each, fully called	100,000	0	0			
Less—Calls in arrear	442	10	0			
				99,557	10	0
Mortgage on Freehold Land and Buildings ...				3,000	0	0
Creditors—						
On Sundry Accounts	5,193	2	2			
For Payments in Advance on Account of Orders	809	0	0			
				6,002	2	2
Profit and Loss, Balance as per Account				9,175	17	6
				£117,735	9	8

CR.

	£	s.	d.	£	s.	d.
By Licence—Amount Paid for Licence to Manufacture and Sell Daimler Motors, &c., as per Agreement dated January 30th, 1896				40,000	0	0
Freehold Land and Buildings, &c.				3,375	0	0
Leasehold Land and Buildings	9,686	0	0			
Add—Amount expended on additions to date	3,894	12	8			
				13,580	12	8
Plant and Machinery				17,352	5	5
Tools				2,280	15	0
Patterns, Drawings, and Blocks				180	0	1
Furniture, Fixtures, and Fittings	1,846	5	6			
Less—Depreciation	184	12	6			
				1,661	13	0
Stock—						
Finished Work and Work in Progress, including Percentage for Establishment Charges	13,458	6	3			
Stores	4,285	13	6			
Carriages, Cycles, and Launches	1,526	16	5			
				19,270	16	2
Shares held				910	0	0
Debtors—						
British Motor Syndicate (Limited)	2,502	15	5			
On Sundry Accounts	4,113	6	10			
Deposits and Interest	56	17	1			
				6,672	19	4
Unexpired Proportion of Rates, Taxes, and Insurance				128	17	6
Cash at Bank and in Hand				12,322	10	6
				£117,735	9	8

PROFIT AND LOSS ACCOUNT.

JANUARY 14TH, 1896, TO MAY 31ST, 1897.

DR.

	£	s.	d.
To Materials, Wages and Salaries, Rent, Rates and Taxes, Insurance, Freight, Light, Heating and Water, Travelling Expenses, Printing and Stationery, Advertising and General Charges	31,316	8	3
Directors' Fees from February 4th, 1896, to May 31st, 1897 ...	2,164	8	4
Professional Charges	802	1	11
Expenses of obtaining Stock Exchange Settlement	75	0	0
Patent Fees	9	9	0
Interest on Mortgage	111	12	4
Depreciation on Fixtures and Fittings	184	12	6
Repairs to Buildings	163	8	2
Repairs to Plant	30	17	5
Balance, as per Balance Sheet	9,175	17	6
	£47,033	15	5

CR.

	£	s.	d.	£	s.	d.
By Sales				13,822	5	3
Profit on Sub-Lease of Portion of Motor Mills and Land	11,746	2	5			
Less—Loss on Sale of Eel Pie Island Property	841	1	7			
				10,905	0	10
Profits (other than by Trading)—						
In Cash	1,705	17	9			
In Shares £1,500 0 0						
Less—Commission in Shares ... 600 0 0						
	900	0	0			
				2,605	17	9
Interest and Dividend...				226	18	3
Profit on Sale of Fixtures and Fittings				188	19	8
Transfer Fees				13	17	6
Stock—						
Finished Work and Work in Progress, including Percentage for Establishment Charges	13,158	6	3			
Stores	4,285	13	6			
Carriages, Cycles, and Launches...	1,526	16	5			
				19,270	16	2
				£47,033	15	5

In presenting the report the directors, in congratulating the shareholders upon the satisfactory results of the first year's working of the business, state that in this period the Company has had to establish, organise, equip, and partly build its works, and also prepare designs, patterns, and tools for manufacture, work which must in any case entail considerable expense and time, but especially difficult when embarking upon an entirely new industry such as the business of the Company is.

They further report that the factory is now fully engaged in the regular output of motor and motor-carriages, the demand for which appears to be steadily increasing.

Although the very satisfactory and substantial balance of £9,175 17*s.* 6*d.* stands to the credit of the Profit and Loss Account on the first year's working, equivalent to nearly 10 per cent. on the capital of the Company, the directors do not recommend the payment of a dividend, as they have found it necessary to utilise this balance in the laying down of additional plant to meet the orders in hand.

Oil as Locomotive Fuel.—The fastest and longest run of a train hauled by an oil-fired engine is, says *The Engineer*, that of the Cromer express, on the Great Eastern Railway. Leaving Liverpool Street terminus at 1.30 p.m., this train arrives at Cromer—138 miles' distance—at 4.25 p.m., with but one stop at North Walsham, eight miles from Cromer, where it is due at 4.10. This gives a run of 130 miles in 160 minutes, or an average rate of 48·75 miles per hour. The train is regularly worked by the single-driver express engine of Mr. Holland's standard design, and fired on his oil-fuel system, and no similar fast train in the world is worked with such ease to the firemen.

NOTES OF THE MONTH.

Lord Carnarvon has purchased a motor-car.

Mr. D. Albone, of the Ivel Hotel, Biggleswade, stores petrol for automobilists, and, being a cycle manufacturer, can undertake repairs, &c.

Mr. Jas. Roots, the well-known maker of various types of automotors, is contributing an excellent series of articles on gas and oil engines to *The Engineer.*

The first electric motor-cab wedding took place on September 16th last at Brixton Church. Needless to say the bride and bridegroom attracted more than the usual attention.

Mr. A. Valentine (Student I.C.E.), of Croxton House, Leamington, has been appointed agent for the Arnold motor in that district. He stores petrol for the use of automobilists.

Owing to the failure of a scheme for a light railway between Lincoln and Brigg, a proposal is now being brought forward to improve the communication between these places by the formation of a motor-car company.

Country visitors to London with motor-carriages will be glad to know that good accommodation, if not for man and beast, at any rate for motors, can be obtained at Coulson's Livery Stables, Endell Street, Long Acre.

We understand that the cycle show to be held in Liverpool on January 11th next year will also comprise an exhibition of motor-carriages. Intending exhibitors should apply to Mr. Thos. Price, 77a, Lord Street, Liverpool.

The total "paid up" capital invested in British railways at the close of last year was 1029·5 millions, of which more than 10 per cent. is simply nominal, consisting of additions made in the conversion, consolidation, or division of stocks.

The United States naval officials are about to undertake a series of experiments to ascertain whether petroleum fuel, which would occupy less space than coal, can be satisfactorily adapted for use in torpedo-boats, and one of the torpedo-boats now building at the Herreshoff yards will be used for conducting a series of experiments with oil-burning apparatus. These experiments will be carried out at the Newport torpedo station.

L'Electricien mentions an instance of great presence of mind on the part of a Frenchman travelling in a New York electric cab. The cab suddenly stopped, and one of the occupants—a cool-headed engineer—investigated the cause and found that the fuse had blown. It was the work of an instant to take a tablet of chocolate out of his pocket, remove the tinfoil in which it was wrapped and connect it in place of the fuse, so as to allow the cab to proceed gaily on its way again. We shall now expect to see automatic sweetmeat distributors added to the comforts of our electric cabs.

The beautiful "Rougemont" carriage that has been specially constructed for Miss Minnie Palmer by the Daimler Motor Company was delivered to her in Aberdeen last week. It is made to carry six persons, and its speed can be regulated to four, eight, or 16 miles an hour. Its first appearance in Aberdeen created somewhat of a sensation, where motors were unknown. Miss Palmer has already started on her travels in her new acquisition, her first journey being to Dundee, where she has been appearing in *The School Girl.* Miss Palmer's example should be speedily followed by other members of *the* profession, as packed audiences have been the result so far, due in a measure, no doubt, to the bold advertisement obtained through the motor-carriage.

"After waiting nearly a year," says the editor of the *Cyclist*, "we have at last obtained delivery of our own particular autocar, and on Thursday, Friday, and Saturday we travelled considerably over 100 miles upon it. Although we had only once previously practically handled a car, we drove it from Northampton on Thursday, and on Friday took it through all the traffic of the Birmingham streets, which will show how soon the management of a good car can be mastered. It is driven by a Daimler motor, will carry five, steers like a bicycle on a good road, and swings along at an average 12-mile pace splendidly. If any of our readers are fancying autocaring, we can recommend the pastime as an exhilarating one, and we are also in a position to state that these vehicles have now reached a thoroughly satisfactory and practical stage, and no one need have the least hesitation in placing orders."

Drivers of road locomotives in Kent had better avoid Sandwich, if possible, as in that decaying town there is a deal of decayed property, and the Mayor is afraid it might fall down and hurt some one if a locomotive passed through the streets. While presiding in his awful magisterial capacity as the local "Beak," he asked the local bobby if he had a copy of the bye-law regulating the passage of locomotives through the town. The policeman said he had not, and his worship said he should be furnished with a copy. The bye-law said that the rate of speed while passing through the town should not be more than two miles an hour; but there had been frequent complaints that the rate was greatly exceeded. A good deal of damage to property was likely to be done by these heavy machines passing through the streets at full speed, and he hoped the police would bring any offenders before the Court. Needless to say, the policeman said that he would give instructions to that effect.

Speaking of the recent French heavy-weight trials the *Electrical Review* says, at the conclusion of an article :—"While steam is so decidedly best for heavy traffic, petroleum is, at any rate, serviceable for loads up to one ton. Electricity is not named. It appears that the steam and petroleum cars are dear, 18,000 francs being quoted for a petroleum omnibus, and 22,000 francs for a steam car, figures a little outside the range of ordinary transport concerns. A four-horse coach will be horsed for about £160, or 4,000 francs, but one team of horses will not run it all day; so that a four-horse coach represents probably nearly 12,000 francs of capital for a day's work. Still, the mechanical omnibus seems dear, and must be reduced or shown to be very economical in order to make its way. Since the foregoing was written, the electric cab has been placed on the streets in London, and it seems to run very well. But London streets are smooth, and if accumulators cannot work satisfactorily on a London cab they can work nowhere on a moving vehicle. The London experiment should afford very valuable experience for improving the accumulator."

Professor R. C. Carpenter, of the Cornell University, has been conducting an elaborate set of experiments on bicycle friction which have led him to the conclusion that no form of gearing can possibly equal the best chain for efficiency and durability. With such the frictional loss has been found to be between $\frac{1}{2}$ and $\frac{3}{4}$ per cent. of the total power transmitted, this result being obtained with a chain which had previously been ridden more than 2,000 miles with a rider weighing about 14 stone. With some other chains less well constructed, a greater loss has been found, the friction lying generally between 2 and 5 per cent.; the maximum shown even by an old chain which did not fit its sprocket properly was under 10 per cent. No bevel gears yet constructed give as good results as these, and Professor Carpenter concludes that with even the best bevel-geared bicycles the loss must be four times as much as with an ordinary chain, and six times as much as with the best chain. Moreover, as has been previously pointed out, gear wheels to work well must be in very accurate adjustment with each other, whilst with a chain no such careful fitting is required.

MR. F. T. BIDLAKE, the well-known tricyclist, writes in the current *C. T. C. Monthly Gazette*:—"Until recently I shared what I believed to be the very general opinion that a motor tricycle is a costly plaything of a most unreliable nature, tricky to manage and apt to suffer serious derangement of its working parts. An extended trial of one has dispelled this illusion completely. I do not mean to say that it is cheap, or may be carelessly handled with impunity, but when you sit still on a machine and coast, uphill as well as down, and can keep up 20 genuine, not policemen's, miles an hour on the level, you cannot write the thing down a fad. I learned the meaning of the taps in half a mile, and the fascination of manipulating them haunts me now, though I have had to return the machine, and the new toy pleased me well enough to urge me to do 190 miles in one day on it, and I only stopped then for a fault in the machine independent of its motor nature. Although you lose the independence of a cycle, you gain in being heedless of the question of fatigue. Your motor can do its hundredth mile as easily as its tenth, and the last yards of a climb are run at a uniformly tiring pace, fatiguing to the muscles of the man motor who essays to keep with you."

Wind Motors.—At a special meeting of the Town Council of Lymington recently Mr. Rollason attended with a model of his wind motor—the latest kind of improved windmills—and explained its working in detail. He proposes to erect one at Waterford, together with a huge storage tank, at a cost of £454, and maintain the same for 12 months. In reply to questions, Mr. Rollason said his guarantee was that the motor would do the work if there was sufficient breeze, but not otherwise. It was agreed to obtain further data as to wind power in the district before proceeding further with the subject. Before separating, the Mayor, in the name of the Council, heartily thanked Mr. Rollason for attending and for the valuable information he had given them.

Not Abreast of the Times.—The City Companies, as befits their mediæval origin, are not, as a rule, promoters or encouragers of their various "Crafts" and "Mysteries." We are not aware that the Grocers' Company have done anything to prevent, say, adulteration, nor do we remember any sartorial improvement emanating from the Merchant Taylors; while the Spectacle Makers have certainly done nothing to encourage optical research. Hence we are not surprised to learn that the Coach Makers are not encouragers of the "Arte or Mysterie" of motor-car manufacture, probably because this Company also includes the Coach Harness Makers. Of course a City Company must, however, do something to justify its existence in the eyes of a public which, urged on thereto by wicked Radical newspapers, is always asking *Cui bono?* And so the Coach Makers have offered prizes, amounting to the princely sum of about £50, for the best designs in carriages. There are five competitions of various kinds, but we see no reference to motor-carriages, and good designs of the latter are badly wanted just now, and we can only express our surprise and regret that the Coach Makers' Company should be so blinded by and guided by its mediæval traditions as to exclude motor-carriages in the 1898 competitions. However, our French friends will no doubt assist the "trade" in this.

CONTINENTAL NOTES.

Two of the latest disciples of automobilism are M. Edmond Blanc, of Paris, and the King of Siam.

IT is proposed to establish a permanent exhibition of automotor vehicles and accessories in Paris.

WE understand that M. Bollée is busy upon a new design of automotor of which great things are expected.

OWING to the new French regulations automobilists have now to carry about a large heavy book containing the law on the subject.

THE latest Pennington tricycle is *said* to give off 12 H.P., and its weight is also *said* to be 150 kilos.—at least *Les Sports* says so.

As one result of Les Poids Lourds, a French Omnibus Company is adopting the De Dion omnibus for certain lines in the south-western district of Paris.

IN consequence of some unfavourable criticisms that have appeared in the French Press concerning the London electric cabs, the Company concerned has dispatched one to Paris for inspection.

NOT content with its achievements, the Automobile Club is about to establish a line of automotor mail coaches in Paris available for excursion parties. These will start each day from the Place de l'Opera.

BERLIN is at length awakening to the possibilities of automobilism, and an exhibition of automotors will be held in that city from October 25th to November 25th, under the auspices of the Deutsches Export Musterlager.

AFTER the heavy-weight trials M. Scotte proceeded with his motor and trailer to Luxembourg, where he had a most gratifying reception. He has returned to Paris with his vehicles, and the French Customs have demanded 6,000 francs as duty.

THE French Minister of Marine invited essays and designs for submarine boats this year; 47 authors responded, six sent in complete designs. Three types are considered to be feasible. One is worked by electricity, another by automatic machinery, and the other by petrol.

IN Berlin the fire brigade employs steam tricycles. These are always kept ready for a start, and on a call being received two firemen proceed at once to render preliminary assistance by clearing the way, &c. When will the London County Council drop its present expensive system of horse traction?

THE Automobile Club of Paris has already decided upon its programme for 1898. It will comprise an exhibition of vehicles, and will last throughout June. There will be four sections, consisting of automotor vehicles which have given proof of their practical efficiency, industries connected with automobilism, motors and vehicles adapted for automotors. On July 5th, and on the following days, there will be a race from Paris to Amsterdam and back, a distance of 868 miles, and a body of members will proceed to survey the route to St. Petersburg for the Paris-Petersburg race to take place in 1899.

MAKING MANHOLE JOINTS IN BOILERS.

As steam is unquestionably destined to be the motive power for vehicles intended for heavy traction on roads, and as this steam must necessarily be of high pressure, boilermakers and others will do well to pay particular attention to such details as making joints in doors, handholes, &c. The importance of

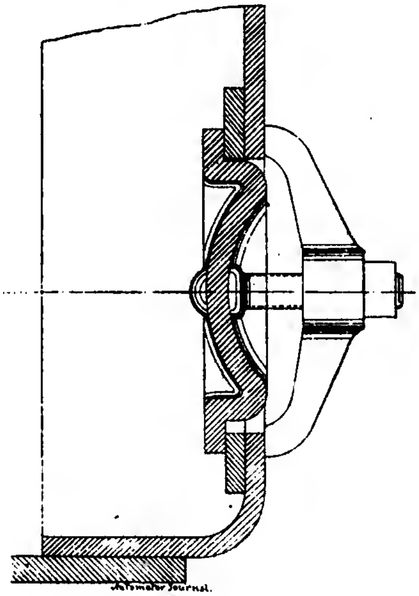


Fig 1

accurate fitting can hardly be over-estimated, as the consequences attendant upon a sudden eruption of steam and water in a street would be very serious, involving possible loss of life and damage to property. The blowing out of the packing used in making manhole joints is always a likely contingency unless the very greatest care is exercised. As showing the importance

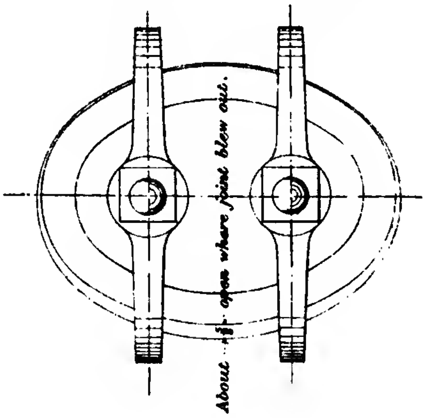


Fig. 2.

of this we give an account of an accident of this nature which occurred on board the steamship "Strathclyde." This vessel is a screw steamer of 3,314 tons. She was outward bound from the Tyne in ballast for Montreal when the explosion occurred.

A portion of the material of which the joint of the door of the forward lower manhole of the port boiler was made was blown out from the lower edge of the door, where indicated in the sketches (*see* Figs. 1 and 2), and the contents of the boiler were discharged with considerable force, the pressure of steam on the boiler at the time being from 140 lbs. to 150 lbs. per square inch. The second engineer, who has been three years on this steamer, stated that the first intimation he had of the explosion was by hearing a "shout" from the fireman, whom he met coming from the stokehold, and who told him that one of the forward doors had blown out. He immediately pulled the fireman's trousers off, and had him removed to the poop, where his legs were dressed preparatory to his removal to the Shields Infirmary. After he had eased the starboard, and the chief engineer the port safety valves, attempts were made to get into the stokehold to draw the fires, but owing to the presence of steam and water, the ship rolling and the *debris* floating about in the stokehold, this was not accomplished for some hours. The second engineer also stated that the appearance of the joint before the door was taken off showed that for 4 or 5 inches at the bottom it had been blown clean out. Previous to the blowing out of the joint he had seen no leakage from any of the doors, and until this casualty no trouble had been experienced with the doors, which had always been jointed with flat asbestos rings made to order, excepting on one passage from Hamburg to the Tyne, when several of the joints had been made with Tuck's packing. From the statement of the chief engineer, it appears that a requisition had been made for asbestos tape jointing material, but steam having been required before the demand had been complied with, the joint was made with $\frac{3}{4}$-inch round packing. The spigot of the door in the direction of the major axis was less than the manhole by $\frac{5}{16}$-inch and in the direction of the minor axis by $\frac{3}{8}$-inch.

In his remarks on the explosion, Mr. P. Samson, the Engineer-in-Chief of the Marine Department of the Board of Trade, says:—

"This explosion affords another illustration of the danger which may arise from the use of badly-fitting manhole doors, especially when the joints are made with packing of unsuitable section, and when sufficient care is not taken to ensure that the doors are placed centrally in the manholes. It appears that it has been the usual practice on this vessel to use flat asbestos rings for the joints of the manhole doors, and no trouble was experienced with that description of joint, but it seems the joint of the door in question was made with $\frac{3}{4}$-inch round packing in this instance, in consequence of the supply of flat asbestos rings being exhausted, with the result that the explosion followed shortly afterwards, and, unfortunately, injured one of the firemen."

ALLOYS AND BRONZES.

THE addition of $\frac{1}{4}$ to 1 % of aluminium to the ordinary brass and bronze mixtures effects a great improvement. The metal runs better and is more durable and tough. A higher percentage of aluminium will produce brittleness.

Aluminium Bronze consists of copper 90 %, aluminium 10 %; or copper 95 %, aluminium 5 %. The former alloy has a tensile strength of 80,000 lbs. It is largely used for bearings, gearing, chain belting, and for all purposes where great strength and toughness are required.

Silicon Bronze—Copper 95 %, silicon 5 %—is, as regards strength, equal to aluminium bronze, but does not resist corrosion so well; it, however, casts better.

Manganese Bronze, as now made, consists of—

	%
Copper	53
Zinc	42
Manganse	3·75
Aluminium	1·25
	100·00

This is perhaps the best material to employ for heavy or light gearing wheels.

Imitation German Silver.—

	%
Copper	67·25
Manganese	18·50
Zinc	13·00
Aluminium	1·25
	100·00

This takes a good polish, and is besides very strong. May be usefully employed for motor-car purposes.

Aluminium Solder.—

	%
Aluminium	2·38
Zinc	26·19
Tin	71·19
Phosphorus	0·24
	100·00

Another solder for aluminium is known as Green's; it is stated to be composed of—

	%
Zinc	50·03
Tin	47·99
Aluminium	1·76
Phosphorus	0·22
	100·00

No flux is required, but the faces of the joint are cleaned and coated with solder, and a hot bit is used to make the joint.

Mr. John Philipson on Coach-building and Automotors.—At the Durham College of Science, Newcastle, on September 29th, Mr. Henderson, president of the Institute of Carriage Manufacturers, presented the prizes to the successful students in the carriage building classes last session. The chair was occupied by Mr. John Philipson. The Chairman, in the course of his opening speech, said:—I am pleased to notice that science subjects are engaging attention, and I should like to impress upon young coachmakers the importance at the present time of devoting some attention to applied mechanics, and this for two reasons. I need not remind you that the future success or failure of many industries will be in proportion to the employment of labour-saving tools. Now, some of the best labour-saving tools in use at the present time have been invented by workmen, and this fact is not difficult to understand, because those men have had a knowledge of applied mechanics, and they knew precisely what conditions would have to be fulfilled by the tool in working. The second reason is, that in a short time motor-carriage construction will form a department in many carriage factories, and the man with a knowledge of mechanics and machine construction will stand in a vastly more favourable position than he who is ignorant of such matters. I say that I believe the construction of self-propelled carriages will ultimately form a department of our business, because I feel assured if the motor-car has to come (and there cannot now be any doubt about its coming) coachmakers cannot afford to rest on their oars and allow the new industry to be monopolised by others outside of the trade. The motor-car is yet far from perfection, but it would be idle to shut our eyes to the fact that it must eventually play an important part in our methods of travel and transit, and in this connection we may reasonably congratulate ourselves that the birthplace of the locomotive has not been behindhand. The long series of experiments which have been carried out by my firm and our friends, Messrs. Toward, have convinced me that for rural districts, where there is no electrical supply—steam will play the most important part as the motor power chiefly on account of its simplicity and its reliability.

ELECTRIC CABS IN PARIS.

The Paris correspondent of the *Pall Mall Gazette*, which paper, by the way, is evincing an intelligent appreciation of automobilism rather rare in the daily Press, sends an account of an interview he has had with M. Bixio, who is President of the Compagnie Générale des Voitures à Paris, and who has sent an engineer to report upon the London cabs.

Said the *P.M.G.* man: "And does he speak favourably of the London cab?"

"Not exactly; but it is just what I expected. The fact is, that although there are several motor-cabs running in London, the results are not very satisfactory, English engineers being hampered by exactly the same difficulties as ourselves. In my opinion, it is useless to put electric cabs in circulation until these difficulties have been overcome."

"Then when do you expect to be able to give them a trial in Paris?"

"Ah! that is absolutely impossible for me to tell you. I am considering new ideas and receiving new specifications almost every week, and I carefully examine them all. Some of them are quite worthless; others contain certain improvements, and I have no doubt in the end we shall find a motor-car that will give us more practical results than we have yet obtained. At the present time I am expecting a motor-car from Berlin, one from London, and another from New York. You see, we are not letting the grass grow under our feet."

I imagined that the difficulties of which M. Bixio spoke were the old difficulties of the motor and the accumulators. I asked him if this were the case.

"Yes," he said, "you are right, and it is especially the accumulators that are troubling us. The motor only presents difficulties of quite minor importance. The whole question turns on the weight and the power of the accumulators. An ordinary cab covers about 60 miles a day, and in order to be ready for emergencies the accumulators ought to have a driving power of, say, 80 miles. Of course, there is the alternative of re-charging in the middle of the day, and in this case 40-mile accumulators would answer the purpose. But this would lose the cabman's time, and would also entail extra expense at the charging stations. What we are trying to find is an accumulator that will carry a cab about 80 miles. Now, I am told that the accumulator in use in London is 10 years old; the best we have in Paris is only five years old."

"Do you consider that petroleum or electric automobile carriages will be in use in Paris in the future?"

"Oh, the petroleum car has no chance at all. As soon as we get the electric car ready, the petroleum automobile will be seen no more. For several reasons the latter cannot compete with the former, principally because it is not strong enough—that is to say, it cannot be relied upon to ascend an incline, such as the Rue des Martyrs or the Rue Lafayette. I quite admit that at present there is an enormous demand for the petroleum autocar, and the manufacturers are, I am told, asking for from 15 to 18 months for the execution of an order. But it is mostly the wealthy classes and amateurs who are using it. They obtain amusement from it just as a child is amused by a new toy.

"But I am of opinion," concluded M. Bixio, "that neither the electric nor the petroleum car will ever come into universal use. Automobilism is only likely to replace horses in public conveyances and in the case of delivery carts and wagons. The wealthy classes will always keep to their horses. A wealthy man will never be so proud of his automobile as he is of his well-groomed thoroughbreds."

The fourth Dublin Cycle, Motor-Car, and Inventions Exhibition is to be held from January 15th to the 22nd, 1898, in the grounds of the Royal Dublin Society.

NOTICES.

Contributions and articles likely to prove of interest to our readers will receive due attention, but in all cases the name and address of the writer must be given, not necessarily for publication.

All matter intended for publication should reach us not later than the 10th of each month, and be addressed to The Editor of "The Automotor and Horseless Vehicle Journal," 62, *St. Martin's Lane, London, W.C. Stamped envelope must be sent if the manuscript is required to be returned. The Journal is published the middle of each month.*

All Advertisements should be addressed to F. King and Co., Limited, 62, *St. Martin's Lane, London, W.C., where Advertising Rates may be had on application.*

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The Automotor and Horseless Vehicle Journal *can be obtained from all* Messrs. W. H. Smith and Son's *bookstalls, and the following Agents:*—

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The Automotor and Horseless Vehicle Journal.

A RECORD AND REVIEW OF APPLIED AUTOMATIC LOCOMOTION.

OCTOBER 15th, 1897.

ANSWERS TO CORRESPONDENTS.

A. J. Ashmore (Rowney Green, Alvechurch). — We have returned your drawings and stamps. We could not say whether the invention is novel or worth patenting. Your best course is to consult a patent agent. You might communicate your ideas to Messrs. Haldan and Co., 18, Buckingham Street, Strand, London.

H. H. (York).—We cannot recommend as an investment. See the back numbers of our Journal, in which 20 or 30 references are made to this affair.

W. E. H. (Altrincham).—(*a*) We regret it is impossible to supply you with No. 1 except in volume form, the price of which is one guinea net. (*b*) We thank you for all your suggestions *re* 1898 Handbook. The majority of them have already been embodied and are in type for the forthcoming issue. You will find that the new book will more than satisfy the requirements you mention.

J. K. (Forres, N.B.).—The address of the Clayton Company is New York. They are a very big Company, and a letter addressed simply New York is sufficient.

B. ROBERTS (Hyde Park).—(a) No. 7 is a Daimler motor; the address of the Company is 219, Shaftesbury Avenue, W.C. No. 17 is a Benz motor; the address in Germany is Messrs. Benz and Co., Mannheim. For England you had better apply to Arnold's Motor-Carriage Company, East Peckham, Kent. (b) At present the £1 shares stand at $\frac{7}{8}$ to $1\frac{1}{16}$.

DR. TURNER.—You will find considerable information on the Serpollet system in our back numbers. By reference to the Index which is issued with this number you will find the pages. You might also apply to Mr. E. Shrapnell Smith, Royal Institution, Colquitt Street, Liverpool, who possibly might send you a copy of the Committee's report on this system, which has been issued. A motor-vehicle has been completed on this system in England, and we understand it will not be very long before building motor-vehicles on the Serpollet system will be in full swing in this country.

CLUBS.—(a) We cannot advise you upon the first point. (b) We are not connected with either of the proposed clubs. For any information you require from either of them it will be necessary to write to either Mr. Harrington Moore, 4, Whitehall Court, London, or Mr. Andrew W. Barr, 30, Moorgate Street, London, E.C.

J. B. (Liverpool).—The advertiser had an enormous number of answers in reply to his advertisement, and we believe he is still considering the various designs sent in. We hope later on to receive particulars of his decision and, if possible, shall publish the selected design.

E. J. W. G. (Chipping Norton).—We have no power to issue a permit as suggested, but you may rely upon being received with every courtesy if you mention the name of our JOURNAL.

LEON GROSSE (Aix-les Bains).—(a) We have sent you subscription form as desired. (b) A communication to any of the following should procure you what you want:—Daimler Motor Company, Coventry; Roots and Venables, 100, Westminster Bridge Road, London, S.E.; London Electrical Cab Company, Juxon Street, Lambeth.

W. K. (Ayr)—Your best plan would have been to join the rest of the shareholders originally. We cannot advise you upon your present position, and suggest your communicating with the solicitors who have the matter in hand.

THE GREAT HORSELESS CARRIAGE COMPANY AND THE BRITISH MOTOR SYNDICATE.

THE idea of buying up all the patents relating to a new and promising industry could only emanate from the brain of a clever man; equally so was the idea of forming subsidiary companies to work, more or less completely, some or all of the said patents. The idea, however, of investing in the latter companies could only emanate from the brains of members of the great British public who, as a rule, are *not* clever; indeed, a great philosopher has said that the majority are—well, not exactly very wise persons. We should prefer to put it this way—those who formed the British Motor Syndicate had the brains, while those who subscribed to the Great Horseless Carriage Company, which was formed to work the "valuable patents" owned by the former, had the money but no—or perhaps not much to speak of—brains. An exchange has been made which is apparently agreeable to the members of the Syndicate, but slightly less so to the shareholders of the Great Horseless Carriage Company, who find their £10 shares worth only a few shillings apiece; little or no business being done, general bad management and inefficiency at headquarters, with every prospect of litigation, culminating in reconstruction, or something worse. If we cannot congratulate the shareholders on possessing a remunerative business, we certainly can upon the "vast practical experience" that they are individually acquiring, and which they will no doubt increase, in the art of commercial manipulation. That many of the patents bought up by the Syndicate are valuable cannot be denied, but whether many of them will be worth renewing when they run out is doubtful. On the other hand, the Syndicate owns much patented rubbish. As an example of this we may mention Patent 15,947 of 1893, "For sounding a whistle on an explosion engine by causing the products of combustion to be exhausted through the said whistle"—about as useful an invention as that of a whistle made of sugar candy. It was to work these and other "valuable patents" that the Great Horseless Carriage Company was formed in May, 1896, with a capital of £750,000.

It would seem from the prospectus that the objects of the Company were "to purchase a license to use all or any of the applications for patents, patent rights, or letters patent of or belonging at the present time to the British Motor Syndicate (Limited), so far as such application, patent rights, or letters patent relate to carriages, vans, carts, tramcars, and all other vehicles excepting cycles, bicycles, and tricycles." A committee of the dissatisfied shareholders in the Great Horseless Carriage Company complain that "since the flotation of this Company the British Motor Syndicate have gone on improving the different inventions and buying newer and later patents, the benefit of which they withhold from us, while this Company have bought none, and in a business like this, where its very existence depends upon it being up to date, it is clear that owing to this Company having only bought a partial and non-exclusive interest in the patents owned by the British Motor Syndicate up to but not since May, 1896, it is being altogether left out in the cold, and that in a short time there is every possibility of its having merely old and out of date models to work upon."

We should say that this is very probable. The committee continue:—"In addition to this all-important error of judgment in the formation of this Company, it appears that the directorate contained several members of the board of the Daimler Company. It is, therefore, not surprising to find that this Company paid for its share of the buildings at Coventry more than the whole of such buildings cost when originally acquired by the Daimler Company. Further, that the Daimler motors themselves are being sold to us at immense prices, while our works are employed in making the carriage frames merely under the Daimler directors' instructions. Further, the British Motor Syndicate not having granted us exclusive licenses, has the right to run against us in connection with all its patents, and has also been granting, and continues to grant licenses under the patents in which we are interested, and their newer patents above referred to, to numbers of companies and firms, thereby creating for us business rivals whom we are powerless to interfere with. The Company, therefore, appears to be at the mercy of two enemies—viz., the British Motor Syndicate on the one hand, who claim that they own practically everything, and keep acquiring fresh patents with a view of shutting out everyone else (ourselves included), and the Daimler Company on the other hand, who are living freely upon us. The result is shown pretty clearly by the value of the shares. The £1 shares of the British Motor Syndicate, with a capital of £1,000,000, are quoted at par, while this Company's £10 shares are practically valueless."

The committee seek the co-operation of their fellow shareholders in the direction of a reorganisation, and have instructed a firm of solicitors to investigate the matters complained of. The committee announce their intention "to endeavour, in conjunction with our directors, if they are willing (or, if not, then without them) to obtain from the British Motor Syndicate fair proposals for this Company's future, either by amalgamation on fair terms or otherwise, but to submit such proposals first to the full committee, and afterwards to a general meeting for full consideration. Failing this to requisition for a general meeting to remove any directors who may oppose us, and (if so advised) to take proceedings against the British Motor Syndicate, &c., for return of the purchase price and damages."

To this formidable indictment the directors of the Great Horseless Carriage Company reply also in a circular to the shareholders that the aforesaid statements are misleading and in many cases untrue. They also report that the Company is making steady progress. According to an interview with Mr. H. J. Lawson, published by our contemporary, *The Road*, that gentleman attributes the evil state of the Great Horseless Carriage Company to lack of knowledge on the part of the directors and serious mistakes in the management. Yet in the same breath he says it would have been difficult to come across men more suitable for directors. We do not think so. The Board included a respectable Peer as chairman—who necessarily could have no technical knowledge, and, besides, peers and other noblemen are as a rule entirely out of place on industrial directorates. The other gentlemen composing the Board undoubtedly knew a good deal individually about automobilism although they are not engineers, but we are not aware that they had any great reputation for the successful conduct of large business operations such as are involved in the use of nearly three-quarters of a million of money. And of these directors the more competent were aliens and resided abroad, while those who represented the commercial element were hopelessly divided in their policy. Under these circumstances it is not surprising that one manager followed another into seclusion.

If, again, we consider how restricted are the operations of the Company, and how these are shared by other Companies, it will be seen that there can hardly be sufficient business to earn a dividend upon such a large capital. The Great Horseless Carriage Company is practically restricted to making horseless vehicles of one type, viz., those operated by light oil-motors, although we gather that they are to manufacture the vehicles required by the London Electrical Cab Company. As far as we can see, the position appears to be this—the Great Horseless Carriage Company has acted as a kind of wet-nurse to both the British Motor Syndicate and the Daimler Company. It has supplied the financial pabulum to both, and now finds itself getting more and more flaccid while these other Companies are waxing fat. According to the statements made in *The Road*, it appears that the total capital was £750,000, of which £600,000 has been issued, leaving an uncalled balance of £150,000. Of this £600,000, the public contributed £300,000, and of this huge sum, viz., £600,000, only £120,000 was working capital, of which £70,000 has been spent, leaving but £50,000 to carry on the business with, or the actual cash in hand is but one-fifteenth of the original nominal capital. The Great Horseless Carriage Company now finds itself in the position of having depleted coffers and torn by internal dissension. The question is—What is the best course to pursue? We suggest that a valuation of the plant, patents—especially the patents—should be made, and their value be severely written down, so as to disclose the true position of affairs. The legal rights of the Company as against the British Motor Syndicate should be clearly ascertained, and a policy either of conciliation or litigation adopted accordingly. The directorate should be entirely recast, and, as far as possible, all interests in other motor concerns should be eliminated. A definite policy of motor-carriage building should be decided upon, and the leakage of money for so-called experiments should be summarily stopped.

It strikes us as a curious thing that a Company which owns so many valuable patents should yet be obliged to conduct experiments; this fact alone shows the valueless nature of these so-called "master patents." We are afraid, however, that the Great Horseless Carriage Company has made a bad bargain, and for its present position its directors are morally if not legally responsible. But if the shareholders of the Company agree to the propositions set forth in the circular emanating from "A shareholder," they should bear in mind that by so doing they waive their legal rights to the recovery of their money subscribed for shares under the original prospectus.

This circular strikes us as being of a very ingenuous nature, especially as it appears to quite ignore the actions which are now waiting in the list for trial immediately after the Long Vacation on behalf of a large number of original shareholders, who claim to have their money returned, alleging all sorts of misleading statements in the prospectus. Amongst these litigants are some well-known public men, &c., and we fail to see any *bonâ fide* object in a new combination being started until a legal decision has been obtained in regard to the pending actions. The shareholders should bear in mind that in regard to these actions each and every director of the Company is a defendant, and in the event of judgment being in favour of the plaintiffs, every member of the Board might be held personally liable for the money originally subscribed. We can only assume that those shareholders from whom this latest circular purposes to emanate are unaware of what is going forward, as in the present state of affairs the benefit to be obtained for the shareholders by divided action is not apparent, although we fully appreciate that should the suggestion set forth in the document be arranged, then by whitewashing everybody concerned up to the present time, the relief to the defendants in the actions pending should be very great. We cannot credit that the shareholders upon whose behalf the actions are being brought will be parties to any scheme that would in any way prejudice their rights to recover monies subscribed, and until the Courts have decided the legal question of the liability of the directors, in our opinion the shareholders would be best advised not to consent to any alteration in the present position of the Company.

THE NEW FRENCH REGULATIONS FOR MOTOR-CARRIAGES.

We publish a translation of these elsewhere in our present issue. A glance at them will, we think, satisfy the most ardent advocate for official forms. The French have a love for minute regulations and bureaucratic methods generally, and they have certainly gratified this weakness in framing their regulations for automotive carriages. To say that these regulations are needlessly minute, vexatious, and wholly unnecessary, is no doubt calculated to shock the feelings of those who believe that the State should regulate all things, from the character of the music-hall variety show to the design of motor-carriages. We, however, think that the less the State or local authority interferes in these matters the better. Both in Great Britain and on the Continent the people simply groan under the load of law that we suffer to be imposed upon us, and, so far from deriving any benefit from these multitudinous regulations, it is doubtful whether any good purpose results from them. A few years ago we nearly stifled the electrical industry in this country by enwrapping it in many folds of law paper, but the industry had freer expansion in the United States, with the result that we now obtain much of our plant from that country. The French have so far led in automobile matters, but it looks as though they now wish to check their own progress by these absurd regulations. It is one of the most curious signs of the times, the regulation of all and every industry by the State. It is only right that admittedly dangerous industries should be under State regulation, but to subject a harmless and useful industry to an amount of official inquisition such as is indicated appears to us to be not only an arbitrary and uncalled for interference with individual rights but an absurd and impolitic proceeding altogether. The promulgation of such a mass of regulations has two effects—it checks the development of the industry and increases the already inordinately large army of public officials. We sincerely trust that such regulations as those we refer to will never be adopted in England. Our own view is that the common law is sufficient for nearly all purposes of life not excluding automobile traffic.

ON A COEFFICIENT OF MERIT OF PERFORMANCE FOR AUTOMOTOR-CARRIAGES PROPELLED BY OIL OR STEAM.

There is a great need of some simple formula which will express the relative merits of automotors. Speed is not the only thing that is wanted in a vehicle of this description, but economy in fuel and water consumption, which, of course, measures the cost of propulsion. For want of a better, we submit the following formula to our readers, and invite their opinions thereon :—

Let Ω be the mean speed over any given distance in miles per hour ;
ω the weight (tare) of the vehicle in lbs. ;
W the total weight of the vehicle loaded in lbs., with all stores, passengers, fuel, water, &c. ;
K the consumpt of fuel in lbs. while traversing this distance ;
C the coefficient of performance.

Then—

$$C = \frac{\Omega \omega}{K.\,W.}$$

We should say that this formula is a variation of one proposed by M. E. Hospitallier in *La Locomotion Automobile.* It is also applicable to cycles and ordinary vehicles ; only in their cases (K) would be omitted from the denominator.

TRACTION ON HIGHWAYS.

By Sir David Salomons, Bart.

Many tables giving the power required to draw given loads on roads with various surface conditions have been made by eminent engineers. Such tables are unsatisfactory, for the simple reason that no standards of road-surface exist, and to create them is not a simple matter. With traction upon rails the matter is otherwise--theory, with allowances, applies.

To place the subject before the reader in a manner easy to follow, let us consider a fly-wheel turning upon an arbor without friction. In this case the motion imparted to the wheel will urge it on at some given speed, never to stop. Friction alone will bring it to rest, and we have supposed this to be absent. If such fly-wheel is made to spin at double the first speed, the stored energy will be fourfold ; if at three times the first speed, nine times the energy will be stored. In other words, the energy stored will be proportional to the square of the speed, and such energy must clearly have been put in the fly-wheel at the start. Now advance a step further, and suppose the fly-wheel to run along a rail without friction, instead of spinning about an arbor. Then we have the simplest and ideal form of a railway train. The same law mentioned applies in this case, and may be expressed thus : the energy stored in the ideal train will be as the square of its speed.

A railway train in motion without friction is impossible ; hence energy has to be given to start it, and constantly supplied to make up the losses due to friction in order to maintain the speed. In the case of a railway the conditions are practically constant. It is otherwise with the high-roads. These may be as good as a railway in the case of newly-laid asphalte, and not much worse with new wood pavement ; but there are gravel, sand, macadam, rough, smooth, and dozens of other surfaces to be found, some in good and others in bad condition.

A motor-driven vehicle on a rough road meets with tremendous resistance, so much so that all the energy given to the carriage might at once be destroyed in overcoming friction. In such case the power continually supplied will be in proportion to the square of the speed. Fortunately, such bad roads are not the usual state of things, and experiments lead to show that the *average* power required on fair roads, such as a smooth macadam, is about four times that required upon rails. This figure 4 may be called the road-factor. Although the law of squares must exist for vehicles upon the highway, special conditions exist, due to the nature of the road and the small limits between the lowest and highest speeds usually employed —say, 5 to 12 miles per hour, which makes the power and speed vary in direct proportion for the rates mentioned upon the country roads of England.

To keep up a speed of 12 miles per hour upon all roadways usually met with, such rate not to be exceeded at any time, experiment shows that 10 H.P. per ton is about the power required. Consequently, if half this speed is demanded, 5 H.P. will suffice.

The brief manner in which this subject has been treated covers the ground, and shows the difficulties to be met with when attempting to tabulate the power necessary for traction on roads in a mathematical form. To sum up the foregoing :—

1. The power required upon average roads, compared with traction upon rails, is *four times.*
2. In practice, for speeds up to 12 miles an hour upon fair roads the speed varies with the power supplied.
3. To travel at 12 miles an hour on good and moderate roads, up and down hill and on the level, requires about 10 H.P. per ton.

Trial of a Stirling Motor-Carriage.—Messrs. Stirling, of Hamilton, furnish particulars of a trial of one of their carriages which took place recently on the Glasgow to Carlisle Road. The distance covered was 100 miles. The car left the works at 10.15, and travelled without stop to Abington (26 miles distance), where the cooling water tank was replenished. After about 15 minutes' delay the car proceeded to a point beyond Moffat, which was exactly 50 miles from home. The car then returned to Moffat, where a stay of an hour was made for luncheon. Moffat was left at 3.15, and the run of 21 miles back to Abington was made without stop. Here the cooling tank was again refilled. The remaining 26 miles was again accomplished without stop. A careful note was made of the amount of fuel consumed on the journey, and it was found to be exactly five gallons, which, at the retail price of 11*d.* per gallon, makes the cost of the 100 miles 4*s.* 7*d.* The carriage was of the wagonette type, and carried three gentlemen and about 100 lbs. of baggage. On the road traversed there were several long hills encountered, and on the return journey a stiff head wind was met. The entire journey was accomplished under nine hours, including the stoppages above referred to. The points of special importance which this trial has brought to light are, first, the distance which can be travelled without renewing cooling water, and the economy with which the car can be worked. Adding the cost of lubricant used, the total cost would work out at under 1*s.* 8*d.* per passenger. Messrs. Stirling add that the motor is built on the Daimler system, using light oil. They have built and sold over a dozen motor-carriages during the past few months, and these are now in regular use and giving every satisfaction.

REVIEWS OF BOOKS.

"Annuaire Général de la Vélocipède de l'Automobile, &c., 1897." F. Thévin et Ch. Houry. (Paris.)

This is an international cycle directory, which apparently contains the addresses of everyone engaged in the cycle industry in Europe. It is a well got up volume, and great pains have evidently been taken in its compilation. Although almost wholly dealing with cycles it also has an automobile directory, which, however, strikes us as rather incomplete, and much useful information is given relating to dues, tariffs, railways, &c. Cycle manufacturers will, we think, find this a decided acquisition to their office library.

"A Practical Treatise on Modern Gas and Oil Engines." By F. Grover, A.M.I.C.E. (The Technical Publishing Company (Limited); Manchester: John Heywood, 1897.) Price 4*s*. 6*d*.

We have been not a little indebted to our esteemed contemporary, the *Practical Engineer*, at various times for much useful information, and we have read with interest and appreciation the series of very excellent articles on gas and oil engines that have appeared in the pages of our contemporary and which are now most usefully republished in permanent book form. The author, Mr. Grover, is on the lecturing staff of the Yorkshire College, Leeds, which is tantamount to saying that he is an expert of no mean order. Very excellent work is turned out of Yorkshire College or originates from thence; and we rather envy those students who have had the advantage of the instruction of Mr. Grover on gas and oil motors, because, not only for the reason stated but as all old students know, no instruction is so permanent as that obtained through the medium of lectures which are followed by discussion between the students and the lecturer and between the students themselves, especially if in the latter case, as Professor Perry says in his "Calculus," it "leads to wrangling." Gas and oil motors are tantalising things—they are the media by which the heat energy contained in gas or oil is directly converted into work. Yet for regular performance of this duty they are not nearly so good as the worst steam-engine. Could we but do with gas and oil vapour what we do with steam (that is, in a mechanical sense), what an industrial revolution there would be. It is, no doubt, the great possibilities in gas or oil, or, perhaps, the fascination that surrounds the problem of the direct conversion of latent energy into exterior work that has caused many of our brightest and cleverest engineers to devote so much attention to gas and oil motors, but it is indicative of the difficulties of the problem that the Beau de Rochas cycle is still followed in the best designs. What should we think of a gun that required to be cleaned out every time it was fired; yet this is the characteristic of the earliest and latest types of gas and oil engines, although, as Mr. Grover shows, an impulse at every outstroke is obtained in some motors. Commencing with a slight historical sketch, we learn how, in 1862, the theory of the gas-engine was enumerated by Beau de Rochas, who, by the way, like most original inventors and thinkers, died recently in poverty, while many of those who manufacture engines on the cycle determined by him have made fortunes. This, of course, is quite in keeping with the eternal fitness of things. This Beau de Rochas cycle is now generally known as the Otto cycle, and Mr. Grover tells us in Chapter III "that since the Otto patent expired, the commercial value of other engines has much depreciated, and in many cases makers have abandoned their own patents in favour of the Otto principle." We think it would be as well, as a matter of abstract justice, if the name of Otto in this connection was dropped and the name of the acknowledged inventor substituted. Readers of the Automotor are, we think, aware that, as a rule, we refer to the Otto cycle under its more correct designation. The description of the various types of gas-motors occupies several pages, and each type is exhaustively analysed and illustrated. The directions for testing and indicating are unusually clear and practical, and many useful hints are given. The same remark applies to the analyses of coal-gas. The chapter on gas-engine designs is good, but might be more amplified. For instance, is cast-iron the most suitable material for oil-motors? Cylinders for vehicles and information regarding the limiting value of radiators would also be useful. Part II is a well-written but somewhat meagre account of petroleum oil-engines. All the leading makes are described and their various points discussed. No mention is made, however, of the De Dion, or Phœnix, light oil-motor, while the reference to the Daimler is very brief. We find, ourselves, considerable difficulty in obtaining reliable information of trials of these Continental motors, and perhaps Mr. Grover has experienced a similar difficulty. In conclusion, we must congratulate that gentleman on producing a well-written, technical work, eminently practical and containing no more science than is necessary. It is eminently a work for draughtsmen, foremen and others in charge of gas or oil-motor plant. We can also strongly recommend it to automobilists. The book itself is well printed and got up. It would make an excellent prize to students.

CATALOGUES.

Messrs. W. S. Sargeant and Co., of Chiswick, make a speciality of electric and steam launches for river and sea cruising, and send us a copy of their catalogue, which contains numerous illustrations of their various types of nautical automotors.

From the International Electric Company, of Redcross Street, London, we have received their latest catalogue and price list of electric fittings. We observe that there has been a considerable reduction in the prices of many descriptions of fittings, and also that this firm makes a speciality of apparatus for producing Rontgen rays.

Messrs. J. and C. Stirling, of Hamilton, N.B., have so well established themselves as manufacturers of motor-cars that they find it necessary to issue a catalogue describing the various types of these. There are no less than 14, ranging from the Stanhope car to the furniture van. We notice that, as befits a firm of such experience in carriage-building, the various vehicles are exceedingly well designed for their respective uses. The motors employed are Daimlers, which were fully described in our last issue.

The Mannesmann tube is largely used in motor-carriage construction as in many other branches of applied mechanics, and the high quality of the steel used enables a great saving in weight to be effected. The Company send us their catalogue, from which we learn that they have gone in largely for the manufacture of cycle and motor parts and accessories. There is an interesting record of tests to which their tubes have been subjected, and the results given are ample testimony of their great strength. The steel used has an average breaking strain of 35 tons per square inch.

We have received from Messrs. R S. Newall and Son (Limited), of Washington, Durham, the well-known pioneers of the wire rope industry, their catalogue of wire ropes. In this will be found some very useful tables applicable to every purpose for which wire rope is employed. Messrs. Newall and Son manufacture wire rope for aerial ropeways, suspension bridges, tramways, mines, &c. This firm were not only the first to rig a sailing ship with wire rope but they also supplied the wire rigging to the largest sailing ship in the world, the "France." Of these two vessels, separated in point of time by half a century, two very good photographs are given. This firm also manufactured the first cables used in tramcar propulsion. The catalogue is copious and interesting.

Those interested in electric tramways, railroads, &c., should obtain a copy of the voluminous and well illustrated catalogue issued by the Union Elektricilitats Gesellschaft of Berlin. This catalogue describes the various plants it has installed and gives a mass of interesting and accurate information. It is one of the best got up catalogues we have seen.

The International Motor-Car Company, of London, have issued a neat and well got up little catalogue of their various descriptions of motor carriages, ranging from the phaetonette to the cab and the van. The prices range from £140 for a phaetonette to £420 for a landau. We understand that over 800 motor-cars of this Company's type are in use on the Continent and in this country.

Messrs. Geo. Richard and Co. (Limited), of Broadheath, Manchester, have sent us a catalogue and price list of their specialities, including lathes, slotting and drilling machines, milling cutters, gauges, &c. We notice several new designs and inventions in the direction of accuracy of work and labour saving. This catalogue is well illustrated and described, and those thinking of putting down new plant would do well to peruse it. The prices seem to us remarkably moderate for such high class machines.

The Newton Machine Tool Works, of Philadelphia, send us a well printed, well illustrated, and neatly got up handbook of 180 pages, descriptive of their various machine tools. American machine tools are, we regret to say, occupying a favourite place with many firms, and it must be conceded that marvellous ingenuity is displayed in designing and making labour-saving devices. We notice that the Newton Company have greatly improved the milling cutters, and they can now run these at much higher speed than is usually the case.

Messrs. Davey, Paxman, and Co., the well-known engineers of Colchester, send us their catalogue of the numerous types of engines and boilers they manufacture. Probably no other firm in the world enjoys such a deservedly high reputation as this. Their semi-portable locomotives have been familiar sights in the London exhibitions of the last 30 years. Their position has been gained by supplying absolutely the best class of machinery. In the catalogue will be found full particulars of engines and boilers suitable for every purpose, together with a mass of technical information relating to steam, &c.

PRESENT STATE OF THE HORSELESS CARRIAGE INDUSTRY.

In the current issue of the *Engineering Magazine*, Mr. Worby Beaumont, M.I.C.E., &c., contributes a highly instructive article on this subject. He discusses the various trials that have taken place on the Continent, including the recent Paris-Dieppe Competition. As to the results, he says :—"From all this it will be seen that the victory has been almost entirely, year after year, with the carriages propelled by mineral spirit motors. It must, however, be noted that most of the prizes have been offered for, and have gone to, carriages carrying from two to four people. When larger numbers have had to be carried, steam has done good work, but only a few of the steam carriages have been small and light enough to run under the conditions which the oil motor vehicle is competent to meet. M. Serpollet made a number of excellent victorias, but their weight, although less than that of other steam-carriages, was more than that of the oil motor-carriages. This alone, although the variable power of the steam, and especially in the Serpollet, is a most valuable qualification for good and bad road travelling and hill climbing, has given the light oil motor-carriages every advantage. Every adverse condition of running at high speeds on common roads increases enormously with increase in weight. As soon as the weight is above that at which rubber tyres can be used, speed must suffer a reduction of 30 to 50 per cent. ; else wear, tear, breakage, and loss of power will result, with attendant discomfort for riders. The lighter Serpollet victorias of the type most recently made are light enough to be fitted with rubber tyres. They weigh only about 1,500 lbs., and, as they offer the many advantages of steam, they will probably remove many of the objections raised against the oil motor-driven vehicle.

"The experience in England with the lighter types of vehicles propelled by mineral spirit or oil is limited in comparison with that of the French—not perhaps one-fifth. So far as it has yet gone, it has only confirmed the facts proved in France—that the carriage driven by the mineral spirit motor is a very excellent makeshift, and, as now made by Panhard and Levassor, Peugeot Frères, Roger, and Delahaye, very difficult to improve or to describe as open to obvious improvement. They may be open to obvious objections, including vibration when the carriage is standing, and occasional smell of incompletely-burned oil when frequent stoppings and startings are imposed by street-traffic conditions ; but both these are objections which are lessening with almost every carriage that is built, although the means of their complete removal cannot be specified off-hand. In the early days of locomotives, coke ovens had to be put up as part of every great railway establishment, because for years they could not burn coal. The way to get over this difficulty could not be discovered in the hurry of a few months, but, after some years of every-day use of locomotives, the difficulty was removed in the simplest manner, the locomotive being used all the time, but denounced by every critic, whose useless and obstructive part is followed by similar critics of to-day concerning motor-carriages."

The First Death by a Motor-Carriage.—Last month we chronicled the name of the gentleman who will go down to posterity as being the first Jehu to be convicted of being drunk on a motor-cab. We now have to record the first death through a motor-cab. Juvenile exuberance is strongly manifested by the average London boy, who is *not* taught at the Board Schools how to behave, either at home or in the street. Indeed, the appearance of any novelty in the streets is as eagerly welcomed by the ordinary boy as "some new thing" was by the Athenians of old. Hence it is not surprising to read in the daily papers that as an electric cab was passing down Stockmar Road, it excited the interest of a large number of children who had just left morning school. One of the occupants of the cab cautioned the children to keep away from the vehicle, and naturally they did not, and equally naturally when about 200 yards away from the spot where the caution had been given a groan was heard, and the occupants of the carriage felt a sudden jerk. The driver at once looked at the wheels and saw that a child had somehow or other got entangled with the driving chain of the motor. The occupants alighted and doctors were at once sent for. Considerable difficulty was experienced in getting the child out, and it was not until one of the back wheels had been taken off that he was extricated, and by this time the poor boy had expired. It is thought that he got on the box at the back of the cab, and through his clothing catching in the cog he was drawn under the chain.

We are Glad to Hear It.—According to the *Pall Mall Gazette* the movement towards an introduction of automobile cabs—and omnibuses!—has reached Berlin. Some of the leading men of the electric establishments, among others Mr. Rathenau, the director of the Berlin Electric Works ; Mr. Borsig, the head of the largest locomotive-building establishments ; and Colonel Budde, the chief of the railway department in the "Generalstal" of the Prussian army, have founded a company for motor-cabs and omnibuses in the great towns of Germany, and they will begin their action at once in Berlin if the President of Police does not put a veto in their way. The Berlin pavement, mostly macadam in the principal thoroughfares, is exceedingly fit for motor-cabs, and there is every hope of success for such a company.

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President	Sir DAVID SALOMONS, Bart.
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Hon. Local Secretary	E. SHRAPNELL SMITH, Esq.
Semi-Official Journal of the Association	THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

SELF-PROPELLED TRAFFIC ASSOCIATION.

LIVERPOOL AND DISTRICT CENTRE.

WITH reference to the proposed trials of the Self-Propelled Traffic Association (Liverpool Centre) which are to be held next year, the members of the sub-committee are now engaged in formulating the rules, conditions, &c., and will meet on the 15th instant, when it is hoped a draft will be decided upon for submission to the entire body of the Council. We hope the London Council of the Self-Propelled Traffic Association will also see their way to join in promoting these trials, so as to contribute to their success and make them as representative as possible.

WE regret to announce that the paper which Mr. Dugald Clerk had arranged to read before the Self-Propelled Traffic Association (Liverpool) on "Oil Engines for Motor-Vehicles," and which was postponed from March 2nd last, is now again indefinitely postponed, mainly in consequence of Mr. Dugald Clerk taking the view that the advance in this class of motor has not been sufficiently great during the past year to warrant him in dealing with the subject in detail this session.

THE PRETOT SPEED GEAR.

THE question of variable speed gear for motor-carriage builders who use oil-motors is the great crux in design, and it is usually surmounted in anything but a mechanically satisfactory manner. One of the best designs we have seen has been brought out by M. Pretot, of 42, Avenue Phillippe Auguste, Paris—the well-known motor-car builder. This gear is shown in section in Fig. 1. As will be seen it is of the epicyclic kind. For the following description we are indebted to *The Engineer*:—

A is a disc which can be either keyed directly to the motor or better driven by teeth in its rim from a pinion on the motor shaft. It carries four smaller wheels, *D*—*see* Fig. 2 also—by long spindles, *a*, *a*, to which are keyed four sets of stepped wheels, H^1, G^1, F^1, E^1, which gear with four central wheels, *H*, *G*, *F*, *E*. The latter wheels are quite independent of each other, and each one is provided with a separate wheel, *I*, controlled by a powerful brake. On the other side of the disc there is the double wheel, *B*, *C*, of which *B* is the chain wheel and *C* a toothed pinion gearing with the four wheels, *D*. Let us look now at the action of the mechanism. Suppose *A* is revolving at a constant speed, and the four wheels, *I*, are

FIG. 1.

allowed to turn freely, the brakes being loose, then *C* will not rotate, but *D* will revolve as it circles round *C*, and will impart motion to H^1, G^1, F^1, E^1, and they to *H*, *G*, *F*, *E*, in proportion to their relative sizes. Now, suppose the brake is applied firmly to *E*, then, as *A* revolves, E^1 rotates at a speed proportional to the difference in diameter between it and *E*, and imparts motion to *D*, which in turn passes it on to *C* and *B*, and so to the driving wheels, this representing the highest speed of the vehicle. The two other wheels,

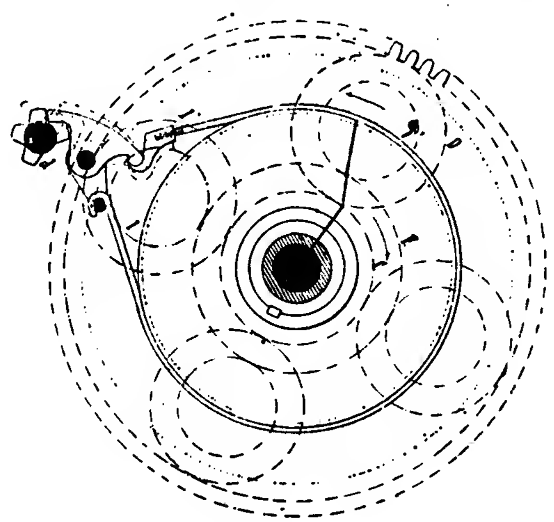


FIG. 2.

G, *F*, evidently give lower speeds, but when the pair, H^1, *H*, are put in action, the driving is reversed, and the carriage goes backwards. It is a little difficult to see at once why this should be. Two considerations will, however, we think, make it clear. In the first place, as we move from *E* to *G*, we get slower speeds until, if a wheel between G^1 and H^1, and of the same diameter as *D*, were used, no revolution of *C* would take place, because *C* and *H* would then be of the same diameter. We have, therefore, come from maximum to nothing, and any further step in the direction of increasing the cone wheel, as *H*, must represent a minus or reverse quantity. For a second consideration, suppose H^1 made so big, and H so small, that H^1 received no rotation at all from H—that is to say, suppose it was revolving round a single tooth in the centre of the shaft—then D would evidently be fixed, and its teeth would lock with C, which would then revolve in the same direction, and at the same rate as A. Now this is the reverse motion to that which all the other wheels impart, for they make C revolve, it will be seen, in the opposite direction to A. The speed which is imparted to B is easily found, and may be expressed by the formula—

$$\left(\frac{a}{A} \times x\right) - x,$$

where $\frac{a}{A}$ is the speed ratio between the stepped cones and x is the number of revolutions made by the disc. This is true only when D and C are of the same size, as in the case illustrated; if they are not of the same size the result found above has to be multiplied by their diameter ratio. The formula will be readily understood from the following considerations. Suppose all the brake wheels were loose and C fixed, and that A was caused to revolve. Then D and C being the same diameter, evidently in one revolution of A, D would make one revolution about its own axis. Now, this direction of revolution so produced is the same as that imparted by any one of the brake wheels. It is evident, however, that the only motion transmitted to C must be due to an excess of speed that D receives from the brake wheels over that which it would have by simply rolling round C, which means that the motion given to C equals the revolutions of C less the revolutions of A.

To Determine the Speed of Railway Trains.—Count the number of telegraph poles passed in a minute, double it, and the result is speed in miles per hour.

Fuel Cost Calculator.—We have received from Messrs. Meldrum Bros, of Manchester, one of their fuel cost calculators, and a most ingenious and useful little instrument it is. It is a double sliding rule made of stiff cardboard and about 6 inches by 2 inches, and can be conveniently carried in the pocket. By this automatic calculator the steam user can see at a glance what is the cost of the power he is employing, and also the weight of coal burned per I.H.P. per hour. It also enables him to see how the price of coal affects the cost of the production of power. To managers of mills and factories we can strongly recommend this miniature calculating machine. We would suggest to Messrs. Meldrum Bros. whether they could not bring out a similar one adapted for motor-cars showing the cost of running per hour and per week and per mile, for coal, electricity, and petroleum.

Magisterial Prejudice against Motor Vehicles.—We have often occasion to comment upon the discriminating harshness with which magistrates treat cyclists and drivers of automotors. From the provincial bumble, usually some petty horsey squire, we expect such things, but to find a London magistrate exhibiting such narrow-minded prejudice is simply deplorable. Yet more than one London magistrate shares the unenviable reputation for failing to do strict justice. At Marlborough Street Police Court recently the following parallel "judgments" (*sic*) were given :—

CABBY.—Leaving horse and cab absolutely unattended for thirty-five minutes, fined 1*s*.	MOTOR-CAR DRIVER. — Sitting in car outside owner's premises for fifteen minutes waiting orders—10*s*. and costs.

Comment is surely unnecessary—unless it be from the Lord Chancellor or Home Secretary.

LAW REPORTS.

MR. JUSTICE BYRNE, on September 15th, made an order for the appointment of a receiver and manager in the matter of the I.E.S. Accumulator Company (Limited), the action being brought by the sole debenture holder (Mr. Browning). Leave was given to act at once, and to borrow a sum not exceeding £1,000 for the carrying on of the business.

A PETITION was presented on September 7th to the High Court, by Messrs. J. K. and R. Lord, Barnbrook Boiler Works, Bury, Lancashire, for the winding up of New and Mayne (Limited). The solicitor for the petitioners is Mr. T. R. Birtwistle, Bury; the London agents, Messrs. Shaw, Tremellen and Kirkman, 14, Gray's Inn Square, W.C.

IN the Vacation Court, on September 15th, Mr. Justice Byrne, on the application of Mr. Rucker, a debenture holder, appointed a receiver and manager in the matter of New and Mayne (Limited), electrical engineers. No opposition to the order was offered. The receiver appointed was granted leave to act at once, and to borrow a sum not exceeding £1,500 for the purpose of the business.

UNDER the failure of Sidney J. Hersee, 14–15, Coleman Street, a meeting of the creditors was held on the 7th inst. at the London Bankruptcy Court. During the last two years he has been connected with the promotion of the Tavernier Motor Syndicate (Limited), Armstrong Dove Motor Syndicate (Limited), and other companies. The accounts filed under the proceedings show total liabilities £14,746, of which £4,492 are unsecured, and assets valued at sufficient to yield a surplus of £2,728 beyond the liabilities.

AT the London Bankruptcy Court, on September 23rd, the first meeting of creditors under the failure of Berkeley B. Bennett was held. The debtor about 18 months ago became a director of the British and Colonial Trading Corporation, and through it he became interested in certain company transactions. He has filed accounts showing a total indebtedness of £41,197, of which, however, only £2,135 is returned as expected to rank, and assets valued at £2,382. Amongst other things the debtor attributes his insolvency to a loss of £13,000 sustained by financing Mr. L. H. Goodman's undertakings, and to liabilities on unpaid calls, for shares underwritten, in the Leather Shod Wheel, £9,000, &c.

Daimler Company *v.* Bowen.

ON September 17th, before Mr. Justice Byrne, in the Vacation Court, on behalf of the Daimler Motor Company (Limited), counsel asked his lordship to restrain one, Bowen, from removing certain of the machinery and plant on premises and works on Eel Pie Island, purchased of the mortgagees by plaintiffs in May, 1896, the defendant's case being that the machinery in question was not included in the mortgage. The machinery having been actually moved and made ready for shipment, his lordship suggested an arrangement, as it was evident he could not order it to be replaced in working order pending the trial of the question raised in the case; but, difficulties being suggested by counsel who appeared for the respective parties concerned, the case was fought out at great length, and in the result it was agreed plaintiffs should take within a week.

Is a Motor-Van a Light Locomotive or a Legal "Carriage"? —A Point of Law.

AT Bow Street, London, on September 24th, F. Leaden, the driver of a motor-van, was summoned for allowing his van to stand in the roadway for 20 minutes without loading or unloading. The case was proved by P.C. 231 E who said he saw the van standing outside a shop in High Holborn from 12.30 to 12.50 on September 14th without loading or unloading. Mr. Houston contended at great length that this vehicle, being a motor-car, was to be considered, under the Light Locomotives Act, 1896, as a carriage, as was expressly laid down therein, and therefore it did not come within the Police Act, 2 and 3 Vic., under which this summons was taken out, but was subject only to the penalties provided by the former Act. He also called evidence to show that the van had only called for orders, and left immediately it was found that there were none. Mr. Lushington said that he could see no sort of reason why a motor-van should not be under the same regulations as any other vehicle for the conveyance of goods. The delay had been clearly proved, and he should impose a penalty of 10*s.* and 2*s.* costs. Mr. Houston said he should ask his worship in due course to state a case, and Mr. Lushington replied that he should have no objection to doing so if the application were made in the usual form.

More Furious Driving: Extraordinary Ignorance of Police and Court Officials.—Mr. Edmund Gibbs, of Lime Tree Terrace, New Southgate, was summoned at Marlborough Street, on the 8th inst., for riding a motor-tricycle to the common danger on the public highway. Constable Watts, C Division, stated that on September 23rd the prisoner, who was riding a motor-tricycle, went on the wrong side of the refuge at Oxford Circus. A number of persons were crossing the road at the time. He took the name and address of the defendant. Mr. Hannay: How did you catch the defendant? The Constable: I ran after him and hung on to his coat-tails. (Laughter.) Mr. Lyell (the Chief Clerk): What is a motor-tricycle? The Constable: It is a new invention. There is an electric battery to propel it, but one can work it with the feet without the aid of the motor. In defence, Mr. Gibbs said that the motor-power of his machine was petroleum, and not electricity. At the time in question he was only going two miles an hour, and was propelling the machine entirely by the aid of his feet. He could not move it at a more rapid pace when he only used his feet. Mr. Lyell: What about going on the wrong side of the refuge? The Defendant: I admit going on the wrong side of it. Mr. Hannay: That is in itself an offence. You must pay a fine of 5*s.* and 2*s.* costs.

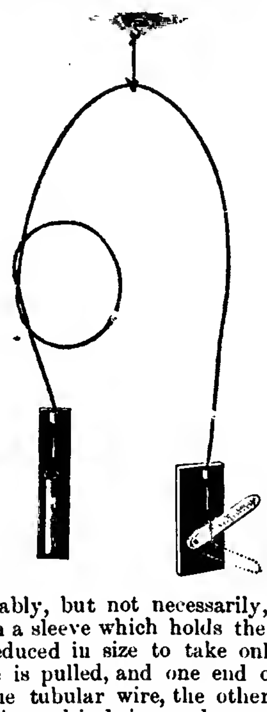
Furious Driving.—At the Gloucester Police Court on the 1st inst. John Taylor was summoned for furiously driving a motor-car on Sunday, September 19th. P.C. Millen said he was on duty in Northgate Street about a quarter to 8 o'clock on the evening of September 16th, when he saw a motor-car being driven at a speed of from 14 to 16 miles an hour. Witness called to the defendant, but he did not think he heard witness, as he was blowing the hooter. Two other young men were with defendant the whole time. Defendant said he had the car under perfect control, although he was going at about 14 miles an hour, and he could pull up within four yards. The Mayor pointed out the danger of such a practice, but as this was the first case that had come before the Bench they let defendant off on payment of the costs.

A Sensible Magistrate.—In a case heard recently in the Aberdeen Sheriff Court in which four cyclists were charged with racing on a section of the Newmachar Road, Sheriff Brown found the case not proven. He understood the prosecutor's contention to be that a bicyclist riding at racing speed, *per se*, committed a criminal offence, without reference to whether, as a matter of fact, danger was created to the public by the act. The prosecutor had not fully explained what the ratio of this view was, but his Lordship took it to be that from the conditions of the pastime in which he was at the time occupied, a racer, whether on a horse or a bicycle, was bound to shut his eyes to danger, and that the safety of the public was never in his mind at all. The presumption must be raised against him that cycle racing was of itself a danger to the public. The Sheriff had no doubt that many people had long ago reached the conclusion that even in their ordinary use such vehicles had added a new terror to life—(laughter)—but if they had to put up with them at racing speed, even on public thoroughfares, it was doubtless held that the Legislature must intervene to protect the public. He should not be at all surprised if legislation followed on the strength of the feeling in the public mind on this subject. But his Lordship was concerned at present only with the scope of the common law, and if a bicycle was a carriage, and so declared by statute, the prosecutor had never yet succeeded in obtaining a conviction against a driver of a carriage for furious driving, except on proof that in point of fact danger to the public had emerged. The evidence for the defence was strong enough to suggest that what was called racing speed in the present case was really of a somewhat harmless kind. (Laughter.) The decision of his Lordship was received with applause in Court.

A MECHANICAL TRANSMISSION SYSTEM.

Mr. Ernest M. Bowden, 9, Fopstone Road, Earl's Court, London, S.W., has patented a simple mechanism by which a small mechanical effort is transmitted round corners, or between points which are not fixed, without the use of such complications as pulleys, levers, or ball joints. It consists of a flexible pipe

formed of coiled wire, in which is another running longitudinally. At each end the inside wire projects beyond the outside, and is passed through a hole which is not large enough for the outside, or tubular, wire to go through; this hole, how-



ever, being preferably, but not necessarily, large enough part of the way to form a sleeve which holds the end of the outside wire, and then reduced in size to take only the inside wire. If the inside wire is pulled, and one end of it is drawn, say, an inch out of the tubular wire, the other end will be drawn the same distance in, and in being so drawn in it performs the operation which has to be done, although the wire cord formed of the two wires may hang loosely about in any position. The accompanying illustrations show the method of use. The wire cord is the only connection between two independent plates. Each plate has a small projection on it, through which the outside wire cannot go; but the inside wire is passed through the projections, and attached at one end to a lever, and at the other to a spiral spring. Notwithstanding that the model is suspended in mid-air, and that the cord is tied in a knot, the action is perfect and positive. When the lever is moved to the position marked by the dotted line, the spring is extended, and when the lever is released, the spring draws it back. For many purposes this method of transmission may be usefully employed.

We, however, question whether there is any novelty in this "patent." The combination is exceedingly simple and obvious, and must have been used in many operations.

DOINGS OF PUBLIC COMPANIES.

New Beeston Cycles and Motors.—Reconstruction Scheme.

After the remarkable and sanguine prospectus of the New Beeston Cycle Company (Limited), issued only as late as June last year, the circular proposing reconstruction just issued by the directors is but sorry reading. Possibly the shareholders have but little option in the matter, but we think it should require a good deal of consideration on their part before consenting to "sink the past" and practically place the original promoters in possession of the whole of the property and assets of the proposed new Company, by handing over £60,000 of debentures in the reconstructed Companies in exchange for £360,000 of vendors' shares in the present Company. Beyond this the shareholders are asked to provide further working capital at the rate of 3*s.* per share, the vendors, as far as we can see, not being called upon for any cash. It appears to us that as the whole of the cash originally subscribed by the shareholders has been absorbed, the vendors, who not only received the £360,000 in shares (which it is now proposed to exchange for the £60,000 of debentures) but a considerable amount in cash, should at the very least contribute to the required working capital *pro rata* with the other shareholders, to the amount of their holding in the old Company. It is for the shareholders to see to this at the meeting.

The following is the circular referred to, issued "by order of the Board," and dated September 29th last, in which the directors state that with reference to the notice of meeting sent out, the scheme embodied in the resolutions to be submitted at the meeting is the outcome of negotiations between the Board and the vendors extending over several months, with the object of (1) reducing the capital, which now stands at £1,000,000 nominal, of which £574,090 has been issued, principally in respect of goodwill and licenses; (2) relieving the business of the onerous burden of vendors' shares, representing over £360,000; (3) separating the cycle from the motor business. The scheme which is explained below will, in the opinion of the directors, place the business upon a thoroughly sound and independent footing and upon a proper business-like basis for the payment of dividends, and greatly increase the value of the shares, which now stand at a considerable discount, caused, no doubt, to a great extent, by the over-capitalisation of the Company. During the past season the Company has erected new works, which, with those previously in existence, are amongst the finest premises in the cycle trade. New machinery of the best class has been laid down for conducting the various departments on an economical basis. During the year nearly £70,000 has been laid out in additional buildings, plant, stock, &c., thus greatly improving the Company's position. Owing to the inclement season last autumn, and to the great difficulty the contractors experienced during the winter in getting building materials fast enough and sufficient men to rapidly complete the new works, the Company did not enter into full possession till April of this year, and it was later still before the new machinery was completed, and in full working order. Thus, in the new buildings, the management has only been able to take advantage of the latter part of this season's trade, while the output of the Quinton Works was much impeded by the introduction of the motor department. In consequence of these unforeseen difficulties the Company was unable to execute a large portion of the orders which had been placed with them, the profit on which would have represented a substantial sum. With respect to the motor department, the Board found themselves embarked in an entirely new industry, necessitating an expenditure of a very considerable sum of money in experiments, while continued changes in the construction of the motor-cycle were necessary to render it suitable for the English market. The great amount of care and attention and the large outlay which has been bestowed on this branch has, however, the directors are pleased to say, resulted in the fact that motors are now produced far in advance of anything previously in existence, either in England or abroad, so far as neatness of appearance, speed, power, easiness of control and absence of noise and vibration are concerned. The result of this expenditure will, your directors anticipate, enable the Company in the future to make a considerable profit on the motor business instead of, as in the past season, an outlay which practically absorbed the profits made in the cycle business. As this expenditure, however, was absolutely necessary in the establishment and development of this new industry, it must not be regarded as a loss; it should in the future be productive of satisfactory results to the new Company. The capabilities and achievements of the Company's latest motors will be appreciated by a perusal of the slip enclosed with the circular. The cycle department is undoubtedly profitable, but the motor department has yet to be commercially developed. The scheme is, therefore, designed to separate the cycle from the motor department, so that immediate dividends can be paid upon the former, while the latter is arranged upon such a basis that as soon as the machines now being turned out are exhibited to the public, and a demand thereby created, it also will prove to be an earning power; indeed, it will probably be more profitable than the cycle department. Two things are imperative for the entire success of the undertaking:—(1) Reduction of capital to a reasonable amount; (2) a substantial working capital to enable the Company to fully utilise the large works at its disposal. With this object in view, the Board has made terms with the vendors which enables the Company to be consolidated by reducing the share capital from £574,000 to £210,000 without reducing the holdings of the general body of shareholders. This, with debentures as referred to below, represents, in the opinion of the directors, the fair value of the cycle and motor businesses, buildings, building land, plant, machinery, stock, and other assets. The main points of the scheme as arranged are as follows:—Two companies to be formed, one called the Beeston Cycle Company (Limited) and the other the Beeston Motor Company (Limited). The former to take over as from September 1st, 1897, the Northern Works, and all the machinery, plant, and stock of the cycle department, all book and other debts, cash, &c., and to discharge all the liabilities of the Company up to that date. The books of the Company are at present in the hands of the Company's accountants. Subject to their examination, the tangible assets to be taken over by the Cycle Company are as follows:—Buildings (Messrs. Whittindale and Watson's valuation), £33,529 5*s.* 11*d.*; machinery, plant, tools, &c. (Messrs. Whittindale and Watson's valuation), £16,596 16*s.* 11*d.*; stock of finished and partly-finished machines, materials, &c., taken at or under cost, £18,521 3*s.*; cash, bills receivable, book and other debts, less reserves for bad and doubtful debts, £18,484 4*s.* 9*d.*; together, £87,131 10*s.* 7*d.*; less current liabilities, £9,721 15*s.* 11*d.*; total, £77,409 14*s.* 3*d.* The Motor Company to take over as from the above date the Southern Works, with the motor plant, stock, &c., also the motor patents and licenses, the former of which, subject to audit, stand in the books as follows:—Buildings (Messrs. Whittindale and Watson's valuation), £9,992 9*s.* 6*d.*; machinery, plant, tools, &c. (Messrs. Whittindale and Watson's valuation), £8,075; stock of finished and partly-finished machines and materials, taken at or under cost, £3,766 8*s.* 2*d.*; total, £21,833 17*s.* 8*d.* In addition to the above-named tangible assets, the Motor Company will possess a valuable license, covering a wider range of patents than the one now possessed by the Company. By it they will be able to make motors upon a simpler method than heretofore, which will cheapen the machines, while at the same time making them more readily saleable. Further, the new license, instead of being for bicycles and tricycles only, will also enable an entirely new branch to be developed — namely, the supplying of light stationary motors suitable for a variety of businesses. This license, as before stated, was the principal asset of the old Company, and is doubtless of considerable value. The capital of the Cycle Company will be £100,000, in £1 shares, divided into 40,000 5 per cent. preference and 60,000 ordinary shares, of which only about £90,000 will require to be issued. The capital of the Motor Company, £110,000, divided into 44,000 5 per cent. preference and 66,000 ordinary shares. The scheme entitles the shareholders, for every £10 share now held by them, to ten £1 shares, divided into five £1 shares in each Company—two preference and three ordinary. Each £1 share thus created will be credited with 17*s.* paid up, it being understood that not more than 1*s.* of the remaining 3*s.* is to be called up within four months. This is necessary to provide adequate working capital. The shareholders are offered an alternative in lieu of accepting the shares as above, to have allotted to them fully paid-up debentures, equivalent to 20 per cent. of each shareholder's present holding—one-half in each new Company. Terms have been made with the holders of vendors' shares by which they accept £30,000 debentures in each Company for their present holding of £360,000, an arrangement which must be of immense benefit to the general body of shareholders. A further important part of the scheme is that the whole of the company promoting element on the Board will be got rid of. Mr. Rowland Hill, J.P., and Dr. C. W. Iliffe (Coroner for North Warwickshire), who were the directors of the successful Quinton Cycle Company (Limited), and Mr. Samuel Gorton (who was general manager), have consented to act as directors. The scheme now placed before the shareholders has not been arranged without long and difficult negotiations, and it at one time seemed quite hopeless of accomplishment. The above-named directors feel convinced that the new arrangement will benefit all concerned. It should immediately lead to an increase in the value of the shares, and the possibility of substantial dividends upon the smaller capital will, the directors trust, secure the support of every shareholder to their proposals.

New Companies Registered.

[Under this heading we give a full list of new Companies registered which take power to make, deal, or become interested in any manner in automotor vehicles.]

	Capital.
Cosmopolitan Cycle and Motor Works, Ld.	£2,000
Croll's Improved Brake-holder Co., Ld. (34–36, Gresham Street, E.C.)	10,000
Electrical Vehicle Syndicate, Ld.	25,000
Fleet Cycle Co., Ld.	2,000
London Electrical Carriage Co., Ld.	100
,, ,, Coupe Co., Ld.	100
,, ,, Van Co., Ld.	100
Scott's Engine Syndicate, Ld. (Norwich)	2,000
Tudor Accumulator Co., Ld. (5, Cross Street, Manchester)	50,000
W. T. Ellison & Co., Ld. (Chaney Street, Manchester)	12,000

THE registered and general offices of the Australian Cycle and Motor Company (Limited) have been removed to Broad Street House, Old Broad Street, E.C.

THE offices of the British Electric Traction Company (Limited) have been removed from Great Winchester Street to Donington House, Norfolk Street, Strand, London, W.C.

Tudor Accumulators.—The Tudor Accumulator Company has been registered, with a capital of £50,000, to take over as a going concern the business of an electrical engineer and manufacturer of accumulators, carried on by Mr. Antoine B. Pescatore at 5, Cross Street, Manchester, and at the Barn Meadow Works, Dukinfield, to acquire certain patents of Henry O. Tudor, and to carry on the business of electricians, &c.

Rossleigh Cycle Company.—At the first annual meeting of the Rossleigh Cycle Company held last month in Edinburgh, Mr. Marshall, the chairman, in moving the adoption of the report—which recommended a dividend of 5 per cent. on the preference shares and 10 per cent. on the ordinary shares, placing the sum of £1,500 to the reserve and carrying forward £924—congratulated the shareholders on the progress the business had made. On the year there was an increase of £24,000. Regarding the motor-car question, the directors were of opinion that the motor-car business could be worked alongside of their cycle business. The report was adopted.

Yorkshire Motor-Car Company (Limited).—The first general statutory meeting of the shareholders of this Company was held last month at the Company's rooms, Albert Buildings, Bradford. Mr. A. H. Hutton, Chairman of the Company, presided. There were present Mr. Mollett, Mr. McEwan, Mr. Conyers, Mr. Cashburn, Mr. Childe, Mr. Roume, Mr. Whitfield, and Mr. Tuke. The chairman reported that the great difficulty with which the Company had had to contend had been in getting hold of cars, especially large ones, for passengers, and wagons for heavy loads. The Company was negotiating for steam wagons which would carry loads of two tons and upwards. Mr. Tuke reported that, although a new undertaking and working under the drawbacks named by the chairman, a profit had been made on the first three months' working, after paying all expenses. Cars were being sent on loan to all parts of the country, to Brighton, Bristol, Norwich, Hanley, Doncaster, York, &c. A licence had been obtained from the Bradford City Council to run a motor bus for hire in the streets. A resolution was passed appointing Mr. Skelton, of Bingley and Bradford, as a director of the company.

The Irish Motor-Car and Cycle Company.—Following the resolution to wind up, no time has been lost in making a first distribution of the assets. On the 21st ultimo, Mr. Robert Gardner, the liquidator, issued the following notice:—"On and after Monday, September the 27th, I will be in a position (upon receiving from you, either by post or personally at this office, the allotment letter and the bankers' receipt for the moneys lodged by you) to refund you in exchange therefor all the money paid by you upon your preference shares without any deduction whatever; and also the entire money paid upon your ordinary shares, save the first 2*s.* 6*d.* paid on application. As soon as the liabilities and costs have been ascertained and discharged there will be a further and final distribution amongst the ordinary shareholders." This is fairly prompt work, and although a good many shareholders are dissatisfied at not getting the whole of their money back at once, we hardly think they have anything to complain of, especially in view of the statement made by the chairman of the Company at the confirmatory meeting, that it was intended to enforce the company's claim under Mr. Baines's guarantee.

The Tendency of Oils to "Gum."—A convenient method of ascertaining the tendency of oils to "gum," owing to the absorption of oxygen—a defect common in animal and vegetable oils—is to place equal quantities of the oils to be compared simultaneously on an inclined sheet of glass or similar surface. In this way it will soon be apparent that the oil which absorbs the greatest quantity of oxygen will become the most "gummy." Although efficient, this method has been found too slow for many purposes. In Bach's method the oxygen is caused to act on the oil under the dual influence of heat and pressure in sealed tubes, and the oxygen taken up may be directly measured. The results obtained in this way on a number of well-known lubricants are given in the following table, which is taken from a paper read some time ago by Mr. Alex. E. Tucker, F.I.C., of Birmingham:—

One grain.	Absorbed oxygen. C.C.
Valve oil	0·10
Valvoline	0·45
Russian mineral oil	0·74
Lubricating oil, S.G. 0·877	0·70
Lubricating oil, S.G. 0·865	4·80
Re-distilled resin oil, V.G. 0·963	76·30
Resin oil	181·00
Olive oil	144·00
Rape oil	166·00
Cottonseed oil	111·00

A NEW-FELT WANT.

(From the *Daily Mail.*)

Mr. Editor,—

I am at a Lost to know what kind of Blow to give with the wishel for the motor-cabs perhaps some of the readers of your valueable paper may kindly inform me one who as Been 14 years at a corner in the Fashionable West end of London will greatly oblidge yours truly C. E. C.

To the Editor of the *Daily Mail.*

In answer to "C. E. C.," the proper way to whisthel (not "wishel") for a motor-cab is to ring a bell. I am a cabdriver, so I ought to know. JOHN MULDOON.

CORRESPONDENCE.

. *We do not hold ourselves responsible for opinions expressed by our Correspondents.*

. *The name and address of the writer (not necessarily for publication)* MUST *in all cases accompany letters intended for insertion or containing queries.*

SOME ESTIMATES OF THE HORSE.

To the Editor of The Automotor and Horseless Vehicle Journal.

Sir,—I observe in one of your articles a reference to the difference of opinion in regard to the horse as between Mr. Preece and myself.

When I was at college one of the subjects for my degree consisted of comparative anatomy, the study of which I have never regretted, as it has rendered me good service on many occasions in designing apparatus.

It is quite clear that Mr. Preece has not had the good fortune to study anatomy, or he would have come across the celebrated book of the late Professor Huxley on the Vertebrata, in which he deals with the anatomy of the horse, and shows how exceeding perfect a machine it is.

The heavy body of the animal is suspended by the equivalent of Cee springs, far more perfect than those employed by carriage builders. In fact, with all the improvements which have been made in regard to machinery to this period, there is not a single invention which can approach in its perfection the principles which are found to exist in the animal kingdom, such, for instance, as complete elasticity of motion—any device equivalent to the muscle or material which can replace itself, after wear, throughout its mass, by a system of feeding. And, lastly, no machine has any property approaching to that possessed by the lowest of animals, generally called instinct.

My opinion is not in any way changed that the horse is a far more perfect motor than any which can be designed by man, although I am ready to admit that machines for many purposes have the advantage.

The horse will no more disappear by the development of motor traffic than has the prophecy come true that such a result would follow the introduction of railways. The number of horses in use at the present time is largely in excess of that existing when railways started, due, no doubt, to the increase of population combined with new demands, and these factors are not likely to be eliminated in the future.—Yours faithfully,

David Salomons.

[We have no comment to make on the above letter save that we agree in the main with our correspondent, and we note with satisfaction that he has been a disciple of that great man Huxley.—Ed.]

DESIGNING MOTOR-CARRIAGES.

To the Editor of The Automotor and Horseless Vehicle Journal.

Dear Sir,—I find the Automotor a very useful and well edited journal, yet I think you might perhaps be able to give more particulars concerning the engines of steam carriages for turnpike roads.

What is wanted in the cases referred to is :—

Number of cylinders; diameter of cylinders; length of stroke; state how many are high pressure; revolutions of crank shaft to road wheels; diameter of same road wheels; amount of heating surface in boiler; steam pressure in boiler; weight of steam carriage.

The above information would enable an engineering man like myself to make calculations, and be a great help in designing a steam carriage.

I have studied the subject for 29 years, and have had some experience with traction engines. I have now designed a simple, compact, and neat steam carriage, with three-speed gearing. The driving and steering are done by one man, who sits at the back end of carriage. It will carry five people.

To construct a steam carriage to the best advantage I consider it necessary that it should have three-speed action gearing—one gear for level roads, another for moderate incline, and a third for very steep hills.

Apologising for troubling you.—I am, yours truly,

W. Stanley.

St. Mary's Gate, Chesterfield.

[The design of road locomotives is well thrashed out, and the information can be obtained from the price lists of Burrell, or Aveling and Porter. We appreciate our correspondent's good opinion.—Ed.]

THE DAIMLER FRICTION GEAR.

To the Editor of The Automotor and Horseless Vehicle Journal.

Sir,—I should esteem it a great favour if you would give me particulars of the friction gear used by the Daimler Company, and illustrated in your last issue, in their oil launch; whether they have the rights, the number of patent, &c.—Yours, &c., A. Dabson.

[We could not express any opinion as to any "rights" the Daimler Company may have in this or any patent. Your best course is to consult a patent agent and have a search made.—Ed.]

A HORSE AND VAN OR AN AUTOMOTOR VAN.

To the Editor of The Automotor and Horseless Vehicle Journal.

Sir,—Owing to the extension of my business I find it necessary, in order to supply my customers at a distance, to have another horse and van. Having heard a good deal about motor-cars I take the liberty of asking you for a candid opinion and advice on the subject. Shall I be wise in placing an order for another horse and van, or shall I have an automotor one? I know the latter are very dear, but the advertisement would be worth something to me, as in this town there are no motor-vans used as yet. What kind do you recommend?—Yours faithfully,

A Belfast Grocer.

[We refer to this in an article entitled "Kelvin's Law of Economy."—Ed.]

THE UNIVERSAL MOTOR-CARRIAGE AND CYCLE COMPANY (LIMITED).

To the Editor of The Automotor and Horseless Vehicle Journal.

Sir,—Can you give any information as to the proceedings, &c., of this Company? What do they manufacture or sell, what dividend do they pay, and what is the present price of their stock?—Yours faithfully, Broker.

[We know nothing about the Company in question beyond that the original Company was registered under the title of British Motor-Carriage and Cycle Company.—Ed.]

FORE AND AFT STEERING.

To the Editor of The Automotor and Horseless Vehicle Journal.

Sir,—In connection with the vexed question of steering, it may not be out of place to remark that there is really no reason why steering wheels should not be placed at *both* ends of a vehicle. The driving wheels would be placed between them (there is not, I believe, any law against exceeding four wheels), and, if midway, this would mean the reduction of the steering length by one-half, with a correspondingly reduced play for the steering wheels. In practice, the driving wheels would probably be placed more forward, making a long composite six-wheeled vehicle, the fore part acting as a locomotive and the hinder part representing a car attached.—I am, &c., A. J. A.

October 2nd.

P.S.—Possibly, where *plateways* are used for heavy goods traffic, the front steerers might be disconnected and coupled to the drivers immediately behind them.

[We hope to discuss the principles of steering mechanism shortly.—ED.]

PROCEEDINGS OF TECHNICAL SOCIETIES.

Mechanical Propulsion on Canals.*

THE really complicated subject of traction on canals involves at the outset the determination of the resistance of a boat in a channel of restricted section. This resistance depends in some way upon the ratio $\frac{\Omega}{\omega}$ which the wetted cross section Ω of the canal bears to the immersed midship section ω of the boat. Although this ratio may remain the same, the resistance varies according as the channel becomes shallower and wider, or deeper and narrower; and in a less degree it also varies with the roughness of the channel bed. Again, the form of the boat, while its immersed midship section may remain unchanged, is an important factor in the determination of the resistance; although in a canal the actual form of a boat has not so much influence on the resistance as in open water.

De Mas.—The most exhaustive and important experiments that have yet been made upon the resistance to traction on canals were commenced in 1890 by M. de Mâs with the chief kinds of boats in general use upon the canals in the North of France; and his first experiments were made upon the River Seine, with a view to determining the resistance of the boats in an expanse of smooth water. The wetted section of the Seine above the weir of Port-à-l'Anglais, where the experiments were made, is at least 5,651 square feet, while the boats tried were about 16·4 feet wide and immersed 6·2 feet deep, that is, about 102 square feet of immersed section: so that the ratio n of the sections $= \frac{\Omega}{\omega} = \frac{5,651}{102} = 55{\cdot}4$; and therefore the results may be taken as if the boats had been tried in an unlimited expanse of water. The experiments showed that the ordinary formula $R = K \omega V^2$ does not hold; that the various elements on which resistance to traction depends are not connected with one another by this or any other proportion of similar form. This is clearly seen from the following deductions, firstly for boats in rivers, and secondly for boats on canals.

Boats in Rivers.—1. *For a boat worked at a given speed the resistance to traction is* not *proportional to its immersed midship section* ω. This fact is shown by the following Table 1, taken from the results of M. de Mas' experiments upon a boat tried at successive draughts of 3·28 and 4·27 and 5·25 feet; the figures are embodied in M. Derome's paper upon this subject, which was presented to the sixth International Congress on Inland Navigation in 1894, and to which the author is indebted for the following information. It will be seen that for one and the same speed the resistance to traction increases less quickly than the immersed section.

TABLE 1.—*Resistance of Boats to Traction in Rivers.*

Speed per second.	Absolute Resistances at Absolute Draughts of			Relative Resistances at Relative Draughts of		
	3·28 feet.	4·27 feet.	5·25 feet.	1·00	1·30	1·60
feet.	lbs.	lbs.	lbs.			
1·64	85·98	97·0	119·05	1·00	1·13	1·38
3·28	284·4	315·3	357·1	1·00	1·11	1·26
4·92	617·3	694·4	782·6	1·00	1·13	1·27
6·56	1106·7	1276·4	1463·9	1·00	1·15	1·32
8·20	1774·6	2101·0	2466·9	1·00	1·18	1·39

* Abstract of paper read by Mr. LESLIE ROBINSON at the Institution of Mechanical Engineers.

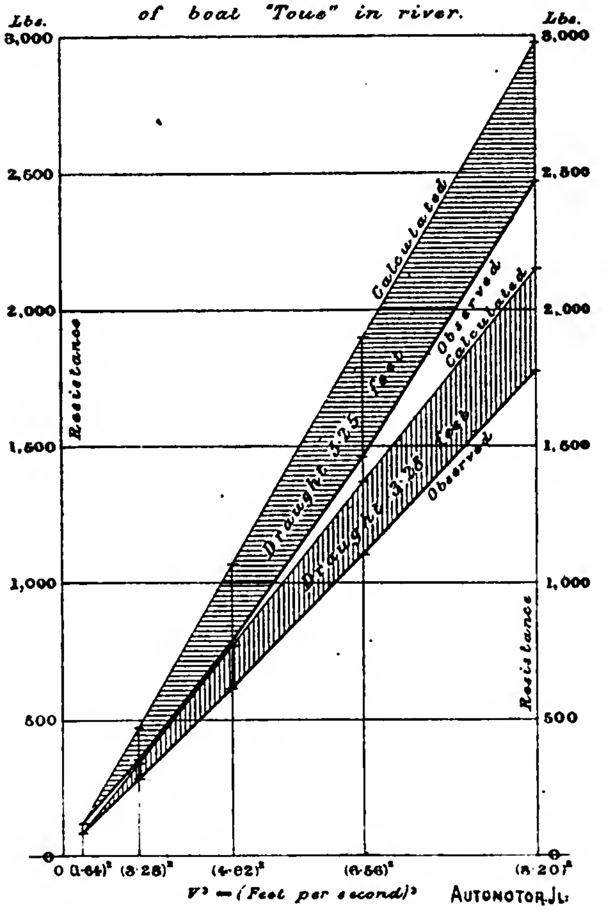
2. *For a boat of given draught the resistance is* not *proportional to the square of the speed.* Although this fact is evident from Table 1, it is more clearly demonstrated by the results of a series of experiments on the different kinds of boats of which the resistances are given in Table 3. The results for the "Toue" have been worked out in Table 2 at a draught of 3·28 feet and at speeds of from 1·64 to 8·20 feet per second, or 1·12 to 5·60 miles per hour; and also at a draught of 5·25 feet for the same speeds. In Plate 1 this Table

TABLE 2.—*Observed and Calculated Resistance of the "Toue" to traction in river. See Plate 1.*

Speed per second V.	Square of Speed V^2.	Resistance at Draught of 3·28 feet.		Resistance at Draught of 5·25 feet.	
		Observed.	Calculated. K=31·97.	Observed.	Calculated. K=44·35.
feet.		lbs.	lbs.	lbs.	lbs.
1·64	2·6896	85·98	85·98	119·05	119·05
3·28	10·758	284·4	344	357·1	476
4·92	24·206	617·3	774	782·6	1071
6·56	43·034	1106·75	1376	1463·9	1904
8·20	67·24	1774·6	2150	2466·9	2975

PLATE 1.

Observed and Calculated Resistance to traction of boat "Toue" in river.



has been plotted as a diagram, giving the resistances actually observed, and as calculated from the formula $R = KV^2$, where the value of K is 31·97 for 3·28 feet draught, and 44·25 for 5·25 feet draught. It would thus seem that the greater the draught of the boat the larger is the discrepancy between the observed and calculated resistances, especially at the higher speeds.

Table 3.—*Relative Resistance of Four Boats to Traction at different Speeds in River. See Plate 2.*

Speed V.	Square of Speed = V^2. Absolute.	Relative.	Péniche.	Flûte.	Toue.	Prussian.
Ft. per sec.						
1·64	2·6896	0·25	0·34	0·38	0·35	0·28
3·28	10·758	1·00	1·00	1·00	1·00	1·00
4·92	24·206	2·25	2·27	1·82	2·35	2·31
6·56	43·034	4·00	4·30	3·41	4·75	4·36
8·20	67·24	6·25	—	5·61	7·95	7·28

3. *For a given boat the coefficient of resistance to traction* $\frac{R}{\omega V^2}$ —being the ratio which the resistance R to traction bears to the immersed midship section ω and to the square of the speed V—*is not independent of the speed, as it is assumed to be in the ordinary formula* $R = K \omega V^2$. This ratio varies as shown in Table 4.

Table 4.—*Coefficient of Resistance to Traction in Rivers.*

Speed V.	Square of Speed V^2.	Values of Coefficient $R \div \omega V^2$. Péniche.	Flûte.	Toue.	Prussian.
Ft. per sec.					
1·64	2·6896	0·9678	0·7843	0·3907	0·2624
3·28	10·758	0·7153	0·5106	0·2788	0·2388
4·92	24·206	0·7219	0·4130	0·2912	0·2455
6·56	43·034	0·7690	0·4935	0·3311	0·2604
8·20	67·24	—	0·4583	0·3547	0·2780

4. *For a given speed and draught the resistance to traction varies considerably, according as the wetted surface of the boat is more or less smooth.*

5. *For boats of the same form, and under otherwise similar conditions, and within the limits of the experiments, the resistance to traction is entirely independent of the length of the boat.* On this point M. de Mas experimented with three boats of the "Flûte" build, having the same breadth amidships, and fore and aft shapes as nearly identical as possible, and differing only in the length of hull below water, which with a draught of 5·25 feet was as follows:—"Alma" 124·64 feet; "René" 99·44 feet; "Adrien" 67·44 feet. As shown in Table 5, and plotted in Plate 3, the total resistances of these

Table 5.—*Resistance independent of Length of Boat. See Plate 3.*

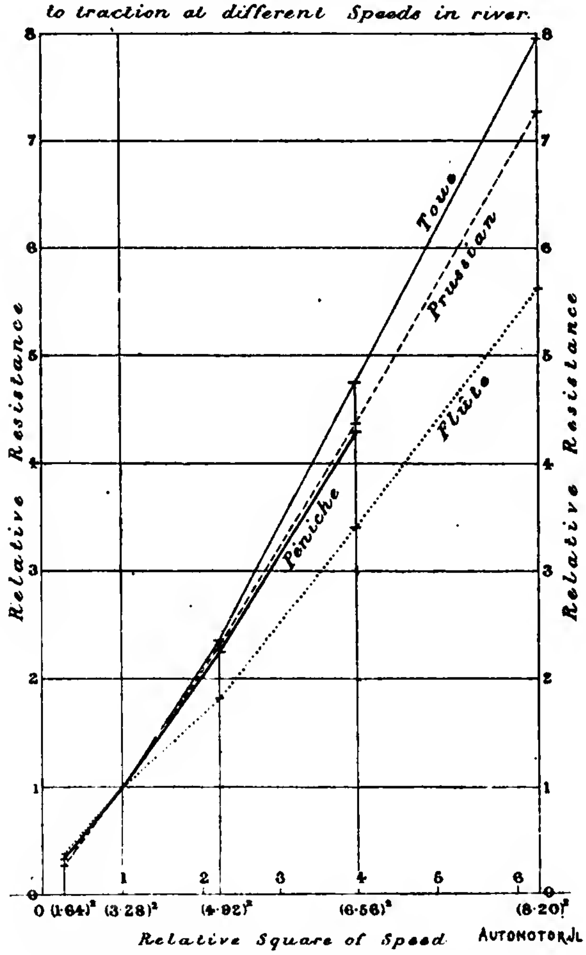
Boat.	Length.	Displacement.	Resistance at Speed per second of 1·64 ft.	3·28 ft.	4·92 ft.	6·56 ft.	8·20 ft.
	feet	tons	lbs.	lbs.	lbs.	lbs.	lbs.
"Alma" ...	124·64	286	119·0	357	783	1464	2487
"René" ...	99·44	—	112·4	353	783	1466	2469
"Adrien"	87·44	148	112·4	353	783	1466	2469

three boats at the same speed were almost identical. The "Alma" and "René" were subsequently tried again at the same speeds as in Table 5, but with 1 foot less draught, namely 4·25 feet, when they gave resistances absolutely identical with each other. From these results it also follows that the resistance due to the build of the boat does not vary in the ratio $\frac{b}{L}$ which the breadth b amidships bears to the length L.

Boats on Canals.—The same boats that had been tried on the River Seine were subsequently tried on the Bourgogne Canal at speeds increasing from 0·56 mile per hour by increments of 0·56 up to 2·8 miles per hour; and it was again found that, other conditions remaining unchanged, and within the limits and under the conditions of the experiments, the resistance to traction is independent of the length of the boat. It was also found that there is a considerable increase in the resistance to traction on passing from the river into the canal. Table 6 is drawn up for different boats and different draughts, and for speeds of 1·64 and 3·28 feet per second, or 1·12 and 2·24 miles per hour, which appear to be the extreme limits of speed adopted and practicable on French canals; R represents the total resistance to traction in the canal, and r in the river; $\frac{R}{r}$ is the ratio of the two resistances.

Plate 2.

Relative Resistance of four Boats to traction at different Speeds in river.



One noticeable fact which appears from Table 6 and from the plotted diagram, Plate 4, is that, for the same value of the ratio $n = \frac{\Omega}{\omega}$, the less the resistance to traction of a boat in the river, the greater will be the relative increase in the resistance to traction when the boat is transferred from the river into a canal: or inversely, the larger the tractive force in the river, the smaller will be the relative increase on transference into a canal. Thus the "Toue," requiring 97·0 lbs. tractive force in the river, requires when transferred to the canal, 240·3 lbs., being an increase of 2·48 times; whereas the "Péniche," requiring 224·9 lbs. tractive force in the river, requires in the canal only 379·2 lbs., that is, an increase of only 1·69 times against 2·48 times for the "Toue." The build of the boat is less important in a canal than in a river; hence it will not exert so great an influence on the resistance to traction.

PLATE 3.

Resistance independent of length of boat.

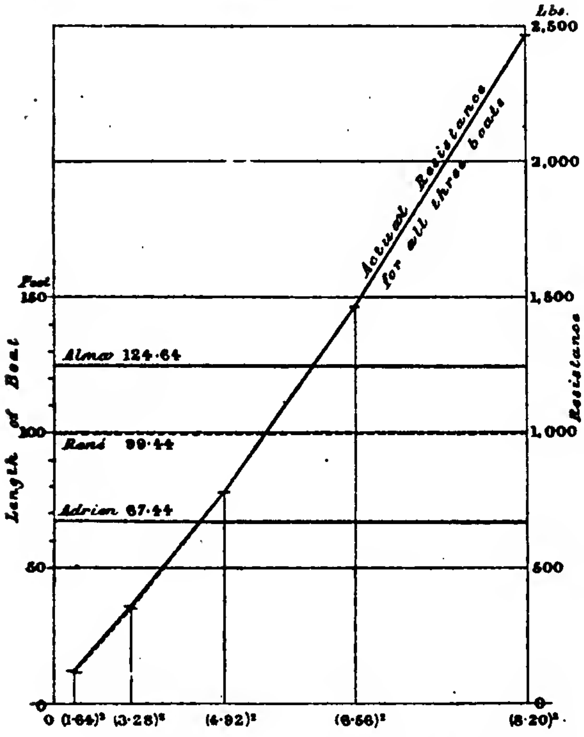
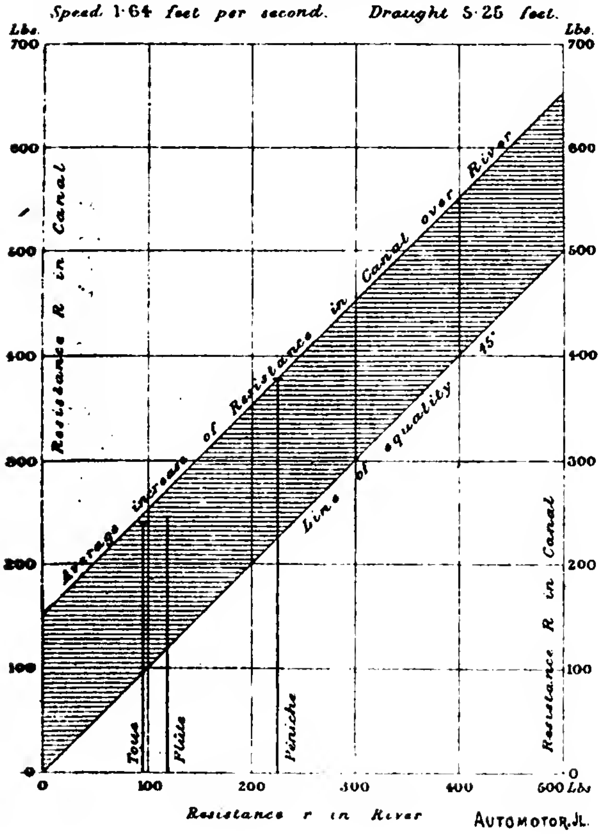


PLATE 4.

Resistance to traction in Canal and in River.

Speed 1·64 feet per second. Draught 5·25 feet.



Another notable fact observed from Table 6 is the rapidity with which the ratio $\frac{R}{r}$ of the resistances decreases when the ratio $\frac{\Omega}{\omega}$ of the sections increases.

TABLE 6.—*Resistance to Traction in Canal and in River. See Plate 4.*

Draught.	Boat.	Wetted Section of Canal. Ω	Immersed Section of Boat. ω	$n = \frac{\Omega}{\omega}$	Speed 1·64 feet per second. Resistance in Canal. R	Resistance in River. r	$\frac{R}{r}$	Speed 3·28 feet per second. Resistance in Canal. R	Resistance in River. r	$\frac{R}{r}$
feet		sq. feet	sq. feet	ratio	lbs.	lbs.	ratio	lbs.	lbs.	ratio
5·25	"Péniche" ...	317·91	86·66	3·67	379·2	224·9	1·69	1896·0	663·6	2·86
	"Flûte"	317·91	86·44	3·68	246·9	119·0	2·07	1060·4	357·1	2·97
	"Toue"	317·91	86·44	3·68	240·3	97·0	2·48	1020·7	277·8	3·67
4·27	"Flute"	317·91	70·30	4·52	154·3	97·0	1·59	626·3	315·3	1·99
	"Prussian" ...	317·91	68·68	4·62	119·1	48·5	2·45	474·0	176·4	2·69
	"Margotat" ...	317·91	69·98	4·54	116·8	46·3	2·52	434·3	147·7	2·94
3·28	"Flûte"	317·91	54·04	5·88	105·8	86·0	1·23	421·1	281·4	1·48

(To be continued.)

Mechanical Traction.

AT the Camera Club, 28, Charing Cross Road, on October 7th, Mr. J. H. Knight delivered a lecture on two years' progress in mechanical traction.

Mr. KNIGHT commenced by stating that it was thought by many that no progress had been made during the past two years, that the public had expected that no sooner were mechanical vehicles permitted to run than the horse would disappear from our streets; but quiet progress had been made, and many more motor-cars were running than the general public were aware of. The lecture was illustrated by 75 lantern slides—the Benz, the Daimler, and other motor-cars being described, and photos and diagrams of same shown—among them Mr. Knight's motor-cycle, made in the summer of 1895, which was the cause of its maker being brought up before the Farnham magistrates and fined.

The Dion Bouton steam cars were shown on the screen, also a diagram showing the boiler of the same. Serpollet carriages were described at some length, and a diagram of the latest type with a petroleum fired boiler was shown; this, it is claimed, will carry two passengers 90 miles with 5¼ gallons of ordinary paraffin oil. Electric carriages were briefly touched upon. Mr. Knight complained that makers of these vehicles were very reluctant to give any information respecting them.

The lecture was followed by a discussion. Mr. H. A. O. Mackenzie spoke in favour of steam, he having constructed a steam brougham about 1872.

Mr. W. Worby Beaumont said thatuntil last November no road trial could be made in this country, and unless a vehicle were well tested on the road it would be useless to expect the public to purchase it, hence months must be spent in experiment. The French had had a great start of us, and had in many ways solved the problem. He alluded to several carriages he had seen in France during the summer, one having travelled from Moscow to Dieppe to take part in the run from Paris to that town in July last.

Mr. Knight, in replying to a question, said there was no difficulty in regulating the speed of a petroleum car if the governor were controlled by a spring that could be compressed by a lever at the will of the driver.

NEW INVENTIONS.

Claiming particularly to apply directly or indirectly to Motor Vehicles, &c.

Compiled for "The Automotor and Horseless Vehicle Journal" by Herbert Haddan and Co., Registered Patent Agents, of 18, Buckingham Street, Strand, W.C., London.

*** *At the request of a number of subscribers we are pleased to announce that for the future we have arranged to more thoroughly cover the field of completed Patents referring to the Motor-Car Industry, by reproducing the latest Specifications and Diagrams.*

Patents Applied For.

Abbreviations: Impts., Improvements in; Relg., Relating to.

1897.

Sept. 1. 20,105. J. Wilson. Impts. motor-carriages, &c.
,, 2. 20,167. A. J. Lyon. Impts. interchangeable gear.
,, 2. 20,191. C. Smith and H. F. Smith. Impts. cycles and motor-cars.
,, 4. 20,336. W. H. Luther and J. Cockburn. Impts. relg. driving gear.
,, 6. 20,424. C. S. McIntire. Periphery driving gear.
,, 7. 20,468. G. F. Priestley. Impts. cycles, motor-cars, and similar vehicles propelled by steam.
,, 8. 20,625. G. Forester. Combined foot-rest and lock for motor-cars, &c.
,, 10. 20,807. F. W. Gorse. Sprocket wheels and chains.
,, 14. 21,040. T. Boydell. Anti-friction roller sprocket wheels.
,, 14. 21,054. British Thompson Houston Company (Limited) (Hewlett). Surface contact electric railway systems.
,, 14. 21,055. British Thompson Houston Company (Limited) (Hewlett). Impts. electric cars and surface contact railways.
,, 15. 21,204. W. Newton. Impts. adjusting ball bearings.
,, 16. 21,291. J. M. McCulloch. Variable speed and reversing gear.
,, 18. 21,434. G. Webb. Construction of ball bearings.
,, 18. 21,438. Robins, Roberts, and Tomkins. Combined foot-brake and rest.
,, 20. 21,493. F. W. Gorse. Fixing pedal crank-pins.
,, 21. 21,580. T. White. Impts. cycles, motor-cars, &c.
,, 21. 21,595. F. Goret. Impts. autocars.
,, 21. 21,639. W. A. Martin. Impts. steering and driving gear.
,, 21. 21,651. W. H. Barker. Impts. driving mechanism.
,, 22. 21,694. C. H. Sims. Impts. relg. cycles and motor-cars.
,, 22. 21,702. S. Straker. Impts. driving and reversing gear.
,, 22. 21,724. P. Schutze. Electrically-propelled road vehicles.
,, 23. 21,781. J. Pritchard. Driving chains for autocars and cycles.
,, 23. 21,792. L. Myers and F. R. Baker. Attaching cycle pumps.
,, 24. 21,936. E. Draullette and E. Catois. Impt. relg. motor-carriages.
,, 25. 21,959. R. Newfliess and W. J. Cranmore. Fastener for chains of motor-cars and cycles.
,, 25. 22,049. G. Chappell. Anti-vibration device for steering bars.
,, 25. 22,060. F. T. Gibbs and W. Wright. Impts. wheels and frames.
,, 28. 22,176. E. Turner and E. Jones. Impts. variable gearing.
,, 28. 22,200. Billing, Partridge, and Middleton. Tool for use in joining cycle and motor-car frames.
,, 29. 22,290. C. H. Sims. Impts. relg. ball bearings.
,, 29. 22,339. O. C. Immisch. Electric motor-car switch.
,, 29. 22,343. C. W. Vosper. Impts. driving gear.
,, 29. 22,365. Gamble and Binnie. Attaching motors to vehicles.
,, 30. 22,439. W. Davidson. Impts. self-propelling road vehicles.

Specifications Published.

14,303. Horseless Carriages. James Garvie, Devanha House, New Southgate, Middlesex. June 27th, 1896.

Relates to horseless carriages, and consists chiefly in arranging the engines within or upon the axle of the road wheels, the said axle being made hollow or tubular to contain the engines.

The said axle may itself constitute the cylinder or cylinders of the engines and in this case the engines would be situated at right angles to the longitudinal axis of the vehicle and would be preferably placed opposite to each other with the crank shaft located between them and at right angles thereto. When the cylinders are arranged in this manner a third cylinder may be used in conjunction with the two others, this third cylinder being situated either vertically above or below the crank shaft or at any suitable inclination thereto. This third cylinder would act to carry the crank over dead points.

Any suitable means may be employed for communicating motion from the crank shaft to the road-wheels, appropriate devices being supplied for reversing the motion.

23,350. Apparatus for Forming and Regulating the Combination of Oil with Air for Oil Motors. Sir William Arrol, Dalmarnock Ironworks, 241, Baltic Street, Glasgow, and George Johnston, 94, Hope Street, Glasgow. October 21st, 1896.

In the improved apparatus constituting the invention a piece of woven or other suitable permeable material is arranged so that at one place it passes through and is saturated with the oil, whilst at another place the air, preferably heated, is made to pass through the oil-carrying permeable material, and thence through a passage leading to the motor, the air in its passage taking up some of the oil.

Fig. 1 is a vertical section of the apparatus, and Figs. 2 and 3 are, respectively, a side elevation and a transverse vertical section of a part of the apparatus.

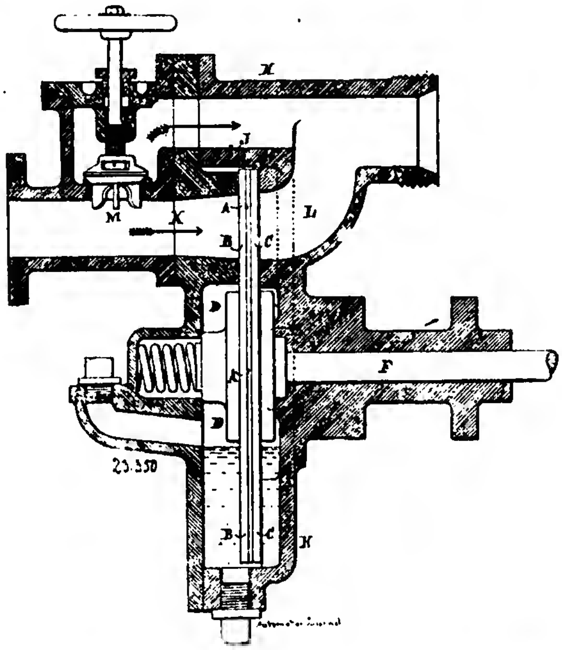


Fig. 1.

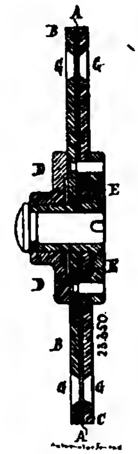


Fig. 2. Fig. 3.

The oil-carrying permeable material, A, is placed between two discs, B, C, held and pressed together by screwed bosses, D, E, on a spindle, F, which is made to rotate at a suitable speed by gearing such as a worm wheel and worm (not shown). Annular sets of holes, G, are formed in the two discs, B, C, to give the oil access to the permeable material, A, and to allow the air to pass through it. The discs, B, C, are enclosed in a casing, H, the lower part of which is supplied with the oil; and they are partly immersed in the oil. At the upper part of the casing, H, the discs, B, C, pass through a narrow space, J, and across openings or passages, K, L, on each side, the passage, K, on one side being the inlet for the air and the passage, L, on the other side communicating with the motor (not shown). The air is thus compelled in passing from the passage, K, to the passage, L, to go through the holes, G, and the oil-saturated permeable material, A, the holes, G, being brought round in succession by the rotation of the spindle, F, and the air in its passage thus taking up some of the oil. A by-pass passage with an adjustable regulating valve, M, is also provided to allow some air, if required, to mix with the oil-saturated air.

16,079. Motors and Transmission Gear. George Dominy, King Street, Weymouth, Dorset, and John James Henry Sturmey, 19, Hertford Street, Coventry, Warwick. July 21st, 1896.

From a steam generator a steam pipe is led into a suitable chest. The end of the pipe is preferably located in the lower part of the chest in a horizontal or other suitable position, and is directed towards the blades of a light vertical fan wheel adapted to rotate at a high speed in the said case. The lower part of the case is filled with water or other suitable liquid, which preferably does not reach up to the wheel, the level being prevented from rising by an overflow pipe hereinafter referred to. Around the end of the steam pipe we arrange a tapered or other suitable nozzle in such a manner that the water is able to enter the back and underside of the nozzle, and is carried therethrough by the action of the steam—on the principle of the well-known injector for supplying steam boilers with water. The nozzle may form a projection from the side of a vertical hollow cylinder or case fixed to the bottom of the chest or special frame in such a way that the water may freely enter the cylinder; the steam pipe may be led through the wall of the cylinder opposite to the nozzle. The lower part of the

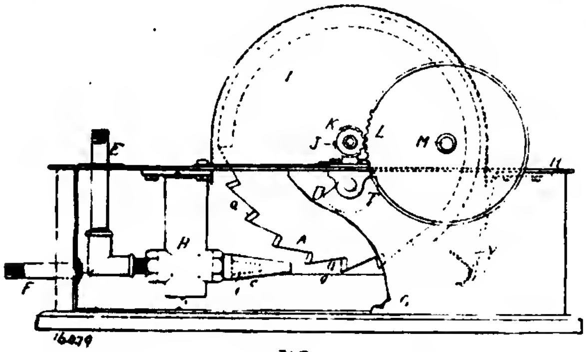


FIG 1

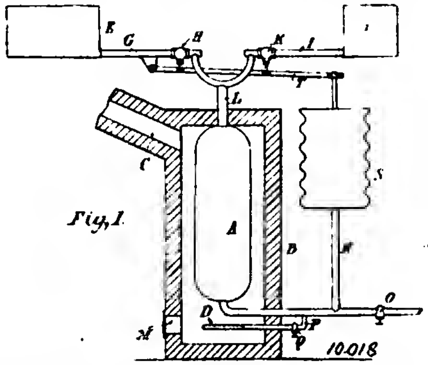
nozzle-cylinder may be provided with a strainer. The nozzle may be adjustable as to angle and to adapt it to the variable pressure of steam, quantity of water, temperature, and other varying circumstances in any suitable manner. The water on being forced from the nozzle impinges on the blades and rotates the wheel. Beyond the wheel a plate, with its upper part curved forward towards the nozzle, may be fitted to direct the disturbed water downwards or otherwise, and so back to the cylinder and nozzle. The spent water may drive an assistant wheel. A loosely fitting float or floats may be employed to help prevent the water splashing unduly. The fan is adapted to rotate at a high speed, though it is anticipated that a lower speed than is employed with steam turbines at present in use will be sufficient to produce the same amount of power. The water in the tank will soon become heated by the steam and cause the condensation to become less rapid. The overflow water rising from condensation may be returned along a tube having its exit end below the level of a small tank of water and thence into the boiler. The said tank (which may be arranged to operate as a cooler) and the chest before mentioned may be made steam tight or not, or up to a pressure regulated by a suitable valve or valves. The overflow or pressure from the chest is preferably made under water. The shaft carrying the fan is preferably geared to another shaft adapted by any suitable means to revolve at a much slower speed but with correspondingly increased power. The first or any shaft or a connection thereto may be made flexible so that its motion may be transmitted in an indirect line with an avoidance of complicated mechanism.

10,018. Motive Power Apparatus Consuming Liquid Fuel, such as Petroleum and Heavy Oils. Howard Lane, 184, Corporation Street, Birmingham. May 11th, 1896.

This invention consists in the construction of apparatus forming an adjunct or attachment to motors of the class described and whereby the nature of petroleum and the like is altered by decomposing it in a retort along with water or along with gas-engine exhaust products, viz., steam or aqueous vapour and carbonic acid.

A is a retort set in a brickwork chamber, B, lined with refractory material and containing at the lower part or furnace or heating apparatus of any suitable kind. The retort is by preference fitted with iron turnings or fragments to present a large surface. C is the flue passing off to the chimney. The heating apparatus is by preference a ring burner, D, for gas. E is an oil reservoir, and F a water reservoir. the pipe, G, from the oil reservoir, E, is provided with a valve, H, and the pipe, I, from the water reservoir, F, is provided with a valve, K. Both pipes are connected to the top of the retort, A, by the pipe, L. The burner, D, is lighted through a firing hole, M. From the bottom of the retort a pipe, N, leads off to the motor cylinder and is provided with a valve, O. The burner, D, is supplied with gas by a branch pipe, P, with a valve or cock, Q. Another branch pipe, R, leads to an expansible and collapsible weighted gas holder, S, which is connected by a lever, T, or other means to the valves, H and K. The petroleum and the water may, if desired, be supplied by pumps instead of by gravitation; and in that case I regulate the rate of pumping automatically by the rise and fall of the gas holder.

To operate the apparatus a little cotton waste is placed in the furnace and a little oil admitted from the reservoir, E, into the retort by the valve, H, or by a separate valve. This oil gravitates without being volatilised and drips upon the cotton waste in the furnace, which is then ignited and the retort gradually heated up. As soon as the retort is hot the water inlet valve, K, is also slightly opened. The petroleum and the water together are now in the retort transformed into carbonic oxide and hydrogen because the oxygen of the water combines with the carbon of the petroleum forming carbonic oxide, and the hydrogen both of the water and of the petroleum is liberated in a free state.

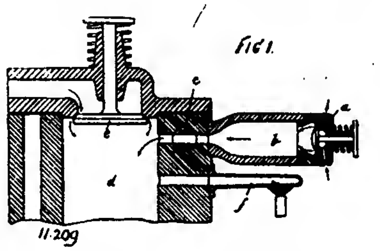


In case the pipe, I, is connected to the exhaust of the motor and the latter is started a mixture of carbonic acid gas, steam or aqueous vapour, and nitrogen finds its way from the exhaust through the valve, I, into the pipe, L, where it commingles with the petroleum admitted by the valve, H, and enters the retort, wherein the carbonic acid combines with the carbon of the petroleum forming carbonic oxide and the hydrogen of the oil is liberated. The nitrogen forms a neutral or diluting gas.

If the make of gas is in excess of the requirement of the motor, the gas holder, S, expands and closes the valves, K and H, partially or wholly. The supply of gas to the furnace is adjusted or regulated by the valve, Q, and is comparatively small in quantity.

11,209. Vaporisers for Petroleum-Engines. Osvald Bomborn, Querstrasse 4[II], Leipzig, Lindenau, Germany. May 22nd, 1896.

This invention relates to a vaporiser for petroleum-engines, its arrangement being such that the hot gases resulting from each explosion are utilised for heating the vaporiser, and this without there being any danger of the gases, or mixture of vapour and air, being ignited within the vaporiser. To effect this a valve opening communications between the vaporiser and the cylinder in which the explosions take place, is closed during the period of compression, *i.e.*, during the upward stroke of the piston, and opens again only during or after each charge is exploded, the resulting hot gases being thus admitted into the vaporiser.



The latter may be heated either by allowing such gases to pass directly into same, or indirectly, by admitting the gases into a chamber surrounding the vaporiser.

The quantity of petroleum necessary for forming the vapour enters the vaporising chamber through a spring-controlled valve at each period of suction. The hot walls of the chamber vaporise the petroleum, and these vapours then pass through the valve into the cylinder and thus mix with the air entering through the valve. On the return of the piston, therefore, such mixture of petroleum vapours and air is compressed, the valves being at the same time closed.

The compressed mixture is now ignited in any suitable manner, for instance, by means of an igniting tube, and the hot gases resulting therefrom pass during, or immediately after the ignition of the charge, from the cylinder through the now open valve into the vaporiser, and thus heat the latter, whereas a premature ignition of the charge by the hot walls of the vaporiser is prevented.

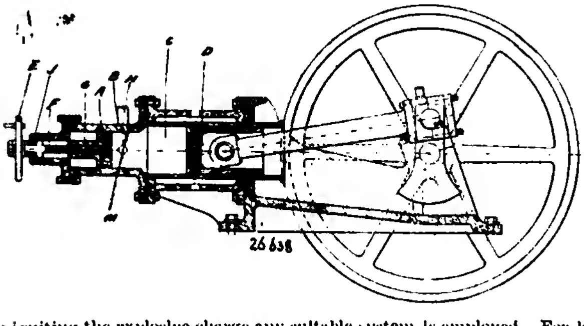
26,636. Gas and Petroleum-Engines and Motors. Robert Owen Allsop, 37, Norfolk Street, Strand, London. November 24th, 1896.

In the compression space or combustion chamber is provided a piston or plunger, A, which, being advanced or withdrawn, diminishes or increases the cubical contents of the space into which the explosive mixture of gas or oil vapour and air is compressed in the return compressing stroke of the motor piston.

The compression chamber employed in carrying out this invention may be water jacketed in gas or petroleum engines, and in the latter also may be employed as and for the purposes of vaporisation of the oil. The space at the back of the adjustable piston or plunger may by suitable means be water-jacketed if desired.

A, B, C, and D are respectively the adjustable piston or plunger, the compression or explosion chamber, the cylinder, and the motor piston. The compression chamber, as shown, is a separate bored casting bolted to the cylinder by suitable flanges. The adjustable piston is advanced or withdrawn by revolving the hand-wheel, E, which operates the screwed spindle, F, working in the screw threads cut in the bored boss, G, forming a continuation of the adjustable plunger or piston, A. Suitable metal piston packing rings are used to check the escape of gases. J is a casting against which the flange of the screwed spindle, F, bears, and is bolted to the casting forming the compression or explosion chamber. J is bored to receive G. At M is a valve timing the ignition of the charge of compressed gas or oil vapour and air. N is the ignition tube with Bunsen or other suitable burner.

FIG. 2.



In igniting the explosive charge any suitable system is employed. For large stationary gas and petroleum-engines a hot tube ignition with a timing valve is used; for locomotives and road motors and the like, preferably one or another suitable systems of electrical ignition. Either hot tube ignition or electric ignition are well suited for ignition in carrying out this invention.

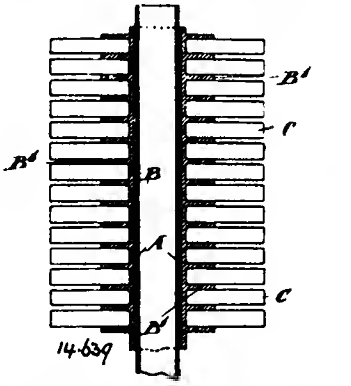
This invention affords a ready means of facilitating the starting of engines and motors for gas or petroleum-driven locomotives for rail or road or for motor-cars or motor-cycles, by lessening the compression when pulling round the fly-wheel by hand.

This invention also affords a ready means of regulating the speed and power of engines and motors. Advancing the plunger towards the motor pistons will increase the initial compression of the explosive mixture and consequently the power of the explosion. Withdrawing the plunger in a direction away from the motor piston will conversely diminish the compression and consequently the force of the explosion will be less. Thus the engine becomes differentially regulated, and its power and speed elastic and variable at will. Moreover, in the use of this invention it is not necessary, in regulating the engine, to interfere with or alter the actual amount and proportion of gas or oil vapour supplied, and thus the delicate adjustment of gas or oil vapour to air need not be disturbed. Several modifications are described.

14,639. Apparatus for the Production of Electricity from the Waste Heat of Gas, Steam, or other Heat Engines. Herbert John Dowsing, 24, Budge Row, London, E.C. July 2nd, 1896.

This invention relates to the application of appliances known as thermopiles for the direct production of electricity from the waste heat of explosive or other heat engines.

A, represents part of the exhaust pipe of the engine, B, a cylinder of porcelain, fireclay, or other suitable fire-resisting material, which is a bad conductor of electricity, and having formed therewith the flanges, B^1, between which are placed the elements, C, of the thermopile. The inner ends of these elements

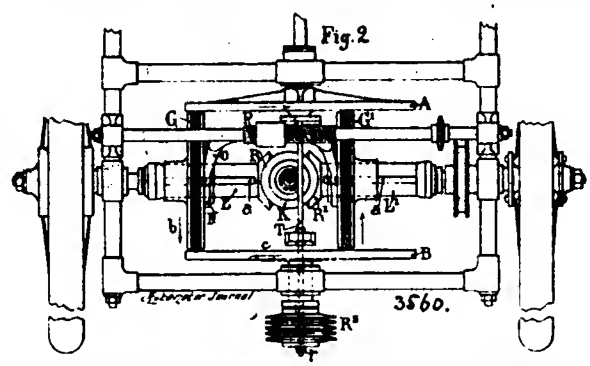


touch or are brought into close proximity with the cylinder, B, so as to be heated by the heat transmitted thereto from the exhaust pipe, A, through which the hot products of combustion pass on their way to the outer atmosphere. The outer ends of the elements, C, are freely exposed to the cooling effect of the outer atmosphere, the difference of temperature between the inner and outer ends of the elements, C, causing a current of electricity to be generated in them in the manner well understood in connection with thermopiles.

The arrangement of thermopile above described and shown, is given only by way of example as any other suitable arrangement of thermopile may be employed.

3,560. Driving Gear of Automotor Vehicles. Paul Auriol, 23, Rue Godot-du-Maroi, Paris, France. February 10th, 1897.

Relates, firstly, to transmitting mechanism composed of a disc, A, a disc, B, two rollers, G, G^1, wheels, R, R^1, and subordinate pinions, K, K^1, hollow shaft, I, at the end of which are mounted the subordinate pinions, E, E^1, which gear with the wheels, F, D, one of which, F, is wedged or keyed on the shaft, H, and the other, D, near the wheel of the vehicle. Secondly, of mechanism composed of the spindle frame, T, the rod, S, and springs, R^2, enabling all reaction on the shafts and frame to be overcome, and effecting the tightening



of the two discs against the rollers, G, G^1. And, thirdly, a mechanism composed of the screw, P, acting on the two arms of cross-piece, O, which, by means of the collars with ball bearings attachments, N, N^1, causes the rollers, G, G^1, to approach or to move away from the centre, which cross-piece can be operated equally well by levers as by the screw, P.

11,734. Steering of Horseless Vehicles. Maurice Le Blant, 21, Boulevard Poissonniere, Paris. May 29th, 1896.

The movable part of the fore carriage is provided with a toothed ring, with which gears a pinion mounted on the spindle of the steering handle or wheel.

Between the ring and the fixed part of the fore carriage, especially in the case of heavy vehicles, anti-friction rollers or balls are placed, such balls or rollers being guided by a circular guide plate carried by arms extending from a collar mounted on the perch bolt.

THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL

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CONTENTS.

ROLLER BEARINGS & THEIR APPLICATIONS.*

As the application of rolling motion to bearings is at the present time exciting much attention, the author ventures to hope that the matter contained in the following paper will be acceptable to the members of this Association.

The subject may be divided into the following heads:—

I. The advantages arising from the application of roller bearings.
II. The requirements and details of construction of such bearings.
III. The results already obtained from roller bearings which have been applied to railway vehicles, tramway cars, and other purposes.

* Paper read at the Manchester Association of Engineers by Mr. THOMAS W. HOW, F.I.S.

I.—*The Advantages Arising from the Application of Roller Bearings.*

The principal advantages arising from the application of roller bearings are the following:—

Reduction in starting effort.
Decreased tractive effort in the case of vehicles, whether running on ordinary roads, tramways, or railways.
Decreased resistance to rotation in the case of shafts and other revolving mechanisms.
Avoidance of hot bearings and economy in lubrication.

The vital importance of reducing starting effort and tractive force to the lowest possible point is well illustrated by the amount of labour and capital which has been expended with results generally satisfactory, from an economic point of view, upon the construction of the road, railway, and tramway systems of the world. The primary object of such systems is to reduce the force necessary to accomplish the transportation of people and merchandise, and, as a consequence, to effect such transportation at the least possible monetary cost.

It is interesting to note that very early in history the advantages of rolling motion were discovered. The ancient Greeks and Romans quickly appreciated the advantages of placing heavy loads upon rollers or wheels when desirous of moving them, rather than attempt to do so by sliding them over the surface of the ground. In other words, the advantages arising from the use of rolling, as compared with sliding friction, were so obvious as to ensure universal adoption of the principle.

Having obtained such good results from the adaptation of rollers or wheels for tractive purposes, it is strange that such a long period should have elapsed before any serious attempt was made to apply the same kind of motion between the wheels and their axles in the case of wheels revolving on fixed axles, or between the axle journals and their bearings, in the case of axles revolving in fixed bearings, as had been found so advantageous when acting between the rims of the wheels and the surfaces upon which they moved, the earliest of such attempts being so far as the author is aware of quite modern date.

The importance of reducing frictional assistance both in starting and running is now fully acknowledged, and is emphasised by the many anti-friction metals and special devices for improved lubrication of axles and shafts now on the market. Whatever degree of success the best of these devices may have attained they cannot approach such favourable results as are produced by the application of properly-constructed roller bearings. With reference to this part of the question, the following extract from a paper read at the Toronto meeting of the British Association in August last, by Mr. Bayley Marshall, M.Inst.C.E., is interesting:—

"*Reduction in Starting Effort.*—The reduction in the effort required to start vehicles or shafts fitted with roller bearings as compared with those fitted with ordinary bearings is of such importance that, if it were the only advantage, it would warrant the necessary additional monetary expenditure.

"In the case of steam, electrical, or other mechanical traction, the reduction of starting effort allows of heavier trains or vehicles being controlled by the existing locomotives or other motors than can at present be dealt with, and in many cases would avoid the necessity of a second locomotive.

"In the case of electrical traction, the reduced starting effort is of almost vital importance, as not only does it effect a very considerable saving in electrical output, but also greatly reduces the serious

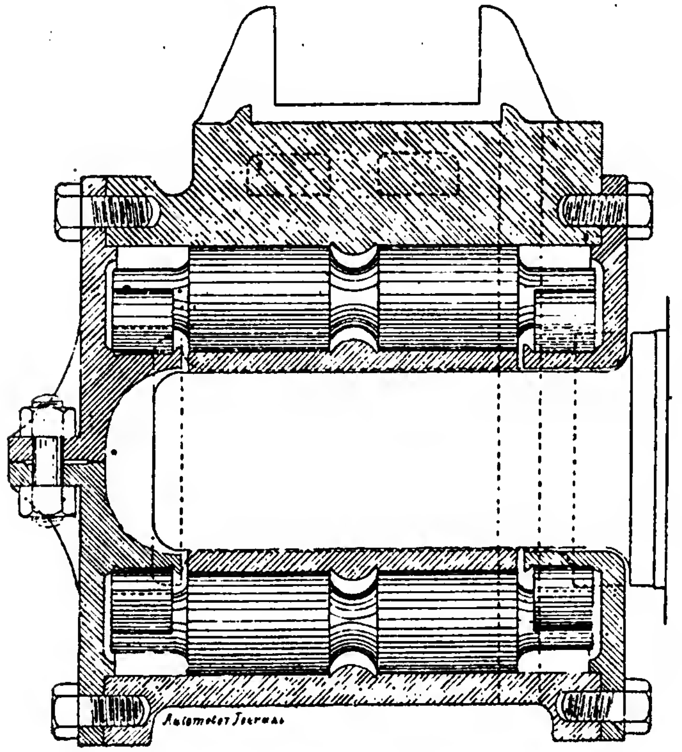

Plate 1.

rush of current through the motors at the moment of starting, which rush is due to the fact that the motors and load have to be started at the same moment, with results most detrimental to the life of the motor. If the necessary effort can be materially reduced, there will be a large economy effected under the head of 'Maintenance of Motors.'

"In the case of horse traction, the starting of the load is, as in the case of electrical traction, the most trying part of the work, and the constant effort the horses have to make to overcome this resistance when employed on heavy draught work, such as omnibuses, tramcars, drays, railway carts, &c., &c., is the principal factor in reducing their lives to the present low average. Undoubtedly, where vehicles are fitted with roller bearings, horses can perform their duties with much less distress than with vehicles fitted with ordinary bearings, a result greatly to be desired from a humane as well as from an economical point of view.

"*Decreased Tractive Force.*—Although it is not claimed that the reduction in tractive force will be so large in proportion to that in starting effort, it must be remembered that this force is in application during the whole of the time a vehicle is running on level ground or ascending gradients; this point, therefore, becomes of great importance when the total amount of work done is calculated.

"*Decreased Revolving Effort.*—This is of great economical value in all cases of heavily-loaded shafting, as careful experiments have shown that the amount of power required to drive the main and counter shafts in workshops, all the tools being idle, amounts to as much as from 50 to 83 per cent. of the power required when all the tools are in full work; these figures show that there is ample room for improvement in shafting bearings.

"Another important field for the application of roller bearings is to the main and thrust bearings of propeller shafts. The author is not aware of any reliable data as to the percentage of engine power absorbed in overcoming the friction of these bearings as now constructed; but, judging by analogy and from experiments on similar bearings, it must be very considerable.

"*Economy in Lubrication.*—This, though not of first importance, is a considerable item, seeing that a perfectly-constructed roller bearing does not require any lubrication, but only sufficient oil need be applied to prevent the rusting of the various parts."

The author thinks it is only right that he should state that Mr. Marshall's favourable opinions were chiefly founded on the results of experiments and trials made with roller bearings of the design and character hereinafter described.

II.—*The Requirements and Details of Construction of such Bearings.*

The requirements of a satisfactory roller bearing may be stated as under:—

1st. The rollers must be provided with sufficient bearing in lineal inches and be of sufficient diameter to withstand the stresses imposed upon them, and must also be made of suitable material.

2nd. The rollers must not be allowed to touch each other; they must be controlled against lateral motion, and must remain exactly parallel with the axis of the journal throughout their revolutions thereon, as any deviation from the later requirement reduces the contact between the rollers and journal to a point, and sets up a spiral movement of the whole series of rollers upon the journal. If such movement is allowed it is fatal to the good working of the bearing.

3rd. That the moving parts must be proportioned so that only rolling movement takes place between the engaged services.

4th. That the end thrust or tendency to lateral movement must be controlled not only in the case of the rollers themselves, but also of the axle or shaft in a fixed bearing, as, for instance, a railway axle, or of the bearing when revolving on a fixed axle, as does the ordinary road vehicle wheel.

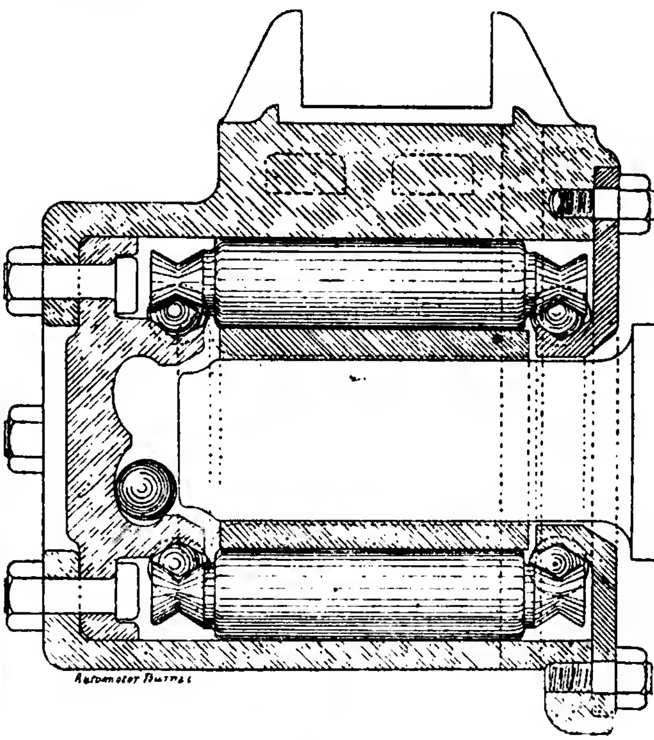

Plate 2.

5th. That the bearing must be as simple and as free from complications as possible.

6th. Dust and dirt must, as far as possible, be excluded, though their presence is not so injurious to roller as it is to ordinary bearings.

7th. If it is desired to make a commercial as well as a mechanical success of such bearings, they must be so constructed that they can be produced at reasonable cost; they must not require special attention, and must be capable of long service, with small cost for maintenance.

PLATE 3.

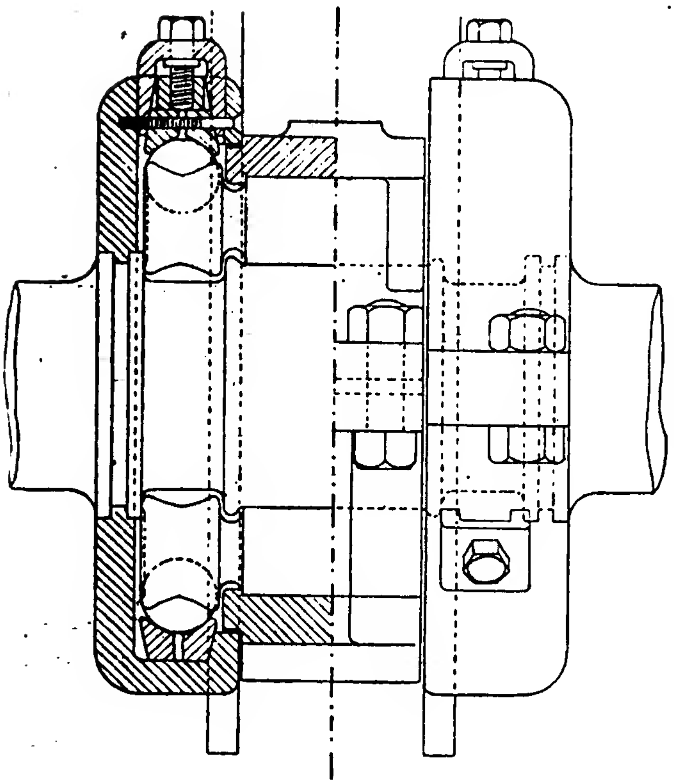

PLATE 4.

Simple as the above requirements may appear, the author believes that the only bearings at present which approach their fulfilment are those he is about to describe, and it will be interesting to state shortly the steps by which the present design was reached.

In the first attempts the rollers were spaced by subsidiary rollers as shown in Plate 1, or by balls as shown in Plate 2; one such subsidiary roller or ball being placed at each end between each pair of rollers so that in any bearing there was twice the number of subsidiary rollers or balls than of main rollers. It was found, in the first place, impossible to keep these spacers in their proper position, as there was a strong tendency for them to fly outwards, and in the second place there was nothing to prevent the whole combination taking a spiral form.

To overcome the first difficulty, floating rings were introduced as shown in Plates 3 and 4, and the results proved that a great step in advance had been made, but that the spiral action still remained. The next step was to connect the spacing subsidiary rollers or balls, or, in other words, to form them on the ends of rods, thus compelling both ends to move at the same velocity. The arrangement then became as shown on Plate 5, a form of bearing which has given

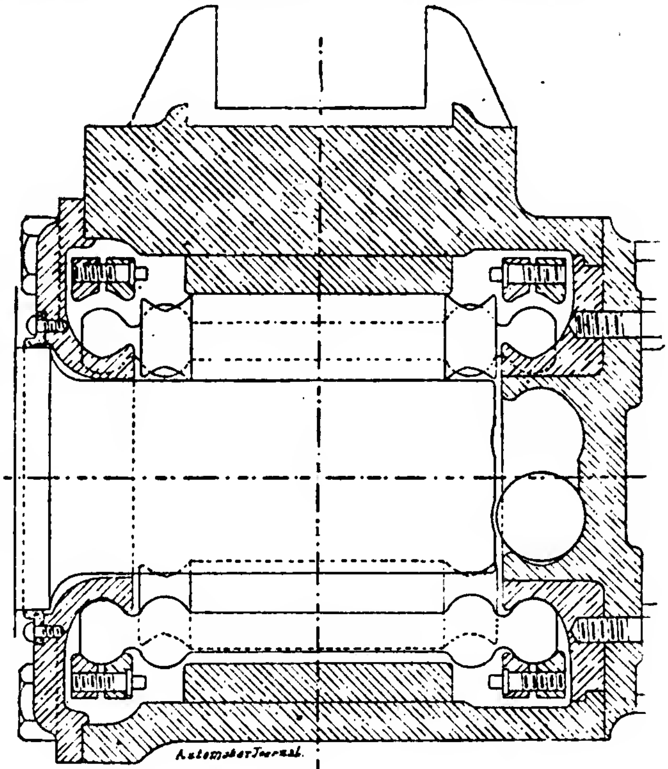

PLATE 5.

excellent results, its only fault being that it contains too many working parts, and is consequently too costly for general application. In this form of bearing, when the various moving parts are properly proportioned, there is nothing but true rolling movement. The next step was to do away with the subsidiary or spacing rollers, and to introduce a floating cage in their place, this cage being so designed that although it acts as a spacer for the rollers it does not carry any of the load. The general arrangement of the bearing then became as shown by Plate 6, and Fig. 1, Plate 7, of which Plate 6 is a cross section of the bearing, Plate 7 a longitudinal section, and Figs. 2 and 3, on Plate 7, details of the small bearing pieces which carry the ends of the rollers. This form of bearing has been applied, amongst other purposes, to "Great Paul," the big bell at St. Paul's Cathedral, London, with most satisfactory results. The next and final step was to do away with the conical points at ends of rollers and special bearing pieces in cage, and to make the rollers simple cylinders bearing on the spokes of the cage, as shown on Plate 8. This is the form of bearing recommended by the author, and is the one that has given the results set forth under heading III. It will be seen that there is only one moving part, namely, the cage, in addition to the rollers, and the only sliding friction in the arrangement is that between the rollers and their bearings on the cage, this is of very small amount, as it has only to overcome the resistance of the cage to revolution.

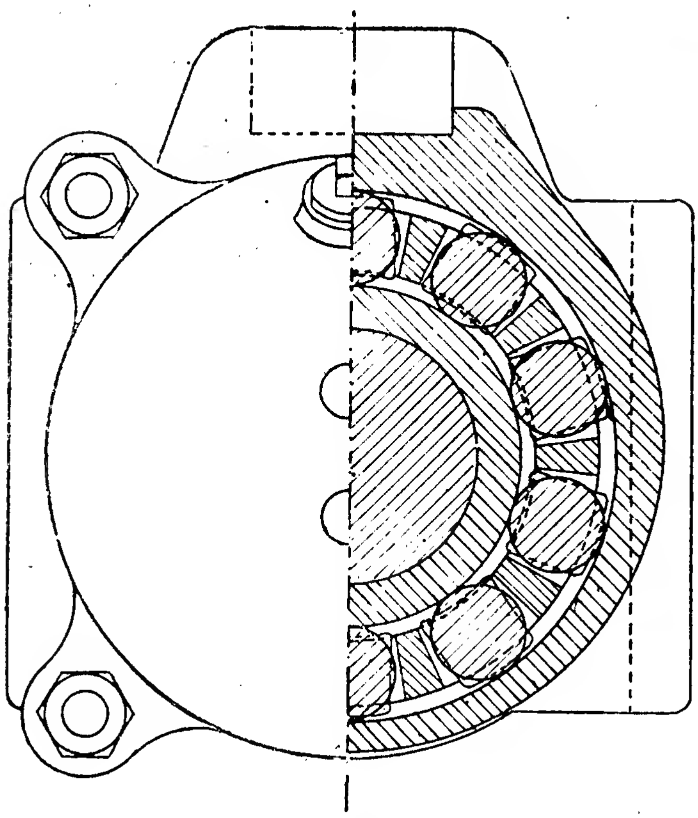

Plate 6.

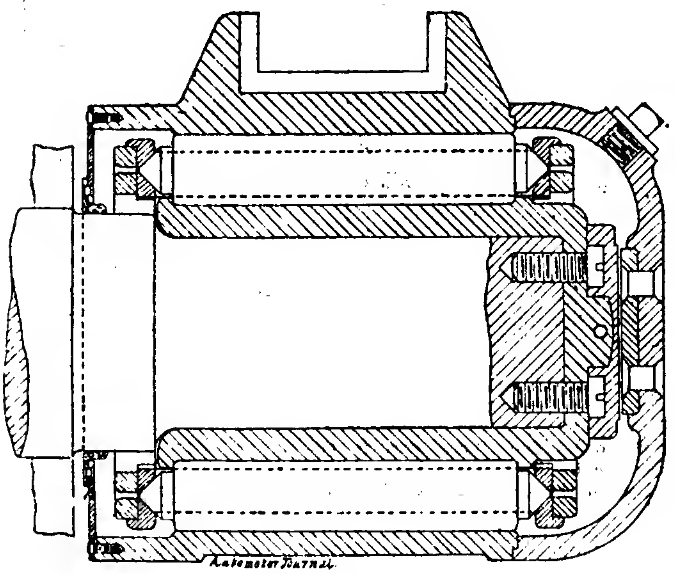

Plate 7.

It is of interest to note that in this form of bearing the speed of revolution of the cage is only about one-third of that of the journal.

The above is a short description of the process of evolution of the latest form of roller bearing.

III.—*The Results already obtained from Roller Bearings which have been applied to Railway Vehicles, Tramway Cars, and other Purposes.*

As to the results which have been obtained in practice from roller bearings:—

"For many years the only successful application of rolling motion to bearings was the well-known 'ball bearing' so universally adopted for cycles, and although these bearings have been found most satisfactory when subjected to light loads, all attempts to apply them to heavy ones have, so far as the author knows, resulted in failure, these failures arising chiefly from the balls indenting the paths or races upon which they run. Directly this takes place the balls begin to lose their friction-reducing properties. If a semicircular trough be constructed which accurately fits a ball, and after the ball is placed therein, one end of the trough is lifted until movement of the ball takes place, it will be found that the ball moves by sliding and not by rolling. This is indentation carried to its extreme limit."

Another defect in the ball bearing is that the balls are allowed to touch each other, and as the touching points of any two balls are revolving in opposite directions, there must be a certain amount of scrubbing friction between them. This is shown by Plate 9.

Roller bearings of the form which the author has described are now coming into extensive use. Considerably over 1,000 of them

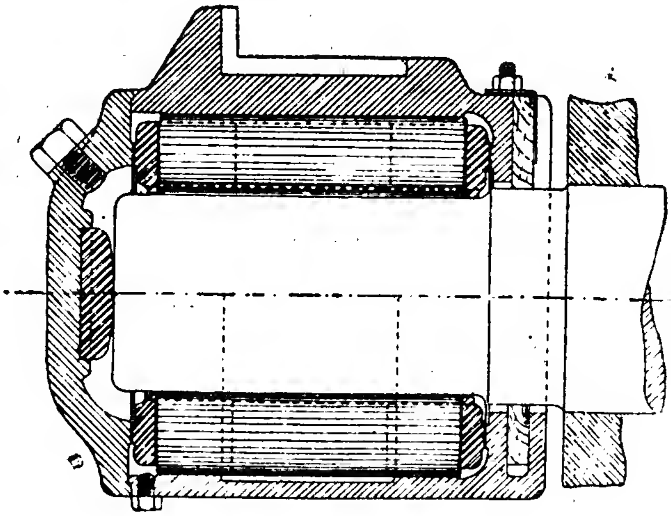

Plate 8.

have been supplied, or are in course of construction, and considering the short time they have been on the market, such results speak for themselves. The following list shows how general is the application of these bearings which have been supplied to or are in process of manufacture for many English and foreign tramways, and—

Line shafting,
Motor-cars,
Seed-crushing mills,
Furnace bottom cars for armour plates,
Hand trucks,
Engine shafts,
Cycles,
Omnibuses,
Gas traction cars,
The great bell of St. Paul's, London—"Great Paul,"
The "Monorail" Electrical Express Railway at Brussels, &c., &c.

The following are amongst the most interesting results obtained:—

Railways.

In railway vehicles fitted with these bearings the starting effort has, in many cases, been found to be as low as 3 lbs. per ton of load.

A passenger train of six carriages, fitted with roller bearings throughout, has been running for over two years between Brighton and Kemp Town, with a total mileage of over 70,000, and has shown a saving of from 12½ to 15 per cent. in the consumption of fuel, which saving has been obtained under most disadvantageous circumstances, inasmuch as the engine has to be kept in steam for about 16 hours per diem, whilst its actual running time is under seven hours.

The road between Brighton and Kemp Town is also a most trying one on account of its almost continuous curves, its constant stoppages necessitating great expenditure of brake power, and the abnormal number of points and crossings in so short a run, added to which a great portion of the line is laid with guard rails, so that the fixed charges of traction are in this case very heavy.

So well satisfied is the Brighton Railway Company with the extended trials as above-named, that orders have now been placed for roller bearings for main-line traffic.

PLATE 8A.

The Western Railway of France are fitting a complete train with roller bearings for experimental purposes, and their report will undoubtedly be of great value, as investigations of this kind are carried out with great care and skill by Continental engineers.

The Liverpool Overhead Railway made their first trials with these roller bearings some two years ago, and are now gradually fitting them to the whole of their rolling stock, as they find that since their introduction they have, with a slight modification of their motors, been enabled to run three instead of two coach trains, the extra coach being without motors, thus increasing the carrying capacity of their trains by 50 per cent.

The contention that the application of roller bearings in the case of electrical traction will show a great economy under the head of "Maintenance of Motors," has been amply borne out by the experience gained at Liverpool.

The City and South London Railway are applying these bearings to their carriages.

TRAMWAYS.

The following are the results of careful experiments made to ascertain the relative starting effort and running friction of tramcars, fitted with ordinary and roller bearings.

Starting Effort.—Tramway cars, weighing 4 tons 15 cwt., ordinary bearings, 198 lbs. or 41·68 lbs. per ton; roller bearings, 30 lbs, or 6·53 lbs. per ton—a saving of 84 per cent.

RUNNING FRICTION—GRAVITY TEST.

A tramway car, fitted with ordinary bearings and weighing 2 tons 15 cwt., was let loose from a point 56 feet up an incline, with 1 foot 6¼ inches rise. It ran down this incline and 57 feet along the level line at foot of same, or a total distance of 113 feet. The force expended was, therefore, 6,160 lbs. falling through 1·521, &c., feet, or 9,364 foot lbs. The average frictional resistance was 9,364 ÷ 113, or nearly 83 lbs., equal to 30·5 lbs. per ton. A similar car fitted with roller bearings being let loose from the same point, ran the full length of the level line available, namely, 320 feet, and had not then quite come to rest, the total distance traversed being 376 feet. The force expended was, again, 9,364 foot lbs. The average frictional resistance was 9,364 ÷ 376—24·9 lbs., or about 9 lbs. per ton of load, a saving of 70 per cent.

The following figures are of interest, and are founded on the results of actual experiments:—

Relative starting effort of a tramcar on a gradient of 1 in 20, ordinary bearings 100, roller bearings 77, saving 23 per cent.; ditto, ditto, on a gradient of 1 in 80, ordinary bearings 100, roller bearings 50, saving 50 per cent.; ditto, ditto, on a gradient of 1 in 140, ordinary bearings 100, roller bearings 39·6, saving 60·4 per cent.—results which require no comment.

Roller bearings have been fitted to many horse cars, with results most beneficial to the animals employed, and it is estimated that the use of them would so prolong the life of the horses that the reduction in their depreciation alone would show a saving of considerably over £10 per car per annum.

The Corporation of Blackpool have had some of their tramcars fitted with roller bearings, and these cars have been running on their electric tramway for over three years, and with results so satisfactory that they have applied similar bearings to all the new cars which have been constructed since the advantages of these bearings were established; and their consulting engineer some short time ago certified that at least 30 per cent. of electrical output is saved by the use of such bearings as compared with those in ordinary use.

PLATE 9.

GENERAL APPLICATIONS.

Perhaps one of the most interesting amongst the general applications of these bearings is that of the big bell of St. Paul's Cathedral, "Great Paul," which, with its headstock and other moving parts, weighs nearly 25 tons, and which gave considerable trouble when mounted on ordinary bearings. The following results are instructive:—When mounted on the ordinary bearings the bell came to rest—after the swinging effort had been discontinued—within one minute, when on roller bearings in 6 minutes 55 seconds, showing that the frictional resistance of the latter was only about *one-seventh* of the former, a result remarkably in accordance with the starting effort tests given under the head of "Tramways."

An equally satisfactory result has been obtained from four bearings fitted to the main shaft of a heavy seed crushing mill at Hull, the actual saving, arising from the alteration from ordinary to roller bearings, being at the rate of no less than £120 per annum, a saving that will repay the cost of such alteration in less than six months, and continue as an annuity for the remainder of the life of the bearings.

Two large bearings are now being manufactured for the main shaft of a large colliery ventilating fan for the North of England.

With reference to the question of heating, it is an interesting fact that there has not been a single case of a hot bearing in all the experience so far gained with roller bearings.

MAINTENANCE.

Although it is somewhat early to predict what the cost of maintaining these bearings will be, the results so far show that if they are constructed of suitable materials, it will be extremely low, 60,000 miles in railway work, and over three years in tramway work, with but very slight wear are most encouraging. It has been found that polished compressed steel is the best material for the rollers, cast steel for the cases in railway and heavy shafting bearings, and hard cast-iron for tramcar and other lightly loaded and slow-running bearings.

The demand for these roller bearings is steadily increasing, and the results obtained from their practical application in every-day use justify the author in his conviction that the experimental stage of roller bearings is now past, and that as the demonstration of their utility and economy becomes more generally known and appreciated, their success is already assured, and their universal adoption is only a question of gradual, if not of rapid, development.

With regard to cost. It is scarcely fair, perhaps, to make an absolute comparison with the ordinary axle-box bearing or plummer block at present in use, since the materials, workmanship, and working parts are essentially different. Moreover, economies in machinery and manufacture which follow a large and increasing demand, cannot fail to exercise a beneficial effect in this respect, but generally it may be said that the present first cost is from two to three times that of an ordinary bearing of similar dimensions, which longer life and the economies effected in fuel, lubrication, and cost of labour in maintenance amply compensate for in ultimate or annual expenditure.

Many of the above facts are recorded in papers read by Mr. W. Bayley Marshall before the Institution of Civil Engineers, London, and the British Association, Toronto, in May and August last, respectively, but in the author's opinion they are of such interest and pregnant with such possibilities for the future, that he hopes no apology is needed from him for bringing them before the members of this Association. They are absolute results obtained from the forms of roller bearings he has described, these bearings being, so far as his information goes, the only successful ones for heavy loads at high speeds. He thinks enough has been said to show that there is likely to be a large development in the application of these bearings in the immediate future, and he also ventures to hope that the foregoing paper will be of use to those interested in the question.

The author, in conclusion, desires to express his obligations to Mr. W. H. Woodcock, M. Inst. C.E., the engineer of the Roller-Bearings Company (Limited), for much of the information and the technical results given in this paper.

In the discussion which followed the reading of the paper, the PRESIDENT remarked that, although a roller bearing might cost more than one of the ordinary kind, this might be compensated for by a reduction in friction.

Mr. W. H. HUNTER, engineer to the Ship Canal Company, observed that they had a large number of sluices on the canal 30 feet wide each, some of them working under a differential head of 16 feet, and every one of which was worked on the roller principle with admirable results. The projectors of the Panama Canal had informed him they were going to adopt the principle of roller bearings for their sluices. Then they had on the canal a number of swing bridges, which were carried on the free roller principle. The whole secret of success in roller bearings was the avoidance of undue unit stress.

Mr. DANIELS said there was no disputing the advantages of roller bearings, and it was simply a question of getting special machinery to produce them more cheaply.

Mr. WOODCOCK, of the Roller Bearing Company, London, said the safe load depended, to a considerable extent, on the diameter of the roller. They might put a heavier load, per lineal inch, on a large roller than on a small one.

THE PARSONS' MOTOR.

AT a recent meeting of the Institute of Marine Engineers at Stratford the Hon. C. A. Parsons read a paper describing the motor which bears his name. This wonderful motor is destined to revolutionise existing practice, and those who are interested in road locomotion will find a study of this paper advantageous.

The Hon. C. A. Parsons in the course of his paper said :—The earliest notices of heat engines are found in the "Pneumatics" of Hero of Alexandria, which dates from the year 200 B.C. One of the steam or motive power engines there mentioned is the Æolipiles, a steam reaction engine consisting of a spherical boiler pivoted on a central axis, beneath which is placed a flame. The steam escapes by bent pipes facing tangentically in opposite directions, at opposite ends of a diameter perpendicular to the axis. The globe revolves by reaction of the escaping steam, just as a Barker mill is driven by escaping water. No practical or useful steam engine appears to have been made on this or any analogous principle until the year 1884, though many attempts seem to have been made on more or less crude lines; meantime the piston engine of Papin, Savery, Newcomen, and Watts has been developed during the last 200 years, and by its general use has revolutionised the means of transit, and tended to vastly increase the productive power of labour generally.

Engine for Driving Dynamos.

The want of a fast running engine for driving dynamos presented an immediate field for the application and development of a suitable steam turbine engine. The advantages of a steady running engine having no reciprocating parts, of small size and extreme lightness, were sufficiently obvious, provided that fairly economical results as to steam consumption could be realised. The highly economical results obtained from water turbines gave hopes that, provided suitable conditions could be arranged, similar efficiencies would be obtained with steam as with water, and assuming this to be possible, it would naturally follow, after taking all other losses into account, that the steam turbine would be more economical in steam than the piston engine. These possibilities, and the interest of applying a practically new method for motive power purposes, led us to build an experimental engine of 10 H.P., coupled directly to a dynamo. For practical reasons it was, however, necessary to keep the speed of rotation of the turbine as low as possible, and also to construct the dynamo to run as fast as possible, so as to couple the turbine directly to it, and in order to obtain the necessary conditions for steam economy the turbine was made what is called compound, or, in other words, a series of successive turbine wheels were set one after the other on the same spindle, so that the steam passing through them one after the other, the fall in pressure being spread over the series of turbines, should be gradual, and the velocity of the steam nowhere more than was desirable for obtaining a high efficiency for each turbine of the series.

The Turbine Motor.

The turbine motor consists of a cylindrical case with rings of inwardly projecting guide blades, within which revolves a concentric shaft with rings of outwardly projecting blades. The rings of blades on the cylinder nearly touch the shaft, and the rings of blades on the shaft lie between those on the case and nearly touch the case. There is left between the shaft and the case an annular space, which is fitted with alternate rings of fixed and moving blades. Steam passes first through a ring of fixed guide blades by which it is projected in a rotational direction upon the succeeding ring of moving blades, imparting to them a rotational force; it is then thrown back upon the succeeding ring of guide blades, and the reaction increases the rotational force. The same process takes place at each of the successive rings of guide and moving blades. The energy to give the steam its high rotational velocity at each successive ring is supplied by the drop in pressure, and the steam expands gradually by small increments. In a moderate size turbo-motor there may be from 30 to 80 successive rings, and when the steam arrives at the last ring the expansion has been completed. On the left side of the steam inlet are the dummy or rotating pistons, which are fixed to and rotate with the shaft. On their outsides are grooves and rings which project into corresponding grooves in the case. By means of the thrust bearing of the motor, the longitudinal position of the shaft is adjusted, and grooves and projecting rings kept nearly touching, so as to make a practically tight joint. The object of these pistons is to steam balance the shaft and relieve end pressure on the thrust bearing. I give herewith a drawing * of a 350 kw. Turbo Alternator, 13 of which size are now at work in the London stations. With compound condensing turbines a steam efficiency comparable with the best compound or triple expansion condensing engines was at length reached, and it was then resolved to test the application of the compound turbine to the propulsion of ships, for which purpose it seemed well suited, provided that as good an efficiency could be obtained from fast running screw propellers as with ordinary ones.

The "Turbinia."

In January, 1894, a syndicate was formed, and a boat was designed for this purpose. The "Turbinia," as the boat is named, is 100 feet in length, 9 feet beam, and 44½ tons displacement. The original turbine engine fitted in her was designed to develop upwards of 1,500 actual H.P., at a speed of 2,500 revs. per minute. The boiler is of the water-tube type for 225 lbs. per square inch working pressure, with large steam space, and large return water-legs, and with a total heating surface of 1,100 square feet, and a grate surface of 42 square feet. Two firing doors are provided, one at each end. The stokeholds are closed, and the draught furnished by a fan coupled directly to the engine shaft. The condenser is of large size, having 4,200 square feet of cooling surface. The circulating water is fed by scoops, which are hinged and reversible, so that a complete reversal of the flow of water can be obtained should the tubes become choked. The auxiliary machinery consists of main air pump and spare air pump, auxiliary circulating pump, main and spare feed pumps, main and spare oil pumps, also the usual bilge ejectors; the fresh-water tank and hotwell contain about 250 gallons. The hull is built of steel plate, of thickness varying from $\frac{3}{16}$ inch in the bottom to $\frac{1}{16}$ inch in the sides near the stern, and is divided into five spaces by watertight bulkheads. The deck is of steel plate, $\frac{1}{16}$ to $\frac{1}{8}$ inch in thickness. The approximate weights are:—Main engines, 3 tons 13 cwt.; total weight of machinery and boilers, screws and shafting, tanks, &c., 22 tons; weight of hull complete, 15 tons; coal and water, 7½ tons; and total displacement, 44½ tons. Trials were made with screws of various patterns, but the results were unsatisfactory, and it was apparent that a great loss of power was taking place in the screw. Owing to the cavitation of the water, the matter was then thoroughly investigated theoretically and experimentally, and it was finally determined (as the best course to overcome the difficulty) to subdivide the turbine motor into several separate compound turbines. Consequently the single compound turbine engine was removed from the boat and replaced by three separate compound turbines, directly coupled to three screw shafts, working in series on the steam, the turbines being the high pressure, intermediate, and low pressure, and designed for a complete expansion of the steam of hundredfold, each turbine exerting approximately one-third of the whole power developed, the three new screw shafts being of reduced scantling. By this change the power delivered to each screw shaft was reduced to one-third, while the division of the engine into three was favourable to the compactness and efficient working of the turbines. The total weight of engines and the speed of revolution remained the same as before. The effect on the screws was to reduce their scantling, and to bring their conditions of working closer to those of ordinary practice. The thrust of the propellers is balanced by steam pressure in the motors. At all speeds the boat travels with an almost complete absence of vibration, and the steady flow of steam to the motors appears to reduce the liability to priming; at any rate, no sign of this has yet occurred with ordinary Newcastle town water. No distilling apparatus has yet been fitted. The boat has been run at nearly full speed in rough water, and no evidence of gyroscopic action has been observable, though such a result would be anticipated from the known small amount of these forces under actual conditions; indeed, the "Turbinia" has so far proved herself an excellent sea-boat.

Advantages over Ordinary Engines.

The advantages claimed for the compound steam turbine over ordinary engines may be summarised as follows:—(1) increased speed; (2) increased economy of steam; (3) increased carrying power of vessel; (4) increased facilities for navigating shallow waters; (5) increased stability of vessel; (6) increased safety to machinery for war purposes; (7) reduced weight of machinery; (8) reduced space occupied by machinery; (9) reduced initial cost; (10) reduced cost of attendance on machinery; (11) diminished cost of upkeep of machinery; (12) largely reduced vibration; and (13) reduced size and weight of screw propellers and shafting. For the purpose of going astern a small reverse turbine is used. This turbine has hitherto been of an inefficient form, and has constituted a part of the low-pressure motor; the power consequently that has been developed has been very small, and has given an astern speed of three knots. A powerful reversing motor is, however, now being fitted of similar construction to the ahead motors; its weight is three-quarters of a ton, and it is estimated that the astern speed will then exceed 10 knots. The turbine will be permanently connected to the central propeller shaft, and its casing will be connected to the condenser, and the amount of power spent in turning it when going ahead will be insignificant. In June last the "Turbinia" steamed from the Tyne to Harwich at the average speed of 12 knots, and from Harwich to Cowes at the average speed of 16 knots. During and after the week of the review she was run at speeds up to 34½ knots, estimated from the curve of steam pressure and speed, and ample steam is provided by the boiler at the highest speeds hitherto reached.

Results of Trials.

In April a series of trials were made by Professor J. A. Ewing, and the following paragraphs are extracts from his report, which comprises, I believe, the most complete set of investigations made on the working of a small fast vessel:—

"The mechanical friction of the turbines is particularly small, and the work spent on friction is not materially increased by increasing the range of expansion. This allows the steam to be profitably expanded much farther than would be useful or even practicable in an engine of the ordinary kind. Apart from questions of friction, the addition of weight and bulk to allow for this extended expansion would be enormous in the ordinary engine; in the turbine it is very moderate. Steam is expanded nearly two hundredfold in the "Turbinia," and this is accomplished with engines which are much lighter than reciprocating engines of the same power, although in these the expansion would be much less complete. Rough weather was met with in some of the trials, and I had the opportunity of seeing that the "Turbinia" is for her size a good sea boat. The machinery worked with perfect smoothness, the screws did not race, and the bearings remained perfectly cool throughout. From first to last during the whole of the trials there was no hitch whatever or difficulty of any kind in the action of the turbines. Some 20 trial runs in all were made under various conditions as to speed, the range of speeds tested extending from 6¾ knots to 32¾ knots. Full speed trials were made on 10th April, the boat having then been in the water for fully a fortnight. Two successive runs on the measured mile, in opposite directions, in smooth water and at the slack of the tide, gave the following data:—

	1	2
Time on the mile	109¾ secs.	110 secs.
Corresponding speed in knots ..	32·79	32·73
Mean speed in knots	32·76	
Revs. per minute of high pressure and intermediate shafts	2,230	
Revs. per minute of low pressure shaft ..	2,000	
Steam pressure in boiler by gauge	210 lbs. per sq. in.	
Steam pressure on admission to high pressure turbine	157 lbs. per sq. in.	
Greatest pressure in stokehole, by water gauge	7¼ in.	

"The speed reached during this trial, 32·76 knots in the mean, is, I believe, the highest recorded for any vessel. It is greatly in excess of the speed hitherto reached in boats so small as the "Turbinia." It is clear, then, that the exceptional speed developed in the "Turbinia" has been achieved without sacrifice of any economy, and that the substitution of turbines driving high speed screws in place of reciprocating engines driving screws of much more moderate speed is not attended with increased consumption of steam so far as fast running is concerned."

Turbines for Large Vessels.

In conclusion, the application of the steam turbine principle to fast ships in general, including passenger vessels, Atlantic liners, and ships of war, would appear to present no special difficulties. It may be said, generally speaking, that the larger the scale on which the engines are made the simpler is the construction and the higher the steam efficiency and the lower the speed of rotation. In the sizes hitherto constructed, the largest being the engines of the "Turbinia,"

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* We hope to reproduce this in our next issue.—ED.

tbis has been found to be tbe case. In applying turbine engines to a large passenger vessel or warship of, say, 30,000 I.H.P., probably four screw shafts with two screws on each shaft would be adopted; each of tbe four shafts would be driven by one compound turbine at a rate of between 400 and 700 revs. per minute, and the turbines would consist of the high pressure, the intermediate and two low pressure, each turbine developing approximately one-quarter of the total power. The screw propellers would be about one-half the diameter of ordinary twin-screw propellers, and the aggregate blade area would approximate closely to ordinary practice. With such engines the consumption of steam per propulsive horse-power would probably be less tban that found in the mercantile marine, and considerably less than that found in war-vessels, where space and other conditions must necessarily be considered. Tbere is also no limitation in steam pressure in the case of turbines other tban those imposed by the boilers, and it is probable that in conjunction with water-tube boilers higher pressures than those at present usual would be generally adopted. With turbine engines in passenger vessels there would arise no questions of vibration from machinery or propellers, and in the event of one screw shaft or one motor becoming disabled, the one affected can be more readily taken out of action tban is tbe case with ordinary engines, and the parts being lighter, can be more easily dealt with by the staff on board; thus the liability to serious breakdown is considerably reduced.

THE "SCOTTE" SYSTEM.

We are in receipt of the following letter from the Director of the "Société des Chaudières et Voitures a Vapeur Système Scotte":—

Monsieur le Directeur de L'Automotor and Horseless Vehicle Journal, 62, St. Martin's Lane, Londres, W.C.

Je viens de recevoir le No. du 15 Octobre de votre Journal. Voulez vous me permettre de compléter les appréciations formulées par votre correspondant relativement au fonctionnement de notre train à marchandises pendant le Concours des Poids Lourds.

Étant donné le profil extrêmement accidenté des parcours ou l'on rencontrait des rampes de 14 per cent., nous n'avons transporté au maximum que 5½ tonnes de poids utile: mais il faut admettre que ce ne sont pas là les conditions normales du roulage.

Sur bonnes routes, en palier ou faibler rampes, c'est à dire ne dépassant par 4 per cent., nos machines peuvent convoyer à la vitesse de 7 à 8 kilomètres à l'heure de 10 à 12 tonnes de *poids utile.*

The Scotte Tractor and Trailer.

Par ce même courrier et sous pli séparé je vous adresse deux phototypies représentant notre tracteur porteur avec sa charge réelle.

Dans vos "Notes du Continent" je relève qu'à la suite de nos essais dans le Luxembourg, la douane nous réclame 6000 francs pour la rentrée en France de nos machines. Permettez moi de vous faire remarquer que nos trains étant construits à Paris peuvent sortir de France et y rentrer absolument en franchise.

Veuillez agréer, Monsieur, mes salutations empressées.

Paris, *Octobre* 18.

[We have pleasure in reproducing the photograph herewith.—Ed.]

Death of a well-known Carriage Builder.—*Le Guide du Carrossier* notes the death, at the early age of 55 years, of M. Basile Dimitri-Markoff, of Moscow, Russia. M. Markoff was well known and bighly honoured in Moscow and Paris. He was wealthy, and the head of a great plant devoted to carriage building. He was urbane, genial, and his broad ideas led to the establishment of amicable relations between the members of the craft in tbese two cities. He was an admirer of France and of the French people. It was his habit to spend two or three months of each year in Paris or at French watering places. Lately he decided to remove to Paris to reside permanently, but after a return to Moscow recently be fell ill and died. He was the recipient of distinctive French honours. He carried the ensigns of tbe orders of St. Stanislaus and St. Vladamir, and was to have been decorated with the red ribbon, Legion d'Honneur, at the coming Paris exposition of 1900. Last year he was nominated a member of the jury at the Nijni-Novgorod Fair, where be rode in the Emperor's sleigh, wbich, in Russia, is regarded as a great honour. M. Markoff was a devoted Christian, and a member of the Russian (Greek) Church, and lived close to the Golden Rule, a tribute accorded him by all who knew him.

A New Electric Motor Vehicle.—Mr. T. Parker and several gentlemen connected with Messrs. Parker (Limited), of Wolverhampton, in addition to a number of distinguished visitors, attended the works in Wolverhampton, on October 27th, baving been conveyed there from tbe station in Mr. Parker's new motor-car. The main object of the visit was to test tbe capabilities of this electric motor, which was in every way satisfactory. We understand tbat Mr. Parker, when on his motor-car trips, has had a good deal of trouble with small boys, who, not satisfied with hanging on behind, have thrown sticks and stones into tbe mechanism whilst the car has been running.

RESISTANCE OF VEHICLES IN ROUNDING CURVES.

MR. HENRY SIMPSON, writing to *The Engineer* on "The Elements of Train Resistance," gives the subjoined formulæ, which, although representing what occurs on railroads, is equally applicable to steam-tractors on common roads hauling a string of wagons. In the course of his letter, Mr. Simpson says:—

"Most enginemen prefer to have the longest and heaviest vehicles near their engine, because, they say, the heavy wagons 'pull so hard' when near the break van. I cannot see that this can possibly be so on a straight road, and I will endeavour to show that even on a curved road the obliquity of the draw-bar pull cannot have a very material effect. Let us assume, for the sake of simplicity, that the vehicles of a train are all of the same weight, length, and resistance, and let—,

- T = Tractive force in pounds of engine in excess of that portion which is absorbed in overcoming the resistance of the engine itself;
- R = Resistance in pounds of each vehicle;
- θ = Supplement of angle contained by any two vehicles;
- n = Number of vehicles whose resistance is overcome by the tractive force, T;

"Now, pull exerted on first draw-bar = $T \cos\theta$, and since R is absorbed in each vehicle, the pull exerted on—

$$\text{Second draw-bar} = (T\cos\theta - R)\cos\theta = T\cos^2\theta - R\cos\theta;$$
$$\text{Third ,,} = (T\cos^2\theta - R\cos\theta - R)\cos\theta = T\cos^3\theta - R(\cos^2\theta + \cos\theta);$$
$$\text{Fourth ,,} = T\cos^4\theta - R(\cos^3\theta + \cos^2\theta + \cos\theta);$$
$$n\text{th ,,} = T\cos^n\theta - R(\cos^{(n-1)}\theta + \cos^{(n-2)}\theta + \ldots \cos^2\theta + \cos\theta).$$

"Since we have assumed that the engine is just capable of pulling the n coaches, it is obvious that the pull on the nth draw-bar must just equal the resistance:—

$$\therefore R = T\cos^n\theta - R(\cos^{n-1}\theta + \cos^{n-r}\theta + \ldots + \cos\theta)$$
$$\therefore T\cos^n\theta = R(\cos^{n-1}\theta + \cos^{n-2}\theta + \ldots + \cos\theta + 1)$$
$$\therefore \quad T\cos^n\theta = R\left(\frac{1-\cos^n\theta}{1-\cos\theta}\right)$$
$$\therefore \quad T\cos^n\theta - T\cos^{n+1}\theta = R - R\cos^n\theta$$
$$\therefore \quad \cos^n\theta = \frac{R}{R + T(1-\cos\theta)}.$$

"It will be readily seen that on a straight road $\theta = 0$ and $\cos\theta = 1$, and the geometrical progression would sum 'n,' and our equation would therefore stand $T = Rn$. It will be found that in all cases θ is so small as to make $\cos\theta$ so nearly approach unity that the obliquity of the draw-bar pull may for all practical purposes be neglected. For instance, a train of 45 empty wagons is being hauled round a curve of 600 feet radius, the total resistance being 20 lbs. per ton. It will be found from the above formula that a draw-bar pull of 5,455 lbs. is necessary; whereas, if we neglect obliquity, a pull of 5,400 lbs. is necessary. The difference, 55 lbs., is so small as to be inappreciable; nevertheless, the length of a train and the position of the heaviest laden wagons are such important items in the eyes of most enginemen that I venture to draw attention to the matter, in the hope of a correct explanation being forthcoming."

Leicester Invites Tenders for Motor Dust Carts.—The Leicester Sanitary Committee invites designs and tenders for motor-vehicles for the collection of house refuse. The motive power capacity and all other particulars are to be described in a full specification, accompanied by drawings, and delivered at the office of Mr. E. George Mawbey, C.E., Borough Engineer and Surveyor, Town Hall, Leicester, addressed to the Chairman of the Sanitary Committee, by January 31st. The loaded wagons would have to ascend an incline of 1 in 20, turn in a limited space, back and tip over a beam about 14 inches high by 12 inches in width, and when empty descend a road having a gradient of 1 in 15. The committee do not bind themselves to accept any proposal, and firms tendering must do so at their own cost, no fees being allowed for the preparation of drawings, &c.

REPORT OF THE MANCHESTER DEPUTATION ON ELECTRIC TRACTION.

THE following is a brief report of the deputation recently appointed to visit the Continent on the results of inspection of Continental stations:—

The object of the inspection was to ascertain the latest Continental practice in electric lighting, and to learn the extent to which electric traction was used, and the various methods by which it was applied, and especially, if possible, to ascertain how the problem of supplying current for both lighting and traction was dealt with.

One result of the investigation is to show that electric traction is fast superseding all other means of hauling trams. Wherever electric traction has been introduced on a small scale, the system is being largely extended, and the use of horses is being entirely abandoned. Electric traction is not only preferred to horse traction, but to all other forms of mechanical propulsion; even the Serpollet steam system in use in Paris, and which appeared so promising, is being abandoned in favour of the electric system. The essential elements common to every system of electric traction are an electric generator driven either by steam or water-power, and an electric motor fixed upon the tramcar geared to the axle of the wheels and causing them to revolve; the difference between the various systems of electric traction is comprised in the various ways of establishing the connection between the generator and the motor. The most direct and simplest method consists in connecting one pole of the generator to the tram lines, and the other to a wire suspended over the middle of each track, and carried on insulated supports. This system is known as the overhead trolley system. Next in order of simplicity and directness comes the underground conduit system. In this, each pole of the generator is connected to an insulated conductor carried in a concrete culvert beneath the roadway. Connection with both conductors is established by means of a contact-making device known as a "plough," which enters the culvert through a slot running longitudinally in the same direction as the tram lines. The third system is as simple as either of the two preceding ones, but it is less direct. It consists in charging secondary batteries or accumulators from the generator, which accumulators are fixed on the car, and afterwards give out current to the motor on the car. The electrical energy is thus stored in the accumulators, and no direct connection is necessary between the generator and the motor. The fourth system is that known as the closed conduit system. In this, one pole of the dynamo machine is connected to the rails, and the other is connected in succession to a series of metal plates between the tram lines, the connection being established automatically by the car as it moves onward. This system is as direct as the trolley or slot system, but it is much more complicated, and is very liable to become deranged.

All systems of electrical traction fall broadly under the four heads named above, but there are endless differences in detail. Thus with the trolley system, the overhead wire may be supported on posts fixed either in the middle of the roadway or at the side, arms projecting from the posts over the tracks; or it may be carried on wires, known as span wires, stretched across the track and attached either to the buildings or to two posts without arms. The wire may be fixed over the centre of the track or near one side, the latter being known as the side trolley system. Contact may be made with the wire either by means of a wheel, known as the trolley wheel, carried at the end of a long arm fixed on the roof of a car, or by means of a metal bow, also carried on the top of the car.

Again, in the underground slot system, the slot may either be at the side, one rail forming one side of the slot, or it may be midway between the two rails of each track, a third line of metal being thus necessary for each track.

In the accumulator system the batteries may be removed from the cars for charging, or they may be left in the cars. In certain cases, the accumulator system is combined with the trolley system, and the accumulators are charged from the overhead wires in those portions of the city where it is fixed, while the electrical energy so stored in the accumulators is used to run the cars over the lines in that portion of the city where overhead wires are not allowed.

Comparing the advantages of the various systems, there can be no question that the overhead trolley system is by far the cheapest to construct, costs less for maintenance than any other system, is the simplest to operate, and the most easily repaired. It is much less liable to interruption than either the underground slot system or the closed conduit system.

The accumulator system is extremely reliable, but the expense attendant on its introduction throughout the whole of the system of tramways is prohibitive, while if it be adopted for certain portions of the city, the working expenses are largely augmented on account of the great weight of the batteries having to be hauled over the whole of the lines, whether the accumulators are furnishing current or not.

The underground slot system, though as simple to work as the overhead trolley, is very much more expensive, and possesses the serious disadvantage that it entails an entire cessation of traffic over the portion of line being converted for at least three weeks during its construction. The closed conduit system, though very attractive in theory, is not at present sufficiently developed to admit of its adoption being recommended, as it is not capable of dealing with heavy traffic, is liable to fail, and may give rise to shocks fatal to animals, and unpleasant to human beings.

Inquiry and observation show conclusively that on the Continent, wherever possible, the overhead system with either trolley or bow is employed. Other systems are only resorted to when the overhead is forbidden from æsthetic considerations. These considerations doubtless have weight when streets such as the principal streets of towns like Paris or Berlin are in question; but in the case of a great commercial city like Manchester, where cheap transit is a paramount consideration, and where an interruption of the heavy traffic would be fraught with disastrous consequences, there appears no necessity to insist upon the streets being kept absolutely free from overhead wires.

Where the tram lines are laid, steel posts should be erected on each side of the street with arc lamps fixed on same.

That the steel posts should be prepared to receive cross span wires to carry the overhead trolley wires if the overhead system is adopted in Manchester.

In the streets where there are no tram lines, the arc lamps to be suspended in the centre of the streets and carried by span wires. These span wires to be fixed by rosettes to the sides of the buildings if permission can be obtained from the tenants and landlords, and if the permission cannot be obtained, steel side posts be erected, and the span wires be carried from them.

Generating Stations and Installations.—The deputation were much impressed with the manner in which the electric installations in the various cities had been carried out. The workmanship and design of the engines and electric appliances were extremely good, and silent working and steady running seemed to be the order of the day. It was evident that cleanliness of machinery and buildings were made a special object of the management.

THE COLUMBIA MOTOR-CARRIAGES.

THIS vehicle is manufactured by the Pope Company, of Hartford, U.S., and its general appearance is shown in Fig. 1. As will be seen, it is an electrically-propelled four-wheeled carriage, having seating capacity for two persons.

The body consists of a box in which is carried the battery of accumulators, the front part of the box forming the seat, and protection is given by fitting a light hood. The wheels are of the bicycle pneumatic-tyred type, with ball bearings. The body is carried by an ingenious and elaborate system of springs, while the front axletree is made something like a bowstring girder of light tubing, and forms a very rigid, strong, yet light support. The rear axletree, together with the motor, differential gear, &c., is shown in Fig. 3. The motor is of the Lundell type, and is of two H.P. rated, but can be overloaded to twice this without appreciable heating.

FIG. 1.—THE COLUMBIA ELECTRIC CAB.

Fig. 4 shows the battery and system of driving and controlling. The battery consists of 40 cells contained in four groups, 10 in each. Its capacity is 70 ampère hours, with a maximum discharge of 35 ampères. Under ordinary conditions of city traffic, running on asphalte, a speed of 12½ miles can be obtained with a discharge rate of 18 ampères. The efficiency of the system is stated to be 72 per cent., that is when discharging at the rate stated, 1⅜ H.P. are developed on the wheel rim. The connections are so arranged with a watt meter that when the charging current enters the "full" position on the dial it indicates that slightly more energy has gone into the battery than was taken out. Two small contacts, after the manner of the ordinary electric alarm clock, are provided at the "full" position, so that when the finger reaches this point the circuit is completed through the electromagnet on the cut-out which actuates the armature and permits of the main switch of the carriage being thrown out. Thus, by simply inserting the charging plug in the carriage and closing the main switch, no attention whatever is required until it is desired to next use the carriage. The recording watt meter is of a special type made by the General Electric Company.

The reversing switch shown is not put in the controller on Columbia carriages, for the reason that in some cases it is possible for an excited person during an emergency to quickly draw the controller from full speed ahead to backing. This would be liable to cause serious results, and in the Columbia carriages a special reversing switch is provided which is operated by the foot, and which makes it practically impossible for an unthinking or careless person to reverse the current in the motor when the carriage is going at full speed ahead.

The emergency switch is a small plug placed conveniently near the seat; an operator can always pull it out in case of any accident to the motor, which would prevent its being stopped.

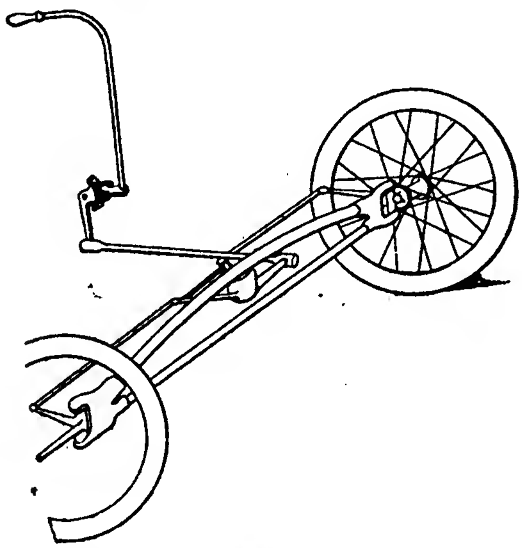

FIG. 2.

All battery connections, and, for that matter, all connections throughout the carriage which have to be manipulated in any way, are made of two different sized holes, all of the positive holes being the larger. Thus no negative plug can be entered in a positive hole, nor any positive plug entered in a negative hole; by this means it is almost impossible to make any mistakes in forming up connections.

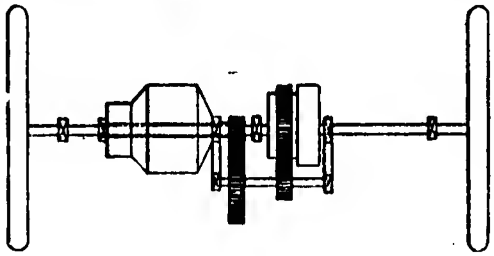

FIG. 3.

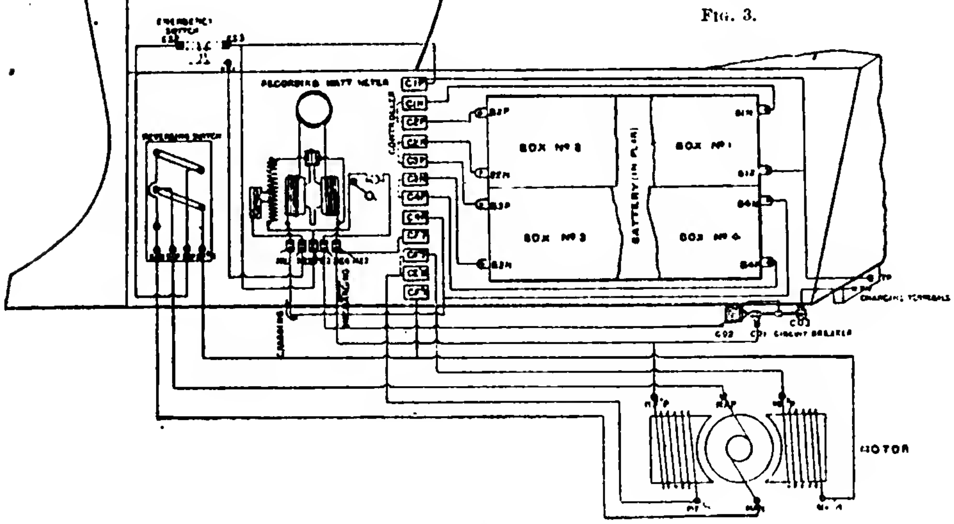

FIG. 4.

The carriage weighs about 1,700 lbs., of which 850 lbs. are accounted for by the battery. The cost of recharging is about 50 cents., and the energy suffices for a run of 30 miles on good roads at a speed of 12½ to 15 miles per hour. The cells are stated to stand wear remarkably well, one set having run 2,300 miles without deterioration. In design, appearance, and finish the Columbia motor-car is all that can be desired, and reflects credit upon the Pope Company.

MOTOR-CARS AND MAIDSTONE.

MAIDSTONE and some other towns have lately been "afflicted" —this is, we think, the orthodox word—with typhoid. In plain English, Maidstone is, like so many county towns, rather indifferently governed, and hence the people have dilute sewage given them to drink, and thereby suffer from the existence of typhoid and other filth diseases. For the sufferers we have every sympathy; and we trust that after this lesson the electorate will do their duty, and free themselves from the government of those whose first duty, in many cases, consists in maintaining abuses and privileges, and who steadily set their faces against progress, whether this takes the form of new waterworks, electric lighting, or motor-vehicles. Few other counties are so backward as Kent. With no manufactures to speak of, it is a county in which the influence of the Squire and the Parson is supreme, and hence, it is not surprising that bad sanitation should prevail in the houses, and that the water supply should be contaminated with sewage, and that motor-vehicles should be regarded with disfavour by the local bumbles and beadles. There are, unfortunately, many other towns like unto Maidstone, both in the quality of their water and in their local administration. It is, however, only when an epidemic breaks out that the public learns how very backward and reactionary a local governing body can be, and how very ridiculous the proposals emanating from such bodies can be. Thus, the Warwickshire County Council has, as is well known, a strong antipathy to motor-vehicles. At a recent meeting of this body, as we learn from the *Birmingham Argus*, it was stated that complaints had been received of motor-vehicles proceeding along Coventry Road, between the city of the three spires and Birmingham, at a high speed and refusing to stop, infringing the Light Locomotives on Highways Order, 1896. The Council decided to make a representation to the Local Government Board that such an alteration of the Order was necessary as would ensure the registration of all motor-cars; th
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responsible for any breaches of the Act. It is clear, says our contemporary, that the carriage people on the Council do not intend to part with their horseflesh or they would not suggest these restrictions, which will give a plying-for-hire appearance to a gentleman's private motor-car.

We do not object to the principle of registration, although we see no necessity for adopting it, and if it is necessary for motor-vehicles, it is also equally necessary for horse-drawn vehicles. We can assure the Warwickshire County Council that Acts of Parliament and Local Government Board Orders are not altered because a few selfish persons desire it, and before the alteration was made people of much more importance than those who compose a provincial county council would have to be heard. If our worthy friends in Warwickshire will mind their own business and look after their local water supply, they will exhibit a capacity for local self-government which at present they evidently lack, or they would not pass such childish resolutions, which are framed in no spirit of anxiety or desire for the public weal, but merely to gratify the selfish wishes of what are known as "carriage folk."

NAUTICAL AUTOMOBILISM.

THE THAMES RIVER SERVICE.

SOME time ago the Rivers Committee of the London County Council was instructed to consider what steps, if any, should be taken to provide London with an efficient steamboat service, and to free from toll the piers or landing-stages on the Thames in the county of London. The Committee have considered this and other references on the same subject, and the result appears in their report, in which they state that the first step to be taken "is to acquire and work the piers," a view which is in accordance with the one taken by the local authorities who have approached the Council. It is believed that the following 18 piers can be acquired without involving capital expenditure:—Belonging to Thames Conservancy—Wandsworth, Chelsea, Pimlico, Lambeth, Westminster, Waterloo, Temple, Blackfriars, Allhallows, London Bridge (Old Swan), London Bridge (Surrey side), Cherry Gardens, Tunnel, Globe Stairs, Limehouse, West India Docks, Commercial Docks; belonging to London County Council—Hammersmith. The undermentioned 10 could not, it is thought, be obtained without purchase:—Belonging to Thames Steamboat Company—Putney, Battersea Square, Carlyle, Battersea Park, Nine Elms; belonging to railway companies—Fulham (District Railway), Charing Cross (South Eastern Railway); belonging to dock companies—Blackwall; belonging to Greenwich Pier Company—Greenwich; belonging to Sir Maryon Wilson and the Thames Steamboat Company—Woolwich.

The following particulars show the Thames Conservancy's charges for the use of about 20 of their piers during the 10 years ended 1893:—

Expenditure on wages and staff	£4,887.3
Expenditure on repairs, rates, stores, &c. ..	3,815.7
Total	£8,703
Receipts for pier dues	5,572.6
Loss by the Thames Conservancy	£3,130.4
Maximum receipts (1884)	£8,029
Minimum receipts (1889)	4,274

The apparent smallness of receipts compared with the river traffic is accounted for in this way, that the money paid for the tolls is not the statutory charge for actual calls but for sums paid under agreement between the steamboat companies and the Conservancy. The Conservancy, it is pointed out, have statutory power to charge up to sixpence per call of each boat at each of their piers, and it is estimated that for a winter service of 15 minutes' interval and a summer one of 10 minutes, this toll would amount to £17,000 per annum. Additional charges are made by the Conservancy for the location of piers which do not belong to them, amounting to £327 10s., and there are charges for annual rental at other piers, not owned by the Conservancy, which reach a total of £3,850.

It is explained that there is reason to believe that the Thames Conservancy are willing "to arrange with the Council to facilitate the traffic on the Thames by transferring to the Council the charge, regulation, and maintenance of the existing piers belonging to them, but this concession, to be of practical utility, would need to be accompanied by the right on the part of the Council to remove them, where necessary, from their present positions to such others as might be deemed more suitable for the river passenger traffic; and perhaps would require to be supplemented by the right to acquire such piers as are owned by others which may be found necessary for the Council's purposes.

"The possibility of a municipal steamboat service has also been carefully considered by us under the Council's reference on this subject. We have received full and valuable reports from the Council's officials in this matter. We have also received, in favour of the Council providing a municipal steamboat service for London, resolutions and petitions from the following:—A public meeting held at Rotherhithe, the London Reform Union, the London Trades Council, the Vestry of Fulham, and the Vestry of St. Margaret and St. John, Westminster.

"The matter requires further consideration, and we intend to bring up, at an early date, a recommendation to the Council on this subject, but the question of instituting a municipal service is not, we think, one that is involved in any way with the acquisition and working of the piers. We have therefore considered the question of dealing with the piers first as the best way of securing an adequate and efficient steamboat service, and of increasing communication on the river and restoring the old service of the Thames as a highway, without recommending to the Council any particular system of steamboat service at present.

"We accordingly recommend the Council to pass the following resolution:—

"'That it is desirable, in the interests of better communication, that steps should be taken to secure an adequate and convenient steamboat service on the Thames, and that with this view the Rivers Committee be authorised to approach the Thames Conservancy Board and others concerned in order to ascertain on what terms and conditions the Council could acquire the piers.'"

At the last meeting of the Council this resolution was adopted by a large majority.

MAXIM'S AUTOMOTOR.

MR. HIRAM S. MAXIM, the well known inventor, has brought out a new oil motor, of which the following is an account, taken from the patent specification:—

This invention is particularly applicable to engines for horseless carriages and for other purposes where an exceedingly light and active motor is required. Gas and oil engines are now very commonly constructed to perform what is known as the "Otto" cycle, that is to say, a cycle in which work is done only at every alternate outward stroke of the piston. Therefore in such an engine no less than four cylinders are required to perform the same number of working strokes as an ordinary single cylinder steam engine and eight separate cylinders are required to effect one revolution of the crank without a fly-wheel, which can be done with a two-cylinder steam engine, as, for example, a locomotive engine. Moreover, a gas engine performing the "Otto" cycle is capable of only very slight variation of speed. It must work at a rather high speed or not at all, and it is impracticable to provide it with reversing gear. Therefore such engines are not advantageously applicable for the purpose of a road carriage which must be able to run either fast or slow, and must be capable of being reversed at will, and of being started at any time without manual assistance.

Mr. Maxim constructs an engine with two or more working cylinders, each of which will perform work with every outward stroke of its piston. In some instances is arranged, in conjunction with one or both of the working cylinders, an air-pump, the piston of which is preferably attached to the piston rod of the working cylinder; or, in some instances, the cylinder may be so constructed that one of its ends serves as the air-pump while its other end is used as the working cylinder. It is found best to arrange that the air-pump is as far as possible from the hot cylinder.

Those familiar with the subject are aware that engines have been constructed in which one end of the piston rod has been provided with a piston working in a cylinder and propelled by the pressure of hot air or gas, while another piston on the rod has been employed for compressing the air, but in such engines the pressure in the working cylinder never exceeds the maximum pressure in the air reservoir, consequently these engines are not as economical as those using the "Otto" cycle, in which the pressure exceeds that of the compressed air in the air reservoir.

In Mr. Maxim's engine the connecting rod may be attached directly to the pump-piston so that the cross-head pin or pivot will be situated in a cool place, and consequently the piston will work better than if the said pivot were at the other end. The crank pins are set at angles of 90° from each other, and are arranged in such a manner to balance the engine as nearly as possible.

The engine works in the following manner, viz.:—Suppose it is ready for starting, the compressed air tank having a pressure of about 45 lbs. to the square inch, the valve in the air passage is opened, the compressed air enters the cylinder, and the piston is pushed forward as in a steam engine. When the piston has moved through about one-fourth of its stroke it uncovers the ignition tube, or otherwise causes the ignition of the charge of gas or vapour that has been admitted to the cylinder. At this instant a valve operates to close the communication between the compressed-air tank and the cylinder, and the charge being ignited the pressure suddenly rises to about 100 lbs. to the square inch. In some instances the cylinder is allowed to become very hot, especially where heavy petroleum is used. Its temperature may be sufficiently high to ignite the gas or oil without any special igniter, and in such cases the desired result is obtained by not injecting the gas or vapour until after the piston has travelled through about one-fourth of its stroke, thereby obtaining the same results as by igniting the charge by means of a special igniter. If very heavy oil is to be employed and the cylinder kept hot as stated, it is advantageous to use a long piston provided with packing rings at its outer end, and to keep cool only that part of the cylinder in which these rings work, while the inner end of the piston may be loosely fitted in the cylinder, and made of material which will endure a high temperature. For instance, the piston may be covered with asbestos, with or without an external covering of "platinoid," which is a mixture of wrought-iron and nickel. The end of the cylinder may also be made of the same or similar material, and heated with a Bunsen burner to a temperature sufficient to ignite the oil. But where a light petroleum is used the cylinder need not be kept at a high temperature. It can be jacketted throughout its entire length, and the charge may be ignited at about one quarter of the piston's stroke either by an ignition tube or an electric spark. As the piston moves outward it performs work on the crank and at the same time compresses the air, the two pistons being brought to a state of rest at the end of the stroke by the compressed air in the air-pump.

In an engine of this kind it is necessary that a definite quantity of inflammable material shall be introduced into the cylinder at each stroke, and apparatus is provided which so operates that the admission valve, when opened at any particular part of the stroke, will not remain open. For this purpose a device is employed, which first raises a weight, and then, by means of a tappet, releases it, so that the weight in falling strikes the valve, and by its impact opens the same, but allows it to close again immediately. In this case the oil, which should be under a pressure greater than that of the compressed air, enters the cylinder in a fine spray; or it may be volatilised, and enter the cylinder in the condition of vapour. The quantity of fluid admitted may be varied by varying the force of the blow, the length of the stroke, the force of the spring, the action of the tappet, or the size or shape of the valve. The pressure on the oil should be at least 100 lbs. to the square inch, so that it may enter with great force into the cylinder. The oil may be contained in a strong tank subject to the pressure of compressed air; or a small pump may be arranged to pump a larger quantity of liquid than is required, the superfluous oil being blown through a bye-pass at a pressure in excess of the pressure of the compressed air in the tank.

When four cylinders are employed upon the same crank shaft the engine may run either at a high or a low speed. Suppose that the engine is required to run slowly on a slight downward grade, the liquid may be shut off, and then, if the cylinder is hot, the apparatus will work as a hot-air engine, the only power developed being due to the increased volume of the air entering the hot cylinder, and whenever more power is required a larger or smaller quantity of oil can be admitted as required. The speed of the engine may be reduced by closing a valve in the compressed air passage.

If an automatic regulator or governor is required, one constructed in the following manner is employed; that is to say, a diaphragm is connected with the compressed air tank and with the oil-supply in such a manner that if the pressure in the air tank rises above the pre-determined pressure it diminishes the quantity of oil or gas introduced into the chamber, whereas if the pressure shall fall below this point an increased quantity of oil will be introduced and the heat will be correspondingly increased. In this way the quantity of oil burned can be automatically regulated according to the amount of work being performed. If the load is light the engine may work simply as a hot-air engine, whereas if the load is heavy it will work as a gas or oil engine.

Reversing the engine is effected as follows:—There are two sets of cams on one shaft arranged to actuate the induction and exhaust valves, and capable of the required adjustments; or if preferred, two shafts can be used, each one having its own special cams. When a single shaft is employed the shaft may be arranged to be pushed inwards to reverse the engine, whereas if two shafts are used they may be arranged to be turned about a common centre so that one or the other will come into its operative position according as the engine is to run forward or backward.

This engine, according to Mr. Maxim, will work at any desired speed, and under very different loads, and will work as well with a heavy as with a light load. It therefore requires very much less gearing than other forms of gas or oil engines, and may in fact be geared directly to the axle of the carriage or vehicle on which it is used. The engine may be arranged to permit one or more cylinders to be used as may be required, and can be adapted to the various conditions which affect the working of a road carriage which not only has to run on the level but also has to mount and descend steep inclines. In some instances arrangements can be made for employing the engine as an air pump and thereby retarding the vehicle in descending an incline.

The air reservoir may be of any convenient shape or size, but preferably it is constructed of strong tubing completely surrounding the engine and serving as its foundation, and in some cases as the framework of the carriage. The oil reservoir may be located at any convenient part of the carriage, and the water tanks may be arranged in such a manner that the water can be fed into the parts to be cooled and can only escape as steam, the water being employed for cooling the cylinder or the exhaust valve or both as may be required.

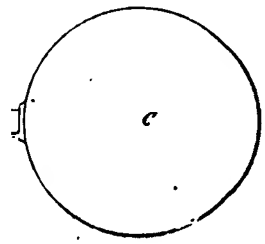
Referring to the drawings, Fig. 1 is a sectional plan of the engine adapted to be worked by charges of oil and air. Fig. 2 is a side elevation. Fig. 3 is a longitudinal section taken through one of the working cylinders and air pumps. A, A are the working cylinders and B, B are the air pumps. C is the air reservoir connected with the air pumps by the pipes, C^1, C^2, C^2. D is the crank shaft, and D^1, D^1 are the cranks thereon. E is a sprocket wheel mounted on the crank shaft and adapted to transmit motion by means of a driving chain to the axle, F, which may be the driving wheel axle of the vehicle. G, G are horizontal standards by which the working cylinders and air pumps are rigidly connected together. These standards are provided with bearings, G^1, G^1, in which the crank shaft, D, revolves and with other bearings, G^2, G^2, in which the driving wheel axle, F, revolves. The working cylinders are connected together in pairs side by side, each pair being provided with a slide valve, a, that works transversely with respect to the cylinders, and alternately opens the inlet ports, a^1, a^1, to the compressed air supply and to the exhaust passage, a^2. The slide valves are similar in construction to ordinary steam slide valves and work in valve boxes or chests, A^x, which communicate with the air reservoir or air pumps by branch pipes, C^3. At the junction of these branch pipes a throttle valve, C^4, is provided for the purpose of regulating the amount of compressed air passing to the cylinders. This valve is furnished with a stem, C^5, to which suitable lever mechanism is connected for enabling the driver of the vehicle to conveniently adjust. These slide valves are actuated by rocking shafts, a^3, having arms, a^4, a^5, the latter of which are connected to the slide valves by links, a^6, and rods, a^7, passing through suitable stuffing boxes. The arms, a^4, are connected by rods, a^8, to eccentrics, a^9, worked from the crank shaft of the engine.

For reversing the engine the sheave of each eccentric is so made that it is capable of sliding tranversely on the crank shaft.

a^{13}, a^{13} are non-return valves which are situated between the slide valves, a, and the pipes leading to the air valve, C^4, these valves serving to shut off the connection between the valve box or chest, A^x, and the air pumps when the pressure within the chest, A^x, exceeds that of the air pressure.

The working cylinders are arranged in alignment with the air pumps, their pistons being coupled together by connecting rods, A^1, A^1; B^1, B^1, the former of which drive the crank shaft. The rods, A^1, B^1, are connected together by a transverse pin, a^{14}, and the head of the rod, B^1, is formed with a curved slot, B^2, for the crank pin to work in during the revolution of the cranks and the oscillation of the rods, A^1, B^1, as they alternately assume a straight and oblique position.

By arranging the connecting rods in this manner the pump cylinders and the working cylinders are brought closer together than would be possible if a simple rod connecting the two pistons together were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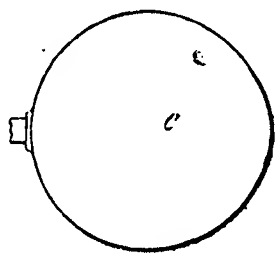
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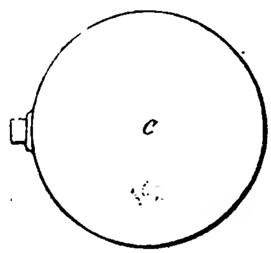
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employed, and yet the air pumps are kept a sufficient distance from the working cylinders to ensure the former being kept cool.

The connecting rod, A[1], is made hollow as shown, so as to contain lubricant which can flow to the crank pin. At every outward stroke of each of the air pump pistons air enters the pump from the atmosphere through the openings, b, b^1, b^2, in the piston. During the inward stroke of the pump piston the openings, b^2, are kept closed by a flexible disc valve, b^3, and the air within the pump is forced into the air reservoir through the openings, b^4, which are kept closed against the return of the air by a flexible disc valve, b^5.

The end of the working cylinder is closed by a cap or cover, A[8], which constitutes the explosion or combustion chamber. The explosive mixture of oil and air enters the chamber, A[6], through the ports, A[8]. A[9], A[10] are electric igniters which, at the required portion of the stroke of the piston, are caused to "spark" by any suitable contact device. An externally arranged lamp for heating an ignition tube, to effect the explosions, may be used if necessary. This lamp may also be used to raise the temperature of the cylinders sufficiently to cause the vaporisation of the oil charges prior to ignition.

I, I, are the oil inlet valves, each of which is arranged to be actuated by a finger or tappet, A[11], on the pistons of the working cylinders as the pistons reciprocate. The oil inlet valve is of the plunger type, and comprises an outer casing formed with a central passage, to which the oil gains access from the inlet by transverse holes. Within the passage are two valves, one being the outlet valve, and the other a non-return valve.

Extending transversely across the engine is a rocking shaft, i^{10}, having arms, i^{11}, to whose outer ends are pivotally connected levers, i^{12}. The free ends of these pivoted levers engage with the slotted heads of the plunger pump. Situated about midway of the length of this transverse rocking shaft is another arm, i^{13}, acted upon by a spring, i^{14}, which keeps the said arm, i^{13}, constantly pressed against a plunger, i^{15}, forming part of the regulator, I[1]. This regulator consists of a box or casing within which is a flexible diaphragm, upon one side of which the inner end of the plunger, i^{15}, is located. The other side of the diaphragm communicates by means of a pipe, i^{16}, with the compressed air pipe, C[3], so as to be acted upon by the pressure of the air supplied to the engine as such air passes the throttle valve, C[4]. The free ends of the pivoted levers, i^{12}, are formed with lateral inclines, i^{17}, against which the fingers, A[11], on the pistons act to open the oil inlet valves.

It will be seen that the arm, i^{13}, is subjected to two opposed pressures—that is to say, a pressure due to the spring, i^{14}, and a pressure due to the compressed air within the regulator, I[1]. Thus the rocking shaft, i^{10}, will be shifted angularly in a direction depending on which of the pressures predominates. By such angular movement the outer ends of the arms, i^{11}, will be moved up or down, and by correspondingly shifting the pivoted levers, i^{12}, will thereby vary the extent to which the inclines, i^{17}, on the pivoted levers protrude into the path of the fingers, A[11], so regulating the extent and the duration of the opening of the oil inlet valves. Thus the amount of the oil charges supplied to the cylinders by the oil inlet valves will be automatically regulated or varied by the amount or pressure of the compressed air passing the valve, C[4], from the compressed air reservoir, or pumps. By means of this governor or regulator the driver of the vehicle can, by altering the air valve, C[4], regulate the speed of the engine.

Mr. Maxim makes no less than 22 claims in connection with this motor, but the first two seem to be the more important. They are:—

1. An engine in which the first portion of the piston's stroke is effected by the pressure of air compressed before admission to the cylinder, and the remainder by pressure due to the combustion of oil or gas in such compressed air

2. A gas or oil engine adapted to work either as a hot air and explosion engine or as a hot air or explosion engine.

The specification is numbered 9,526 of 1896.

THE USE OF ALCOHOL IN PRIME MOVERS.

M. L. LÉVY, professor of distillery at Douai, has recently published in the *Distillerie Française* an interesting article in which he investigates the thermo-dynamics of alcohol and other hydrocarbons when employed as the source of motive power in an ideal motor, following the Beau de Rochas Cycle. One of the principal advantages of the use of alcohol is the total absence of that disagreeable smell that accompanies the use of petrol and other petroleum compounds in motors.

Number of Horse-power Hours theoretically produced by the Combustion of one kilogramme from the Agent.

Nature of the Agent.	Explosion in presence of the least volume of air absolutely necessary.	Explosion in presence of a volume of air double that strictly necessary.
Alcohol at 90°	3·235	3·05
Petrol	6·75	6·12
Amylic alcohol ($C^5H^{12}O + H^2O$), 83 per cent. of alcohol	4·28	3·92
Butylic alcohol ($C^4H^{10}O + 2H^2O$), 67·3 per cent. of alcohol	3·2	2·93
Distillery oil, 0·75 of amylic alcohol, 0·25 of butylic alcohol	4	6·73

From this it will be seen that from the thermo-dynamic point of view petrol has a great superiority. Coming now to the economical aspect of the question, in which one seeks to obtain the greatest amount of work at the least cost of material, the results obtained in the following table show how much work can be obtained from the combustion of one franc's worth of each of the various agents named. In the calculation the following prices obtain:—Alcohol at 90°, 30 francs per hectolitre (in bond); petrol, 0·45 franc per kilogramme; distillery oil, 0·133 franc per kilogramme:—

Number of Horse-power Hours obtained by the Combustion of one franc's worth of each substance.

Nature of the Agent.	Explosion in presence of a volume of air strictly necessary.	Explosion in presence of a volume of air double that strictly necessary.
Alcohol	9·00	8·50
Petrol	15·00	13·60
Distillery oil	30·00	27·50

From this it will be seen that it is impossible to think of replacing petrol by alcohol in small motors; pure alcohol is 60 per cent. dearer than petrol, but its use presents certain advantages, taking into consideration the cleanness and convenience resulting from a complete combustion. If, on the contrary, leaving out economy, distillery oil and alcohol are mixed, they are more easily burnt than petrol, and also they do not, like the latter, infect the air, and are capable of producing as much work, under certain conditions, as economically as petrol.

The Underground Railway and Electric Traction.—We recently commented upon the supineness of the directors of this and the District Company in adhering to steam locomotives when, as it appears to us, compressed air locomotives would offer so many advantages. Since then, a *Daily Mail* representative has interviewed an official of the Metropolitan Railway on the subject of electric traction, for the purpose of ascertaining what are the difficulties mentioned by Mr. Bell before the Board of Trade Commission, whose report was recently issued. The official interviewed said the point referred to by Mr. Bell was, he imagined, the question of finding the initial energy for starting a large number of trains simultaneously on the same section. "There are 27 stations on the circle," he said, "and to start trains from several of these at the same time would require a considerable power from the source of supply. This difficulty will, of course, be overcome eventually; but electrical traction will not be utilised on the Metropolitan system for some little time. The subject is receiving the continuous attention of the directors, but it is naturally one that demands serious consideration. As soon as a decision is arrived at a definite announcement will be made." Why does not Mr. Bell try compressed air locomotives?

DOINGS OF PUBLIC COMPANIES.

THE capital of Headland's Patent Electric Storage Battery Company (Limited) has been increased from £15,000 to £20,000 by the creation of 5,000 new shares of £1 each.

A GENERAL meeting of the Universal Electric Carriage Syndicate will be held at the London Tavern, Fenchurch Street, E.C., on December 2nd, at two o'clock, to receive a report by the liquidator (Mr. W. O. Attree) of the winding-up operations.

"SMIDDY, LONDON," is the telegraphic address of Messrs. J. W. and T. Connolly, King's Cross, manufacturers of the well-known "Ideal" rubber tyre. In this firm's advertisement in our last issue it was inadvertently printed "Smidoly." Business firms please note and alter accordingly.

THE report and accounts of the British Motor Syndicate, to be submitted at the general meeting to be held on the 18th instant, are just issued, and are published in this number. The figures are of a most remarkable nature, and as the report is only to hand as we go to press, we reserve our criticism of this extraordinary document for our next issue.

AT the meeting of the Colonial Assets and Investment Company (Limited), held on the 10th inst., reference was made to the London Electric Omnibus Company, to the effect that the former owned a one-sixth interest in the Ward accumulator, and it was stated that the London Electric Omnibus Company, which has been formed for the purpose of working this accumulator, has completed the construction of three omnibuses, but its directors have decided that until the Company has a sufficient number to run on the streets it will not commence a regular service of electric omnibuses.

A DIVIDEND of 10 per cent. has been declared by the directors of the Caledonian Motor-Car and Cycle Company (Limited), of Aberdeen. The called-up capital of the Company is just over £2,300, and the net profit from all sources from December 24th, 1896, to September 30th, 1897, being nine months and four days' trading, amount, as per profit and loss account, to £548 10*s.* 11*d.*; depreciation on the plant, machinery, fittings, &c., being 10 per cent. written off, £65 12*s.* 10*d.*; leaving a balance for division of £482 18*s.* 1*d.* This sum the directors propose to deal with as follows:—Write off the total amount of preliminary expenses, £124 12*s.* 4*d.*; pay a dividend of 10 per cent., free of income tax, on the paid-up capital of the Company, £233 19*s.*; directors' and auditors' fees, £38 8*s.*; to carry forward to next year £85 18*s.* 9*d.*

THE shareholders in Mr. Pennington's Irish Motor and Cycle Company have reason to be satisfied with the result of the liquidation which was wisely determined upon. A second cheque has been forwarded to them giving a further refund of 1*s.* 6*d.* a share to the holders of ordinary shares, leaving only 1*s.* a share of the amount which they subscribed still due. The preference shareholders have received back the entire amount, and we understand the directors are making arrangements by which, in a short time, Mr. Robert Gardner, the liquidator, will be enabled to remit the last shilling to the original shareholders. Whatever mistakes the directors made in connection with the inception of the Company, their worst enemies cannot but render them praise for the satisfactory manner in which they have seen that those who subscribed their money to the concern, upon the faith of the high characters of the members of the Board, have been properly protected, and will not be losers by their confidence.

THERE appears to have been a great number of hard words thrown about recently in regard to the affairs of the Britannia Motor-Carriage Company (Limited), resulting in the calling, on the 4th inst., at the Holborn Restaurant, of an extraordinary general meeting in compliance with the requisition of certain members holding in the aggregate 5,825 shares, or a trifle over one-tenth of the issued capital of the Company. Whether the accusations put forth against those concerned with the launching of the Company have any measure of truth in them or no, it is not for us to say, but it certainly seems to us that all the matters which this meeting was specially called to discuss would have been better left until after the ordinary general meeting of the Company, to be held on December 15th next. When this meeting has taken place and the accounts have been presented, and the progress of the concern reported upon, it should be time enough to raise questions likely to wreck the Company in the event of the reports being of the nature foreshadowed by the malcontents. At the meeting, the directors made a very good stand against the attacks of their traducers, the Chairman's proposal for the adjournment of the meeting until immediately after the annual meeting, on December 15th, being ultimately carried unanimously. We trust the directors will be able to follow up their advantage by demonstrating beyond doubt at the December meeting that the affairs of the Company are in a flourishing condition and likely to result in substantial dividends being paid speedily to the shareholders. The President, the Hon J. H. H. Berkeley, must be congratulated upon the admirable manner in which he ruled the meeting, which at first gave promise of such unpleasant developments.

THE meeting of the shareholders of the New Beeston Cycle Company (Limited), was held at Coventry on the 14th of last month, to consider the scheme of reconstruction set forth in our October issue. Mr. Rowland Hill presided, and stated that the directors had decided to take the shareholders entirely into their confidence, and had therefore given the fullest information possible. He stated that, as the meeting was aware, the vendors handed over to this Company the business assets of the successful Quinton Cycle Company, which they had previously purchased for £55,000. By the prospectus the promoters were able to legally claim a large number of vendors' shares, which established, in the Chairman's opinion, a crushing load, from which, unless relieved, it would never hold up its head. It was not long after the flotation before Dr. Iliffe and himself saw the necessity of finding some way of relieving the shareholders of this crushing weight of vendors' shares. Their endeavours had culminated in the scheme now placed before them. It was a better scheme than they ever dreamt it was possible to get, and was the result of months of anxiety and negotiation. They anticipated satisfactory results from it, and by that he meant dividends to the shareholders. They knew that their cycle business was a good one, and if fairly capitalised there should be good dividends. They had one of the finest factories in the trade, and if there was one-half the demand in England that there was in France for motor-cycles that business should pay a large dividend, even out-doing eventually the Cycle Company. The directors had been told that the present scheme was above criticism. The separation of the cycle from the motor business was considered absolutely necessary, and it was also absolutely necessary to have more working capital. On the cycle side the Company had done a large trade, and their plans for next year were for a greater trade. He moved that the scheme be approved. Dr. Iliffe, seconded, and stated that the new share capital would be called up at lengthened periods. After some discussion the scheme was put to the meeting and unanimously approved The Chairman then stated that it was a matter of satisfaction that £450 000 of proxies had been received in favour of the scheme, and over £100,000 were ordinary shares. The Chairman and Dr. Iliffe were thanked by the meeting, Mr. Stevens remarking that they had the courage to stick to the firm when the other directors were afraid to meet the shareholders. In accordance with the resolution, the Beeston Motor Company (Limited) has now been registered, with a capital of £110,000 in £1 shares.

G. R. Blot and Co. (Limited).

UNDER the above title a Company has been registered with a capital of £75,000, in shares of £1 each, for the purpose of manufacturing electrical and other apparatus and plant, and especially accumulators of the kind manufactured by Mr. G. R. Blot. The invention is patented practically all over the world, and the English Company acquires the patents of Great Britain, Canada, and several of the colonies, together with the right of taking out patents in all countries in which patents or protections do not already exist. We understand that the whole of the capital has been privately subscribed, and that the Company will at once get to work to place their accumulators upon the market in a commercial form. The directors are Mr. Thomas Parker, J.P., M.I.C.E., &c., of Thomas Parker (Limited), Wolverhampton; Mr. F. Hall Kirby, M.I.C.E.; Mr. Ernest Honey, of the Elswick Cycle Company (Limited); and Mr. G. R. Blot, the inventor. The offices of the Company are at 33, St. Swithin's Lane, London, E.C.

New and Mayne (Limited).

FOLLOWING the appointment of a receiver and manager upon the application of Mr. Rucker, a debenture-holder, made on September 15th last, in the above matter, two meetings have been held of the creditors of the Company at the Westminster Palace Hotel, the first being adjourned until the 10th inst. to enable a report to be drawn up for the creditors by a Committee appointed at the first meeting. The following gentlemen constituted the Committee :—Messrs. Reuben Hunt (R. Hunt and Co.), J. Strong (Henderson and Spalding), J. Hoyle (Dicks' Asbestos Company), and W. L. Gray (Dunlop Company). At the adjourned meeting, Mr. A. L. Basden, the receiver appointed by the Court, read the report drawn up by the creditors' Committee, which, after giving particulars of their investigations into the Company's affairs, the method of keeping the books, the proper issue of debentures, &c., pointed out that Mr. Rucker had from time to time advanced very large sums of money to the Company for the purpose of carrying on the business, amounting in the aggregate to close on £80,000, against which Mr. Rucker held some £53,000 of first debentures. After several interviews and a good deal of negotiation, the Committee had arranged with Mr. Rucker, subject to the creditors consenting to the reconstruction of the Company upon the lines indicated in the scheme set forth in the original circular, to accept in the reconstructed Company £25,000 in first mortgage debentures, and for the balance of his debentures he was willing to accept second mortgage debentures *pro rata* with the rest of the unsecured creditors, who would also receive a similar security in the reconstructed Company for the full amount of their debts. The Committee in their report then unanimously and strongly recommended the full acceptance of the amended reconstruction scheme, and a resolution to that effect being put to the meeting was carried with only one dissentient, viz., a representative of Messrs. J. K. and R. Lord, who recently filed a petition in the Companies' Winding-Up Court for the compulsory winding-up of New and Mayne (Limited). The resolution was then declared carried, and the necessary creditors' signatures obtained to enable the receiver and manager to obtain the consent of the High Court to the reconstruction scheme agreed upon by the creditors.

The Committee appear to have done their work admirably, and the unsecured creditors have to thank Mr. Rucker for the extremely generous way in which he has dealt with his claims upon the entire assets of the Company. There is no question in our mind that the creditors have a very substantial chance of obtaining their money back ultimately, as there is little doubt that New and Mayne (Limited) have valuable assets, which, if properly worked, should, under the coming condition of affairs in the automotor industry, result in the building up of a very valuable business.

Leather-Shod Wheel Company.

A LARGE company of shareholders met at the works of the Leather-Shod Wheel Company (Limited), at Bow Road, E., last month, for the purpose of witnessing a demonstration of the process by which the Company manufactures leather tyres and applies them to wheels of all kinds. It is claimed for the leather tyre invented by Messrs. Pierrou and Klein in 1895—the patent rights of which for the United Kingdom the Leather-Shod Wheel Company (Limited) was formed to take over—that it is at once elastic, durable, quiet, cheap, and light running. In the year mentioned works were started in Vienna, and the Austrian Government very soon began to use the wheels in several of their departments.

Upon the formation of the English Company, among the first orders given was one for wheels for the trolleys in the House of Commons. Then the Secretary of State for War gave an order for wheels for military carriages, and another came from the Director of Clothing of the Royal Army Clothing Department. Instructions were also received before many weeks had passed to prepare trial sets of wheels for the General Post Office, the London Road-Car Company, the Maxim-Nordenfelt Guns and Ammunition Company, Messrs. Merryweather and Sons for fire-engines, and a set of wheels for use on one of the London Tramways. In all these cases it is said the trials made have proved satisfactory, and orders have been sent in for wheels, not only for ordinary carriages, cars, and vans, but also for trucks, trolleys, machine pulleys, roller skates, friction wheels for transmitting power, rollers for bridges and gates, seed crushers, &c.

It is stated that, in addition to the quiet running, it is so elastic that a wheel dropped on a wooden floor will rebound about one-fifth of the distance. In Vienna it is found that the leather tyres last nearly as long as iron tyres, and three to four times as long as tyres made of rubber. As to cost, a whole wheel fitted with the leather tyre can be supplied at the same price as a rubber tyre alone. It is further claimed that considerable economy is effected in repairs of vehicles using these tyres, it being found that vehicles using elastic tyres last much longer than others. Moreover, it is contended that the tyre will stand such heavy weights that a tread as narrow as two inches can, if desired, be used for vehicles carrying loads of five tons upon each wheel, and in support of this statement are instanced the leather-shod wheels used for artillery purposes by the well-known firm of Fried. Krupp, gun-makers, of Essen. Any existing wheel can have the tyre attached rapidly and cheaply.

The process of manufacture, as explained to the shareholders by Mr. H. S. Fearon, the Company's engineer, is as follows:—Strips of leather are first passed into a machine and stamped into dies, which, having also been glued in the operation, are pressed into a cylinder and then delivered into racks in long segments. A whole tyre is made up and placed into a frame, which holds it tightly, and it is then several inches in diameter larger than the wheel for which it is intended. Upon being placed around the wheel, to the rim of which a vertical channel has already been attached, it undergoes a very great circumferential hydraulic pressure, and is contracted into the channel, the edges of which are subsequently turned in upon the leather, thus holding the whole firmly in position. A large factory is in course of construction, and in a few weeks it is expected that the Company will be manufacturing wheels in considerable quantities. The tyring machines are capable of turning out 300 wheels per day, three feet in diameter, with only 60 workmen.

British Motor Syndicate.

THE report of the directors of the British Motor Syndicate (Limited), with balance-sheet and profit and loss account from the date of incorporation to 30th September, 1897, to be submitted to the general meeting to be held at Coventry on the 18th inst., states that the gross profits, before charging directors' fees, amount to £446,285. Dividends and bonuses have been paid absorbing £217,173, and the Board have thought it wise at this time to utilise a considerable portion of the balance of profits in writing liberal sums off the cost of patents, freehold property, furniture, &c., as shown in the accounts. The cost of patents amounts to no less than £413,682, whereas the capital issued to the same date is £250.000, so that nearly half the cost of the patents has been paid out of the profits, and not out of the capital. Last year the Board's efforts were principally directed towards obtaining the necessary funds for purchasing controlling patents—the motor car as now used being quite a modern invention. This year attention has been given to the manufacture of motor-cars in this country, and the industry has now been thoroughly established. The progress made is seen by the fact that, whereas last November no British-made motor car was in existence, to-day upwards of 200 motors and motor-cars have already been turned out by the Company's various licensees at Coventry, and motor-cars are being delivered weekly. So far all attempts to excel the patents and inventions belonging to this Syndicate have signally failed, and all tests, public and private, indicate that their Systems are the only practical ones of any value, and will be found the controlling powers in the industry for years to come. All the international competitions and races have again this year been won by motors in accordance with the patents held by the Syndicate. The directors further report the continued success of their litigation. All points hitherto contested in the Law Courts have been won by the Syndicate. It has been deemed prudent to restrict the issue of new licences for the present, in view of the rapid developments now taking place. With reference to the Syndicate's electrical patents, no better evidence could be given than the electrical cabs now running in the streets of London under the Company's licence. The able management of the London Electrical Cab Company has silenced misrepresentations with reference to electrical motors. The oil-motors have a long list of records for the year in speed. In certain Government departments they are being submitted to severe tests, and the reports to date are in every way favourable. It is a matter for congratulation that in less than two years this Syndicate has obtained the premier position in this country. More progress is shown here than even in America or Germany. Only in France has this been exceeded, where, after the most thorough testing, the motor is being adopted by the railway companies, the post office, the army, and is rapidly coming into general use for large establishments, as effecting great economy in time and money. The state of the share market and the Jubilee year have deferred the launching of any new enterprise this year. Time is, however, in the Company's favour, as the motor is each day gaining ground, and the position is strengthening. The directors are now preparing plans for extensive developments next year.

With the report is issued a circular announcing that an extraordinary meeting of the Syndicate is to be held at the close of the ordinary meeting for the purpose of passing certain resolutions to alter the articles of association (which alterations are rendered necessary in order that the Syndicate may apply for a Stock Exchange quotation, and by reason of the extension of the Syndicate's business which is now transpiring), and to divide the existing capital of the Syndicate into two classes of shares—preference and ordinary. The meetings will be held at Coventry in order that shareholders may inspect the motor-mills there situated, which are proposed to be taken over.

PROFIT AND LOSS ACCOUNT, FROM 21st NOVEMBER, 1895, TO 30th SEPTEMBER, 1896.

Dr.	£	s.	d.	£	s.	d.
To expenses connected with exploitation of patents and licences and agents' and renewal fees ..				134,227	7	7
Office salaries, experts' fees, rent, rates, taxes, insurance, gas and water, postage, law costs, travelling expenses, carriage, repairs and renewals, and petty expenses				12,319	4	7
Purchase of motors, cars, tools, &c., including working models and patterns				19,030	19	4
Printing, advertising, demonstrations, exhibition show and preliminary expenses..				14,578	9	7
Bank charges and interest				173	7	10
Directors' fees				625	0	0
Amounts written off—						
Patents and licences ..	150,000	0	0			
Shares	46,777	10	0			
Furniture, fixtures, and fittings..	215	4	9			
Freehold premises	139	8	4			
				197,132	3	1
Balance carried to balance sheet				248,528	7	0
				£626,614	19	0

Cr.	£	s.	d.	£	s.	d.
By sale of licences—						
For cash	301,000	0	0			
For shares	290,000	0	0			
				591,000	0	0
Motors, bicycles, tricycles, &c., sold, and sundry profits				24,527	12	4
Stock of motors, cars, bicycles, tricyles, tools, &c., on hand September 30th, 1897, as valued by the manager				11,087	6	8
				£626,614	19	0

BALANCE SHEET, 30th SEPTEMBER, 1897.

Dr.	£	s.	d.	£	s.	d.
To nominal capital—						
1,000,000 shares of £1 each	£1,000,000	0	0			
Capital issued and paid—						
250,000 shares of £1 each				250,000	0	0
Note.—By an agreement dated 21st October, 1896, the Syndicate became liable for the issue of 750,000 shares, in respect of patents therein referred to; 650,000 of the above shares still remain to be issued under such agreement.						
Sundry creditors—						
On open account	£29,267	13	3			
On bills payable	2,600	0	0			
				31,867	13	3
Profit and loss account—						
Balance per account ..	£248,528	7	0			
Less dividends and bonus paid—						
In cash .. £52,652 14 7						
In shares .. 164,520 0 0						
	217,172	14	7			
				31,355	12	5
				£313,223	5	8

Cr.	£	s.	d.	£	s.	d.
By patents and licenses acquired—						
For cash	136,683	11	5			
For shares (see Note under heading of capital) ..	276,993	0	0			
Less amount written off ..	150,000	0	0			
				263,681	11	5
Shares in kindred companies—						
At cost or nominal value ..	62,370	0	0			
Less 75 per cent. written off	46,777	10	0			
				15,592	10	0
Freehold property	2,788	6	9			
Less 5 per cent. written off	139	8	4			
	2,648	18	5			
Less mortgage	1,500	0	0			
				1,148	18	5
Furniture, fixtures, and fittings	1,434	18	2			
Less 15 per cent. written off	215	4	9			
				1,219	13	5
Sundry debtors				7,772	6	1
Cost of registration of companies now in process of formation				1,649	1	4
Stock of motors, cars, bicycles, tricycles, tools, &c., on hand, as valued by the manager ..				11,087	6	8
Cash and bills (since matured and honoured) at bankers and in hand				11,071	18	4
				£313,223	5	8

I have examined the books of the British Motor Syndicate (Limited) from November 21st, 1895, the date of incorporation, to September 30th, 1897. Payments in relation to the Motor-Car Club, amounting to £4,378 8*s*. 2*d*., have been charged in the accounts as an expense. A sum of £1,664 13*s*. 4*d*. has been paid in respect of income-tax, but no reserve has been made for the balance payable, as yet unascertained. Subject to the foregoing remarks I am of opinion that the balance-sheet, which is in accordance with the books of the Syndicate, correctly exhibits the position of the Syndicate's affairs.

ERNEST BOOTHROYD, Chartered Accountant,
London, *November 1st*, 1897. Auditor.

Roller-Bearings Company.

THE ordinary general meeting of shareholders of the Roller-Bearings Company (Limited), was held on 28th October. Major-General Hutchinson, C.B., in the chair, during his speech said:—

The accounts of the Company relate, as will be observed from the balance sheet and profit and loss account, to a period of 15 months, from 2nd July, 1896, to 30th September, 1897, and, bearing in mind that the Company started to build up an absolutely new business, and had not the advantage of taking over a working concern, it will, we trust, be allowed that the results obtained during that period are not unsatisfactory. With reference to that paragraph in the report dealing with the number of bearings supplied, it may be interesting to state the various uses to which the bearings manufactured by this Company are being put.

For railway work considerable progress has been made during the last 12 months with the railway companies, both in this country and on the Continent. The London, Brighton, and South Coast Company, after experimenting themselves with these bearings for upwards of two years with satisfactory results, have now decided to adopt them for main line passenger traffic, and they, it is hoped, will shortly be fitted to their bogie stock. The South Eastern Railway have also determined to give them an extensive trial. The North Eastern Railway have been supplied with these bearings, and the Lynton and Barnstaple Railway, now approaching completion, have fitted the whole of their rolling stock with these bearings. With regard to electrical railways, the City and South London (King William Street to Stockwell) have fitted trains with them, and the directors are glad to announce that they have secured the contract for the whole of the rolling stock of the Waterloo and City Railway, and the whole of the carriages upon the Liverpool Overhead Railway are being gradually fitted with their bearings. The Mono-Rail Lightning Express Train at the Brussels Exhibition was fitted throughout with these bearings, and the directors have reason to believe that the results were satisfactory. The Company was awarded a silver medal diploma at the Exhibition for their exhibits. With respect to tramway works, the bearings have been supplied to gas, traction, and electrically worked cars for Blackpool, for cable cars at Edinburgh, and for horse tramways at Burnley, Worcester, Deptford, and Northampton. For motor-car work the bearings have already been supplied to Scarborough and Queensland; and bearings for shafting, furnace-cars, trollies, cranes, and ventilating fans for machinery have also been supplied by this Company, and negotiations are now in progress for fitting up electrical cabs, omnibuses, and other vehicles. Space has been taken at the Crystal Palace, where two loaded wagons are on view, one fitted with ordinary axle-boxes and the other with roller bearings. In conclusion, the demand for these roller bearings is steadily increasing, and the results obtained from their practical application in every-day use justify the directors in believing that the experimental stage of roller bearings is now passed, and that as their many advantages become more widely known and appreciated their success is assured, and their general adoption is only a question of gradual, if not of rapid, development. I now beg to move the adoption of the report and accounts.

Mr. W. SHELFORD seconded the motion, which was agreed to unanimously.

The Daimler Motor Company.

WORK ACCOMPLISHED—OUTLOOK FOR THE INDUSTRY AND DIVIDEND PROSPECTS.

THE second ordinary general meeting of the Daimler Motor Company (Limited) was held last month, under the presidency of Mr. H. J. J. Sturmey (the Chairman of the Company).

The Secretary (Mr. E. M. C. Instone) read the notice convening the meeting.

The CHAIRMAN said when he had the pleasure of meeting the shareholders at Coventry the Company was on the point of commencing actual deliveries of motors. That was in May, and although this balance-sheet took them very little into the actual period of production, he was inclined to congratulate the shareholders upon what he considered was a very successful result for their first year's working, in view of the fact of the long time necessary to organise the works. Remembering that they had undertaken the manufacture of an entirely new article, and that practically no one in this country was acquainted with it, he thought the time had not been wasted in any way upon it, and that the progress made had really been rapid. As would be seen from the balance-sheet (which was published in the October number of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL), the whole of their capital was subscribed. In regard to the item, plant and machinery, £17,752, if any of the shareholders were engineers, the directors most cordially invited them to make the most careful inspection of the works; whilst if they were not engineers, the Board would welcome the visit of any trained practical engineer in whom they might have faith and like to send. He thought that an inspection would show that for "up-to-dateness," completeness, and suitability for the work in hand they had the finest installation of plant and machinery in the trade, either in this country or abroad. For many months the work was that of preparation, and he need not tell the veriest novice at mechanical work that they could not make a complete article until they had every part—motor-gear, wheels, tyres, chains, and everything else. At the same time the work of producing those parts in quantity had been going on, so that although they had very few carriages actually finished, they had the parts ready for a very large number. When they had every part finished and ready to the hand of the builders it took something like a fortnight to erect the motor, and then various times, from a fortnight to as much as five weeks, for the motor to go through the testing shops for its many little adjustments and putting through tests in such a way that the Company could be satisfied that the motor was of the highest efficiency, and be need scarcely say that no motor was allowed to leave the shops until the Company's experts were thoroughly satisfied on that point. Then when the motor was finished there was quite as much work in the frame, gearing, &c., as in the motor itself. It took about three weeks to put the motor into its frame, and then there was the carriage builder's work, which was necessarily slow, paints and varnishes having to be used. The highest class of carriage took 16 coats of varnish, every one of which had to dry and then be rubbed perfectly smooth before the next coat was applied.

The Company had now 24 carriages going through the shops; they were finishing them now at the rate of four a week, and hoped before many weeks had passed to increase the number to six. With regard to the item leasehold land and buildings, £9,686, plus £3,894 spent on additions, he should explain that the first amount was entirely a profit transaction. The directors were fortunate in securing at Coventry a fine property of 13 acres of leasehold land with a double factory upon it. It had been built as a cotton factory, but had been burnt out, and was rebuilt by the insurance company: but the cotton company being wound up, it had not been occupied since. It came into the market at an absurd price—less than what the factory alone cost to build—and the directors lost no time in securing it, especially as at that time the British Motor Syndicate was floating the Great Horseless Carriage Company and searching for works in which to install it. They agreed to pay a fair price to the Daimler Company for one of the factories, that price being a sum which gave them a cash profit on the transaction as well as leaving them with the second factory and the surrounding land. The valuation of the land and buildings had been taken at the insurance value. The only portion of the report which at first sight might appear not at all satisfactory to shareholders, was the fact that although they had made a substantial profit they did not recommend the payment of a dividend. But it must be remembered that the profit be had shown was not a cash profit. The £9,686 was entirely in land and buildings, and not a trading profit in the ordinary sense of the term, so that it could not be distributed. Then, although upon the balance-sheet they had £10,000 on deposit, the directors had since had to pay for additional plant, and erect new workshops for building purposes, which had taken a considerable amount. It would have considerably hampered the future operations of the Company to have paid a dividend; but the directors were hoping that next year they would be able to do so, and that it would be the first of a very long series of highly-satisfactory dividends. It was important for this object that the public should purchase motor-cars in the same way in which they were purchasing in France, and he was glad to say that all signs pointed at the present time to an excellent business in the future for the Company. The chief enemy of the motor industry was a certain section of the press. At first they had nothing too good or too hopeful to say of them. They knew nothing about it, but from their writings gave the public the idea that the motor-car was a sort of thing that could be purchased for a small amount, cost nothing to keep, and that they had only to press a button and the motor would do all the rest. Since then many French and German carriages, many of them worn out before they got to this country, had appeared on our streets, and had not been altogether a success, with the result that a section of the press had turned right round and represented the motor car as a crude thing which ran for five miles and then stopped and was at any time liable to explosion. However, a great many people were having the cars, and he was pleased to say that everyone who had been supplied had been entirely satisfied with the result. With regard to their cars he could say positively that there was absolutely no smell which reached the occupants, and no vibration which would be noticed unless it were specially looked for, while with the exercise of ordinary care, such as had to be used in regard to gas, an explosion was practically impossible. There was absolutely no danger of the car running away; for they had no less than eight means of stopping it, and they could not very well all fail. He, personally, had a car delivered on September 9th, and up to the present he had driven it 1,029 miles. He had driven it from John o'Groats house and came right through the centre of Scotland, and not a single hill, up or down, had given him any trouble whatever. In future the directors' fees would be some £200 less, because they had received a letter that morning from Mr. Harry J. Lawson, stating that he found his time fully taken up with the work of the British Motor Syndicate, and felt obliged to resign his seat on this board, but he added that he should be happy always to afford the Company any help in his power. The Chairman then concluded by formally moving the adoption of the report and accounts.

MR. JAMES A. BRADSHAW seconded the motion, and said he had put his car to an exceedingly severe test, having taken seven passengers, including luggage and a reserve of oil, from Coventry to Liverpool at an average speed of 12 miles an hour, up hill and down dale. He thought that spoke volumes for the possibilities of the Daimler motor. The car was, as far as it was possible to judge at the present moment, almost perfect.

After a short discussion, the motion was unanimously carried.

New Companies Registered.

[Under this heading we give a full list of new Companies registered which take power to make, deal, or become interested in any manner in automotor vehicles.]

	Capital.
Beeston Motor Co., Ld.	£110,000
Blenheim Cycle Co., Ld.	100
Craven Cycle Co., Ld.	2,000
Cyclists' Chalet Co., Ld. (Coxston, Somerset)	30,000
Davidson's Air-Car Construction Syndicate, Ld.	20,000
Dunlop Motor Co., Ld. (14, Regent Street, W.)	25,000
Edward Foster & Sons, Ld. (Halifax and Bradford)	50,000
Edwin Clark & Co., Ld. (Banscombe, Rodborough, Gloucestershire)	3,500
G. R. Blot & Co., Ld. (33 St. Swithin's Lane, E.C.)	75,000
Kodak Cycle Co., Ld.	100
Licensed Tyre Synndicate, Ld.	10,000
Perambulator and Manufacturing Co., Ld.	10,000
Power and Traction, Ld.	10,000
Scottish Motor-Omnibus and Car Co., Ld. (66, Cadzow Street, Hamilton, N.B.)	5,000
Self-Generating Electric Vehicle Light Syndicate, Ld. (3 and 4, Crooked Lane, E.C.)	5,000
Shakespeare, Kirkland, & Frost, Ld. (274, Stratford Road, Birmingham)	15,000
Starleys, Ld. (Aitken Chambers, Cannon Street, Birmingham)	1,000
Thames Rubber Co., Ld. (14, Coventry Street, W.)	35,000

AN AUTOMOBILE HOUSE.

M. RENODIER, of Paris, sends us an account and a drawing of a house on wheels, which owing to the pressure on our space we are unable to reproduce, which has been constructed by M. Jentaud, the well-known French carriage-builder, and purchased by the former gentleman. It was originally intended to have been entered for Les Poids Lourds Competition, but could not be completed in time. The carriage, which in some respects resembles a large railway omnibus, is divided into two bedrooms—each containing two beds, a dressing room, bath room and lavatory, a kitchen, and sundry cupboards. The various apartments are entered from a corridor on the port or left-hand side of the carriage. The bedroom can be transformed at will into a dining or day room. There are two entrances, one on the side and the other at the rear end opening into the kitchen. All the rooms are tastefully furnished and well lighted by windows with lifting panes, as in railway carriages. The beds are 1·80 metre by 0·70 metre. The carriage is 7·70 metres long, 2·50 metres wide, and 2·40 metres high inside. The two bedrooms are each 2·0 metres by 1·80 metre; and the kitchen, 1·50 metre by 2·40 metres. The water supply for the kitchen, &c., consists of a tank which holds 200 litres. On the imperial are seats for 12 persons, and space for their provisions and baggage for a run of 400 to 500 kilometres. The carriage is supported by two wheels, and the fore end rests upon the tail of the tractor, which is by De Dion et Bouton, and is rated at 30 H.P., and which can carry water and fuel sufficient for a run of 500 kilometres. This tractor can haul a load of eight tons at a speed of 16 kilometres, and can easily take 10 per cent. gradients. The cost of fuel coke runs out at about 15 centimes per kilometre.

WEIGHTS OF FRENCH LIGHT PETROLEUM MOTORS.

Name of Maker.	Horse-power.	Revs per min.	Weight. Kilos.
Audibert et Lavirotte	3	—	70
" "	6	—	180
" "	8	—	200
" "	10	—	350
Dalifol	3	—	300
Dion et Bouton	1¼	1,600	35
Chastel et David	12	—	250
Crouan et Cie.	10	—	200
Landry et Beyroux	5	400	160
" "	10–12	400	180
Panhard et Levassor	4	700	75
" "	6	700	130
" "	8	700	160
" "	12	700	250
" "	5·2	1,000	75
" "	8	1,000	130
" "	10·4	1,000	160
" "	16	1,000	250
Pygmée	1	—	30
Benz	1½	—	105
"	3	—	160
"	5	—	198
"	8	—	261
Peugeot	4	—	90
"	5	—	110
"	6	—	135

John o'Groat's to Land's End on a Motor Vehicle.—We congratulate Mr. Henry Sturmey, of the *Autocar*, on the successful completion of what we think is the longest continuous tour yet made in the British Isles in an automotor vehicle. He started from John o'Groat's House on the 2nd ult., and after travelling by easy stages, varying from 36 to 86 miles per day, arrived at Land's End at 4.35 p.m. on the 13th ult., having accomplished the journey of 929 miles at an average speed of just under 10 miles per hour all through, notwithstanding the fact that such elevations were crossed as the Ord of Caithness, the Grampian Mountains, the Pass of Killiekrankie, Kirkstone Pass into Ambleside, and the extremely hilly country between Exeter and Bodmin. Throughout the journey no breakdowns occurred, and all roads were traversed without trouble of any kind. Mr. Sturmey was accompanied by one servant, and carried between 200 and 300 lbs. of baggage, including a sufficiency of oil for the journey. The car used was of English manufacture, having been built by the Daimler Motor Company, and was fitted with a 4 H.P. motor propelled by benzoline. Part of the object of the tour was to prove the capabilities of the new mode of conveyance to surmount all hills which a capable bicyclist can master, and to travel successfully and without failure upon any high road in the kingdom, and in this Mr. Sturmey claims to have succeeded. Mr. Sturmey has since returned to Coventry, viâ London, on his automotor vehicle, which is none the worse for its long journey of over 1,500 miles.

THE HEILMANN ELECTRIC LOCOMOTIVE.

THE following are some particulars of the automotor which is being tried with great success on the Western Railway of France. The net weight is about 124 tons, the locomotive proper weighing 75 and the tender 49 tons; the latter can carry 19·6 tons, or 4,386 gallons of water. In appearance the locomotive is massive, but without being clumsy, it gives one the idea of concentrated energy. The design is well worked out. In working order the total weight of the engine, tender, coal water, &c., is 200 tons. There are eight pairs of wheels, each pair being driven by a 100 H.P. motor. These motors receive current from two dynamos of 1,000 ampères at 450 volts, but this output can be easily increased. These electric generators are mounted one at each end of verti.al engines, which are divided in two groups, each with three cylinders working on the compound system. These engines have been construoted by Willans and Robinson, and with them there has been overcome one of the difficulties experienced with the experimental engine, whereby excessive vibration was set up; the arrangement of the six cylinders gives effective balancing. The motor gives off 1,400 H.P., and at this power it can haul a train of not less than 588 tons weight at a speed of 37 miles per hour, or at a speed of 68 miles per hour it can haul a train of 245 tons weight. The heating surface of the boiler is slightly under 2,000 square feet, while the steam pressure is 200 lbs. The locomotive is 93 feet long over all, 9 feet wide; the chimney is 13 feet 9 inches above the rail level. Whether the comparatively light permanent way adopted in France will stand such heavy traffic is, however, doubtful; our own opinion is, that before the undoubted advantages of the Heilmann locomotive can be enjoyed rails of much heavier section, closer spaced sleepers, &c., must be employed. The first public trial trip took place on the 12th and was most successful. It may be mentioned that the famous McIntosh engine for the Caledonian Company, known as the Dunalistair, is 53 feet 4 inches long, including the tender, and weighs 86 tons. The corridor train taken by her weighs 354 tons, so that the Dunalistair's performance, especially over Beattock, is almost as good as the Heilmann.

AUTOMOBILISM AND THE FIRE BRIGADE OF THE LARGEST CITY OF THE WORLD.

ACCORDING to the report of the Fire Brigade Committee of the London County Council for the year ending March 31st last, issued a few days ago, the staff of the Brigade numbers 963. Firemen employed on watch by day at the stations throughout London number 140, and at the engine and escape stations by night 375, making a total of 515 in every 24 hours. The authorised strength of the Brigade includes 963 officers and men, comprising coachmen, pilots, and men under instruction; 58 land fire engine stations, 3 sub-stations, 16 permanent street stations, with fire-extinguishing and life-saving appliances, 204 fire-escape stations, 60 hose-cart stations, 11 hose and ladder truck stations, 5 river stations, 8 steam tugs, 13 barges, 9 carrying engines (4 being used as store barges), 9 steam fire engines on barges, 58 land steam fire engines, 66 6-inch manual fire engines called "curricles," 35 miles of hose, 115 hose carts and hose reels, 14 hose and ladder trucks, 7 horse tenders and fire-escapes combined, 12 vans for carrying hose, coal, fire-escapes, and stores, 4 wagons for street stations, 7 vehicles for use of officers when inspecting stations, &c., 226 fire escapes (inclusive of 11 small fire-escapes kept at police stations), 5 long fire-ladders, and 9 vans to carry the same, and 139 horses. The actual disbursements during 1896-7 on maintenance, including pensions, were £164,728, and on capital £75,031 2*s.* 7*d.*

Speaking generally, it must be said that most of this enormous plant is antiquated and obsolete in design, and generally inefficient: there is not a single steam motor which works at anything more than 150 lbs.—a comparatively low pressure. There is not a single electric pump. Flexible metal section hoses are things utterly unknown to the Fire Brigade, as are water towers and other improved means for dealing with fires. Lastly, *there is not a single automotor fire engine in the first city of the world.* Can it be wondered at that London fires are so frightfully destructive and so costly? Little or no improvement has been made in the plant of the Fire Brigade since the days of the old Metropolitan Board of Works.

LECTURES ON PATENT LAW.

A VERY important course of six lectures is now being delivered by J. Fletcher Moulton, Esq., Q.C., on "Patent Law," under the auspices of the Council of Legal Education, in the Middle Temple Hall. The first lecture was delivered on Tuesday, November 2nd. at 7.45 p.m., and the lectures will be continued at the same hour on subsequent Tuesdays. The following is a syllabus of the lectures:—

Lecture I.—Nature of Grant by Letters Patent.—Their Legal Status prior to Act of Monopolies.—Effect of that Act.—Practice and Procedure in the Sixteenth and Seventeenth Centuries.—Modern Developments.—Legal Status of Letters Patent under Existing Law.

Lecture II.—The Invention.—Difficulty of Definition of the Word "Invention."—Essential Characteristics of a Patentable Invention.—Negative Canons Derivable from Judicial Decisions.—Delimitation of the Invention in the Specification.—Origin and Function of Claims.—Their Interpretation.—Colourable Imitation.

Lecture III.—Conditions of Validity.—(1) Novelty:—Prior User.—Secret User.—Experimental User.—Prior Publication.—Its Sufficiency.—Conflicting Decisions.—Distinction between Public Knowledge and Common Knowledge.—Publication by the Inventor Himself.

Lecture IV.—Conditions of Validity (*continued*).—(2) Sufficiency of Specification:—Double Duty of the Patentee.—Difficulties arising therefrom.—Examples.—(3) Utility:—Origin and Nature of the Condition.—Meaning of the Term in Patent Law.—Commercial Utility.—(4) Conformity:—Origin and Nature of the Condition.—Fair Development.

Lecture V.—Procedure.—Mode of Obtaining the Grant.—Amendment of Grant.—Revocation of Grant.—Rights and Remedies of Patentee.—Rights and Remedies of Public.—Action for Threats.—Compulsory Licences.

Lecture VI.—Defects of English Patent Law.—Foreign Systems.—Relative Advantages.—Possible Improvements.—International Rights.

The lectures will be open to all members of the Inns of Court free, and to gentlemen non-members on payment of a fee of one guinea for the course. Tickets to be obtained at the office of the Council, Lincoln's Inn Hall, W.C.

Automotor Vehicles in Berlin.—A society has just been started in Berlin to promote the introduction of motor-cars on the Continent. In discussing this enterprise, the *Elektrotechnische Zeitschrift* brings forward certain statistics to show that the electric car, with accumulators, is not so very far behind the petroleum motor-car in weight and speed, and that for certain purposes, such as for cabs and parcel vans, the electric car has the advantage. A comparison is made between a Daimler benzine car and an electric car made by Kühlstein. Both these cars are capable of carrying five persons. If five persons are taken as weighing 400 kilogrammes, the comparison between the two cars is shown in the following table, using the figures given by the manufacturers:—

	Daimler.	Kühlstein.
Weight, fully loaded.. ..	1,550 kg.	2,000 kg.
Average speed per hour ..	12 miles.	8·4 miles.
Maximum speed per hour ..	15·6 miles.	12·8 miles.

The electric car contains 30 Correns cells, with a capacity of 250 ampère-hours. According to experiments by Correns, the Lundell motor on this car required 35 ampères on good stone pavement, 42 ampères on asphalt, and 60 ampères on the ordinary roads. One charge is sufficient to run 42 miles. The battery weighs 750 kilogrammes, and gives, with an average discharge current of 46 ampères, 14 kilowatt-hours or 1 kilowatt hour per 53 kilogrammes of battery. The London electric cab, carrying three persons, weighs 1,500 kilogrammes, and has an average speed of 9·6 miles per hour. Its horse-power, compared with Kühlstein's car, is as 24 to 28, and the weight of the batteries as 70 to 75. Since the London cabs run 41 miles with one charge, the product of weight × run is 72 mile-tons, while with the Kühlstein car it is 84 mile-tons. Our German contemporary concludes, from these figures, that Kühlstein's car is 9 per cent. better than the London cab in power developed per unit weight of battery.

NOTICES.

Contributions and articles likely to prove of interest to our readers will receive due attention, but in all cases the name and address of the writer must be given, not necessarily for publication.

All matter intended for publication should reach us not later than the 10th of each month, and be addressed to THE EDITOR OF "THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL," 62, *St. Martin's Lane, London, W.C. Stamped envelope must be sent if the manuscript is required to be returned. The Journal is published the middle of each month.*

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The Automotor and Horseless Vehicle Journal.

A RECORD AND REVIEW OF APPLIED AUTOMATIC LOCOMOTION.

NOVEMBER 16TH, 1897.

DIARY OF FORTHCOMING EVENTS.

Notices to be included under this heading should reach the Office not later than the 12th of each month.

1897.

Nov. 19-27	..	Motor-Vehicles at the Stanley Show, Agricultural Hall, London.
Nov. 26	..	Opening Session of Self-Propelled Traffic Association (Liverpool Centre). Address, with lantern illustrations: "Self-Propelled Vehicles, 1896-7," by Worby Beaumont, M.I.C.E., &c.
		Motor-Car Club Annual Meet. Hôtel Métropole, London, 11 a.m. Drive to Sheen House Club, Richmond Park. Returning at 4 p.m.
Dec. 13	..	Yorkshire College Engineering Society—"The Daimler Motor and its Application to Auto-Cars" (illustrated), by J. Sidney Critchley (Daimler Motor Co.).

1898.

Jan. ..	..	Exhibition of Locomotion and Engineering, Rifle Barracks, Belle Vue, Bradford.
Jan. 11	..	Liverpool Cycle and Motor-Car Exhibition, Liverpool.
Jan. 20-29	..	Midland Cycle and Motor-Car Exhibition, Bingley Hall, Birmingham.
Feb. 3-12	..	Sheffield Cycle, Motor-Car, and Accessories Exhibition, Drill Hall, Sheffield.
Feb. 14	..	Yorkshire College Engineering Society—"The Steam Turbine Engine and its Applications," by John D. Bailie (C. A. Parsons and Co., Newcastle).
May 2, 9, 16, 23		Society of Arts Cantor Lectures—"Electric Traction," by Prof. Carus Wilson.
May 24	..	Self-Propelled Traffic Association (Liverpool Centre) Heavy Vehicle Trials.
June ..	..	Motor-Vehicle Exhibition, Paris. Automobile Club of France. Sections—(*a*) Automotor vehicles which have given proof of their practical efficiency; (*b*) Industries connected with automobilism; (*c*) Motors adapted for automotors; (*d*) Vehicles adapted for automotors.
July 5..	..	Race from Paris to Amsterdam, under the auspices of the Automobile Club of France.
1899 ..	..	Race from Paris to St. Petersburg, under the auspices of the Automobile Club of France.
1900 ..	..	Paris International Exhibition — Great Display of Automotor-Vehicles and Allied Trades.

ANSWERS TO CORRESPONDENTS.

G. A. (Sheffield).—Copy sent as desired. We thank you for your expressions of appreciation.

J. G. (Carnoustie).—We have sent your letter on as desired. For future guidance, however, you might note the postage is 2½*d.* The address is 13, Boulevard Malesherbes, Paris.

H. EVANS (Worcester).—We thank you for returning the paper. The address of Mr. J. S. Bickford is Camborne.

J. P. HITCHIN (Rochdale).—A Company is in formation for working the English patents, and will shortly be carried through. A lorry upon this principle has already been constructed in England, and the Company hold the patent rights for Great Britain. The registered offices of the Company are 7, Poultry, London, E.C.

W. B. B. (Hayward's Heath).—The only bath chair motor attachment which we know is one supplied by the Britannia Motor-Carriage Company, of Woodstock Road, Shepherd's Bush. Mr. John Ward, of 246, Tottenham Court Road, has, we believe, one on view at his premises. The motor is electric. You might try New and Mayne, Woking.

A. A. C. (Bedford), R. C. F. (Gloucester), J. B. (Kenilworth), J. E. (Invicta).—We regret it is impossible to supply you with No. 1, Vol. I. The only form in which you can procure it, we are afraid, is in a bound volume at one guinea, which price is likely to increase. Practically all the rest of the numbers can be obtained at the ordinary price.

J. E. F. J. W. (Llandudno).—You did not send your change of address. Hence the reason of your not receiving the paper. We are now forwarding back numbers as desired.

J. W. (Southend-on-Sea).—The address of M. Peugeot is Mandeure, Doubs, France.

THE SELF-PROPELLED TRAFFIC ASSOCIATION'S COMPETITIONS.

ELSEWHERE in the present issue we publish the rules drawn up by the Self-Propelled Traffic Association for the conduct of the competition to be held next year in Liverpool. As will be seen, considerable care has been taken in framing them so as to not only secure the object that the Association has in view, but also to give designers the widest possible latitude. In order to ensure the former the judges will be selected from the Council of the Association, and no difficulty should be experienced in finding suitable men for this purpose. Inasmuch as the S.P.T.A. was largely, we had almost said entirely, formed to develop motor traffic in goods on commercial lines between large towns, the nature of the problem to be solved is not altogether the same as that which existed in *The Engineer* and Les Poids Lourds Competition. In these a more catholic idea was sought to be achieved. In the S.P.T.A. the problem is more definite. The loads to be carried, the work the vehicles will have to do, the routes to be traversed, are all known, and hence judges conversant with the Liverpool and Manchester trade will no doubt be able to make a more suitable choice—that is for their own local conditions. In the district named much produce is carted to and from the docks in large "floats." These are easily laden, the "lift" being not more than a foot or so. The cotton, Jaggary, hides, &c., are usually carted away on four-wheeled open-sided wagons, whose platform is about 3 feet 6 inches or 4 feet from the ground. We mention these things as being possibly serviceable hints to intending competitors. Indeed, we should strongly recommend the latter to study the local conditions on the spot, because it is certain, as can be gathered from the rules, that the competition will be a drastic one. The Liverpool merchants are quite prepared to place a large order with the maker of a vehicle that meets their views, but they won't spend sixpence on an experiment; and competitors will do well to remember that a motor-vehicle which might suit London traffic might not be acceptable in Liverpool. As will be seen, money prizes will be offered, but we do not think this an inducement. The problem, although, as we say, a definite one, is yet a difficult one. The desired motor-van is to have a net carrying capacity of 10 tons, a platform area of 110 square feet, and a mean speed of four miles per hour. It must also of necessity comply with the Locomotives on Highways Act, that is, its weight must not exceed (tare) three tons. If one runs out the salient features of a design (as we have) it will be seen that in order to get within the Act a very special design is called for. It was, we think, the difficulty of complying with the conditions laid down by *The Engineer* and the Act of Parliament that rendered the competition of our contemporary so nugatory. One cannot study the Locomotives on Highways Act without concluding that it appears to have been drawn with the evident intention of delaying the introduction of heavy automotor vehicles as long as possible. It is well known that both in the Lords and Commons there was an influential opposition to the measure, and this had to be so far placated as to render the Act partially inoperative by this limit of three tons, and also by insisting upon a low speed. We are not at all sure that the S.P.T.A. will not be well advised if it directs its energies towards obtaining an amendment to the Act in the next Parliament.

When we remember, too, that in and around Liverpool the gradients are often such that ample motive and braking power are absolutely essential, it will be realised that the problem is, as we say, a most difficult one. One of the conditions that we do not quite see the reason of, is that the mechanism shall be below the platform. Considering that the loading brows in the docks are not more than 2 feet 6 inches or 3 feet high, and that the platform must hardly be higher than this, we think this condition unnecessary. It will be noticed, too, that while the length of the vehicle is determined it is permissible to make it articulated, that is, it can consist of a long "float," the forepart of which rests on a motor-vehicle. We do not think this design will commend itself owing to the additional weight involved in the extra pair of wheels.

We have not the slightest doubt that both the conditions of the S.P.T.A. competition and the Act of Parliament can be amply fulfilled. What we do hesitate about is, whether there will be a sufficiency of competitors. One might produce a successful vehicle, but it might fail in some minor point, and even a prize or certificate of merit would not compensate the manufacturers for time and materials expended. There is, however, no doubt that the S.P.T.A. is making every effort to solve the problem of heavy automobilism, and we sincerely trust that it will be successful.

In conclusion, we would point out that the subject of automotor vehicles capable of carrying loads of 5-10 tons has now been before the engineering community for twelve months. Ample time has been afforded for the elaboration of designs, and we would ask English engineers—Is this problem of heavy automobilism to be solved on this side of the channel, or will it be left for the highly-trained and technically-educated French or German engineers to show us how it's done?

Owing to the pressure on our space this month we are obliged to hold over much important matter relating to the proceedings of the engineering societies dealing with automobilism.—Ed.

OUR IDEA ENTIRELY.

In the July number of the Automotor, on p. 415, we propounded, in an article entitled "The Automotor Industry, and How to Foster It," the idea of establishing an exchange. We wrote:—"We propose that in London and the large provincial cities, such as Liverpool, Glasgow, Manchester, Birmingham, &c., there should be formed Automotor Exchanges—that is, manufacturers and designers of automotors should form a parent Association, with branches in these towns. At each branch there would be a depôt, with examples of each type of motor. A would-be purchaser would thus be able to inspect the whole industry at a glance, and obtain the fullest technical information. Trials could be arranged, and purchases effected with the least trouble, and with the best possible guarantee that the purchaser had obtained what he required. A trial might well be made of this idea in London to start with. It is, of course, not intended to have anything in the nature of, or savouring of, an 'Exhibition.' Our idea is that of a purely business Exchange, where one could see samples of motors and obtain quotations exactly in the same way as one can go into the Corn or Wool Exchange and obtain samples and prices of these articles."

We, of course, are only too pleased that our contemporaries should adopt this idea, but, without wishing to claim any credit for it as a brilliant inspiration, we think that inasmuch as such Exchanges as we mentioned will undoubtedly be established, and as a matter of historical accuracy for the guidance of future writers on the history of automobilism, not to mention such minor considerations as journalistic etiquette, it should be clearly understood that the idea in question was first promulgated by this journal. We mention this because we see *La Locomotion Automobile* lays claim to the inception of the idea, and the *Autocar*, in its issue of October 16th, says with charming naïveté:—"Our contemporary, the *Locomotion Automobile*, has suggested that the difficulty could be overcome by establishing a permanent exhibition of autocars, and of industries attaching thereto. Such a show has become so indispensable that one wonders why it was not thought of before." Really! It has been thought of before.

STABLE FIRES.

One of the many evils attending the housing and accommodation of horses is that the risk of fire is always present, and cannot well be eliminated. As the number of horses is increased, so does the risk of fire become greater, and the Fire Insurance Companies regard stables with well-founded dislike. In London where space is so costly, it has become the practice to house the horses in flats, and when it is considered what a large amount of dry hay and straw is required to feed even a moderate stable of 50 horses, and how this dry and easily-ignited material is scattered about, it will be seen that the risk is a serious one. That it is so is from time to time demonstrated by the fires which take place in connection with stables. Quite recently the well-known carriers, Messrs. Carter, Paterson, and Co., had their stables in the Goswell Road burnt out. Fortunately, owing to the prompt assistance of the Fire Brigade, nearly all the horses were saved, but the damage done to plant, goods, &c., was very great. The firm in question had a very complete and well-arranged block of stables, and it is difficult to account for the fire, unless it be attributed to carelessness or malice. Inasmuch, however, as some explanation had to be given, it occurred to certain scribes to attribute it to the motor-car. The chain of reasoning by which this conclusion is reached is not very strong, but it will serve the purpose of those newspapers which—sticklers for the old order—seek to discredit automobilism. It seems that Messrs. Carter, Paterson, and Co. use motor-vehicles for their business, and hence what more likely than that these new-fangled things caught fire or exploded? As David might say to Acres, "I suppose there ain't been so merciless a beast in the world as your loaded—motor." At any rate this is the idea that not a few writers on the Press—whether from knowledge, which we doubt, or silly prejudice, which we think—entertain. Thus the *Globe* in an inconsequential paragraph said :—

"The pros and cons of motor-car *versus* horse continue to oscillate with nicety, and a large con was registered yesterday when a conflagration broke out in Messrs. Carter, Paterson's depôt through, it is believed, an explosion of stored gas for the Company's motor-cars. It is true that your motor-car needs no oats; but, on the other hand, your horse never spontaneously combusts himself and his surroundings. If the horses which were rescued with difficulty from yesterday's fire could have given their opinions of motor-cars, we might have obtained something more interesting than printable."

On seeing this we immediately communicated with the firm in question, and these gentlemen informed us that there was absolutely no evidence to connect the fire with the motor-vehicles. It is easy to see that the writer of the above precious paragraph knows nothing whatever of motor-vehicles or he would not talk about "an explosion of stored gas." If he and others after his kind would store their brains with a few elementary facts of engineering science they would do their papers more credit and their profession also. The ignorance of a large section of the daily Press on this and similar subjects is truly pitiable. However, here is another lie exposed.

RACING ON ROADS AND HIGH SPEED ON ROADS.

THE National Cyclists' Union has at length, we are glad to say, prohibited road racing or pacing, and the reason is that such locomotion may be dangerous to the public. No sane person will, we think, dispute or deny this danger, and, for our part, we think that all persons who "scorch" on any kind of vehicle, and who thereby lessen the safety of the public to any degree whatever, ought to be severely punished; much more severely, in fact, than has been customary. While saying this it must be distinctly understood that driving a vehicle other than an automotor-vehicle at a high speed is not *per se* unlawful, it is only so when danger to the public is caused, or is likely to result. This view of the law was recently laid down by the Lord Sheriff Brown in the Aberdeen Court (*vide* AUTOMOTOR for October). The learned Judge said :—"If a bicycle was a carriage, and so declared by statute, the prosecutor had never yet succeeded in obtaining a conviction against a driver of a carriage for furious driving, except on proof that in point of fact danger to the public had emerged."

So far as cycles and horse-drawn vehicles are concerned, high speeds may be lawfully indulged in within this limitation. It is, however, because cyclists have shown such a disregard for the rights of pedestrians that they have now to take united action against those of their own body who would use the road for racing purposes. Racing is an unlawful act, as the highway is not, and never has been, recognised as a racing track. It is very necessary that all who use the road in any way, and especially those who administer the law as to vehicles and highways, should have clear ideas on the subject. At present convictions for furious driving are based not upon whether there was or was not danger to the public, but upon the evidence of some illiterate policeman and the personal predilection of some magistrate, who in too many cases is a distinctly prejudiced party. Police evidence is naturally and of necessity biassed. We must remember that the policeman is keenly and personally interested in obtaining a list of convictions with as little personal risk to himself as possible, because the more convictions he obtains the quicker his promotion. It is to his manifest interest to secure a conviction, and cyclists afford an easy and grateful prey.

British law is rarely logical, and the term "furious driving" well exemplifies this. It is not the actual velocity of a mass which does harm, but it is the amount of kinetic energy contained in it which determines the results. A swallow, weighing a few ounces, will fly at a speed of 30 miles per hour against the glass of a lighthouse, and the kinetic energy it develops, while harmless to the glass, is taken up by the bird with the result that it fractures its limbs. A cycle and its rider, weighing 180 lbs. and travelling at 12 miles per hour, will develop 765 foot lbs. of energy. This is, of course, more than sufficient to capsize any pedestrian, but if instead of a human body, it is a wall with which the cyclist collides, the chances are that he will be maimed for life and his machine will be past repair. It is a very common sight to see in London a van drawn by a pair of fresh horses being driven at a rate of eight or nine miles per hour, but it is very uncommon to see proceedings taken against the drivers. The weight of the van (empty) and horses will be certainly not less than $3\frac{1}{2}$ tons and at 8 miles the kinetic energy will be 16,660 foot lbs., yet a motor-van, weighing (empty) 26 cwt., would have to go at a speed of over 13 miles per hour to develop this amount of kinetic energy. Notwithstanding that the motor-van could be stopped in one-fourth to one-third of the distance that the horse-drawn van could be, and could be manœuvred so much more easily, the intelligent policeman and the sapient magistrate would undoubtedly convict the driver of the motor of "furious driving," utterly oblivious of the fact that it could not possibly do more damage than a van weighing nearly three times as much, but only going about two-thirds the speed. It is this failure to recognise the science and the law of the thing which makes many of these prosecutions for furious driving so unjust, not to say ridiculous. Defendants in these cases would do well to consider this view of the question. It, of course, may be urged that it is easier to get out of the way of a heavy brewer's dray than it is to get out of the way of a "scorching" cyclist. It is; but the mere fact that it *is* necessary to get out of the latter's way establishes "furious driving" on his part and the law provides for this.

G. H. L.

THE THAMES STEAMBOAT SERVICE.

As will be seen from a report that we publish elsewhere, there is every likelihood that the great problem of the congestion of the streets of London will be partially solved by the establishment of an efficient service of river automotors. That London in this particular matter should be so far behind other capital cities is to many people inexplicable, but if we remember that for many centuries the banks of the river, say, from Westminster to Blackwall, have been occupied by private owners, and that access to the river can even now only be obtained at certain points, and that by traversing dark and devious passages not always free from danger, the gradual diminution of the popularity of the river as a means of passenger transport is easily accounted for. Take, for instance, the approaches to Wapping Stairs or Cherry Gardens Pier. No one having valuables upon them would care to seek out these piers after dark. As will be seen, the first step is to acquire the piers, at present owned by the Thames Conservancy; and if the Council succeeds in this the next thing will be to sell them again to the "knacker." These piers are, for the most part, "dummy" lighters, with no proper accommodation or protection against the weather, they are all very old, rickety things, not worth repairing or reconstructing, and fit only for "scrap." Larger and more commodious pontoon piers, with glazed and warmed waiting-rooms, should be built; these should be moored at more convenient stations than are the present ones. The approaches to the piers should be wide and well lighted, and the connecting bridges should be covered in and glazed. As regards the vessels, considering that the Council will eventually acquire them, as they have the trams, there will be no excuse for not providing much better boats than those in use at present. These vessels are utterly obsolete in every way. Their design is wretched, and their accommodation as bad as can be; there is no efficient subdivision, and no adequate protection for buoyancy. In fact, there has been little or no substantial improvement in these river vessels ever since the "Princess Alice" disaster. The Council will, we trust, insist upon the Company that proposes to work the traffic complying with a pretty tight specification as regards hull, machinery, &c. A mean speed of not less than 15 knots should be insisted upon. The machinery should consist of oil-fired water-tube boilers supplying steam to horizontal three-stage compound engines driving dynamos which, by means of electro motors, would drive the twin screws; or perhaps a better arrangement would be to use Parsons's turbines; the object in each case being to get all the machinery below the main-deck, and to have absolutely no vibration. The modern but obsolete torpedo-catcher engine-room practice should be avoided. As regards the design on deck, this should be a radical departure from the existing open-deck arrangement. American river boat practice might be to a certain extent followed.

Lastly, but of equal importance, is the question of *personnel*. The boats must be properly manned; the public will not trust themselves to rough, uncouth, uncertificated watermen; at least, no one cares to do so. The Council should insist that all the mates and masters should at least have home trade certificates, while the engineers should be required to hold, at any rate, a second's ticket. We have thrown out these few suggestions as the result of our own experience with vessels in various parts of the world, and in the hope that they may serve to guide those concerned, and of others desirous, as we are, of seeing the Thames become the favourite route. We congratulate the Rivers Committee and the Council on their efforts so far, and we feel assured that the ratepayers will cheerfully lend their aid to further this scheme of municipal and nautical automobilism.

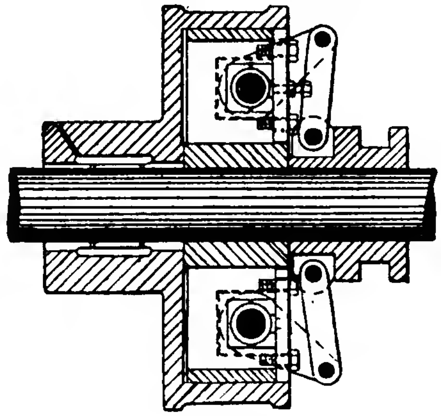
G. H. L.

Curious Collision between Motor Vehicles.—In the afternoon of October 13th a curious accident occurred in Charing Cross Road. A motor-van, belonging to a parcels delivery company, was crossing from Shaftesbury Avenue in the direction of the Palace Theatre, when two omnibuses drove across in front of the van, the drivers making disparaging remarks to the motor man. Behind the omnibuses was a second motor-van, belonging to a patent medicine company, and the driver of the first motor vehicle, turning, it is said, to answer the omnibus drivers, did not see the second motor, with which his own came into collision. The wheels of the two became locked and remained so for some time, the crowd laughing, and cabmen and omnibus drivers jeering. One of the motors could not start again for ten minutes, and when it did move (with the aid of boys pushing) the crowd cheered lustily. Beyond the damage to the paint the motors seemed to be none the worse for the accident. It is to be regretted that steps are not taken by the owners of motor vehicles to check the vulgar and offensive abuse of omnibus and cab drivers. The Police Regulations are quite clear as to the offence in question.

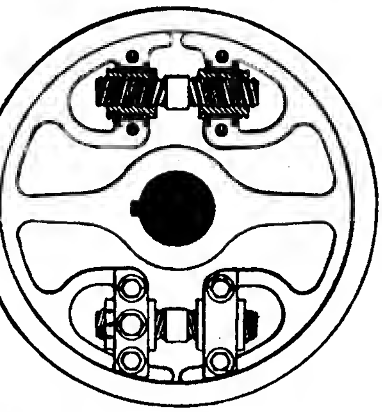
A New Motor-Car and Cycle Club.—Mr. Howard Fenney, a director of Messrs. Hearl and Tonks, is about to establish a club in Birmingham, where those interested in automobilism can meet. The building is a new one, and is rapidly approaching completion; the cost is said to be £12,000, which has been found entirely by Mr. Fenney. When finished, it is intended to let the building, furnished complete, to a limited liability club, at an annual rental to be fixed by an independent valuer. The accommodation will be of the very best, and will comprise in the basement a show-room, where cases containing samples of the goods manufactured by each member may be on view, as also stalls for the sale of all the chief cycle and trade newspapers. The ground floor will be formed into a kind of cycle exchange, where members may meet their customers and transact business, discuss the market quotations, and effect "deals" in cycle shares, &c. Further ahead will be reading, writing, smoking, and general reception rooms, as also a large dining-room, where meals can be obtained at any time of the day. Then, of course, there will be the necessary recreation and billiard rooms, all furnished in the most luxurious style. It is intended to conduct the club on the soundest lines, the membership being limited to principals only, and already a number of the most influential gentlemen connected with the trade have promised to take an active part in the management.

HALSTEAD AND HORSBURGH'S FRICTION CLUTCH.

For those automotor vehicles in which oil-motors are employed, a clutch which permits of rapid engagement and disengagement without shock is an essential fitting. As is well-known, oil-motors have to be run at practically a constant speed, and any variation in the speed is best effected by means of a good clutch which enables the various gears to be quietly thrown in and out of gear. The accompanying illustrations show the clutch invented and manufactured by Messrs. Halstead and Horsburgh. It consists of a split ring which, by means of two right and left-handed screws and toggle levers, can be expanded so as to grip the internal periphery of a shell pulley. As will be seen, provision is made for adjusting two of the nuts



with which the screws engage, so that the effects of wear may be readily compensated for. When correctly adjusted the toggle levers assume the position shown in the sectional view when the clutch is in gear, thus relieving the brasses or starting levers of any pressure, and rendering the clutch self-locking. A further advantage is that the clutch, being perfectly symmetrical, is naturally balanced, and can therefore be used at the highest speeds.



Messrs. Halstead and Horsburgh claim the following advantages for this clutch:—It transmits more power than any other friction clutch of equal diameter. There are no parts liable to get out of order or lock; and any required adjustment may be made whilst engine is running; all parts are interchangeable. It is also self-locking when in gear, and there is no end thrust on brasses or starting levers; it also works vertically or horizontally.

NOTES OF THE MONTH.

A CYCLE, motor-car, and accessories exhibition will be held at the Sheffield Drill Hall, from February 3rd to February 12th, 1898.

THE Kensington Vestry is going to try an automotor vehicle instead of horses, to see if there will be any saving to the ratepayers.

WITH due appreciation of the fitness of things, the members of the Hammersmith Vestry, on the occasion of the recent inauguration of their New Central Electric Light Station, drove to the scene of the function in electric cabs.

THE De Dion Tricycle which the Hon. C. S. Rolls recently acquired is, we understand, turning out a great success. It is particularly suitable for racing, Mr. Rolls having recently paced a cycling friend for 100 miles, which was accomplished in 5 hours 4½ minutes.

THERE will again be a gathering of motor-cars during the Stanley Show this month at the Agricultural Hall. They will be on view in the King Edward's Hall, the exhibiting firms being Humber and Co., Daimler Motor Company, and the Great Horseless Carriage Company.

THE Dunlop Company have decided to embark upon the manufacture of motor-vehicles, and have recently started a subsidiary company with a capital of £25,000 for this purpose. Mr. A. Herschmann is their chief draughtsman, and their works will be situated at Bournbrook, near Birmingham.

WE hear that it is proposed to establish a service of motor-vehicles from Lincoln to Brigg and back, a distance of 42 miles, and passing no less than 29 villages *en route*. We should think that the scheme has every promise of success in it. Mr. E. Danbney, of 9, Chaplin Street, Lincoln, is the Secretary *pro tem.*

WE regret to chronicle the death of Mr. W. Arnold, of the firm of Messrs. Arnold and Sons, engineers, of East Peckham, at the age of 78 years. The deceased gentleman had devoted much time and thought to automobilism, and was the inventor of the very successful type of motor-vehicle which bears his name.

The G.P.O. Authorities are using an electric motor van for the conveyance of mails, parcels, &c., between St. Martin's-le-Grand and Victoria. It makes five journeys per day. So far it has proved itself to be a distinct success in every way, and we hear that the G.P.O. contemplates the use of such vans in the larger provincial cities.

No less than 400 patents have been granted for acetylene gas; and 12 companies, having over half a million of capital, have been formed, and yet only one factory is producing calcium of carbide. Although there are 16 works elsewhere, several of them are on a small scale, and the production is due to the inflated price obtained for the carbide. The only British factory is at Foyers, N.B.

Animals' Friend, in speaking of the automotor, says:—"Patronise the motor-cab and car. It will abolish the tired and broken-down horse from the street and highway, the public thoroughfares will be more sanitary, and there will be no more equine suffering in the wet and cold of wintry nights when masters and mistresses are pleasuring." Our humane contemporary adds that "the horrors of the midnight cab rank have yet to be told."

THE Yorkshire Motor-Car Company, of Albert Buildings, Bradford, has arranged for an exhibition of motor-cars, motor-wagons, motor-cycles, accessories, &c., to be held during December or January, at the Rifle Barracks, Belle Vue, Bradford. Mr. J. E. Tuke, with his usual energy, is the moving spirit in this exhibition, which we wish every success. The Company over which this gentleman presides is thoroughly up-to-date, and prepared to supply all the best forms of motor-cars and tricycles at moderate prices, ranging from £75 upwards. At the latter figure the price list includes a vehicle capable of running 100 miles at the stupendous cost of 1*s.* for fuel!

ON the 25th of last month the Scottish Motor, Omnibus, and Car Company (Limited) started the running of motor-cars between Hamilton and Larkhall and Hamilton and Blantyre; a service for Hamilton, Bothwell, and Uddingston being also started on the 26th. The cars run every hour, at moderate rates. They are elegant and light, and are seated for six outside, with accommodation for one or two more beside the driver. From reports to hand they are being well patronised, numerous groups watching their departure and arrival. The crowd of would-be riders increases every day, and is far beyond the power of the Company to cope with. No doubt by next year arrangements will be made to increase the number of motor-cars upon the route.

THE Lord Mayor's Show was characterised by the presence of a couple of vehicles—the one representing the uncomfortable lumbering, gaudy, stuffy, jerky, and dilatory stage coach, and the other a motor-vehicle which was capable of carrying more for a greater distance at a higher speed, and with less cost, and with greater care, safety, and comfort than any stage coach ever built. It is, of course, too much to expect that the next Lord Mayor will discard that awfully hideous, lumbering vehicle, called the State carriage, but as the schoolmaster continues to make his influence felt in the coming generation we hope the time is not far distant when carriages in all State processions will be propelled by mechanical means, and that in future Lord Mayors' processions the present State carriage will be exhibited as an example of the kind of State vehicle in use in the unenlightend period of the nineteenth century. However, we must not be ungrateful for the recognition that has been bestowed upon automobilism by the city fathers.

THE *Westminster Gazette* is remarkable for two things—an unreasoning and silly dislike of the Right Hon. Mr. Joseph Chamberlain, the Colonial Secretary, and motor-vehicles. We could understand such an attitude on the part of a professed Tory organ, but it seems just a trifle inconsistent to see a so-called "Liberal" journal adopting it. In a note in a recent number the *Westminster Gazette* says:—"If the arrival of the motor-car and the increase of the cyclists in crowded streets has given the Commissioner of Police in London some anxious moments, the state of the traffic in Paris would be enough to break down Sir Edward Bradford altogether. There the motor-car is daily responsible for a growing list of accidents, for the Paris *cocher* is not at the best a careful driver compared with our London cabby, and when his animal sees one of the monstrous motor-vans bearing down on it, with a noise like a siren, and in a cloud of smoke, its rickety form is galvanised into a wild desire to get into the nearest place of refuge, which may happen to be a shop window or the side of a house. Such pranks are extremely disconcerting, not to say alarming, for the man in the street. The Englishman in Paris who has learnt the terrors of the street will be glad to hear, for the sake of his less experienced fellow-travellers, that the Municipal Council has determined to make inquiries into the question of unrestricted motor-car traffic."

WE are absolutely certain that the arrival of the motor-car has not in the slightest degree caused the Chief Commissioner to have any "anxious moments." Indeed, the suggestion is so childish that it needs no refutation. What, may we ask, *is* a "monstrous motor-van"? Does this refer to size or to some immoral trait in its character? Were the *Westminster Gazette* even tolerably well informed, it would know that the size of motor-vans is strictly regulated by the Police in Paris, and nothing monstrous is permitted; hence a motor-van that made a "noise like a siren" and in a "cloud of smoke," would be promptly seized and the driver rather heavily fined. We might enlarge upon the matter, but our time and space are too valuable to be unduly occupied in refuting every absurd and mendacious statement concerning motor-vehicles that appears in a section of the London Press.

THE Paris correspondent of the *Morning Advertiser* writes:—"If M. Paul Mayan's public statements respecting the almost stationary condition of the automobile car industry here are based upon sound information, the reason for the slow production of those vehicles in France must be sought in the paucity of workmen possessing the requisite mechanical skill. M. Mayan says that the builders have provided themselves with the factories and the necessary machinery, but that a year or two must elapse before the technical training has been disseminated among French artisans to an extent empowering the manufacturers here to meet the active demand for motor-carriages. The French artisan, nevertheless, has been the first in the field, and was engaged in the construction of motor-cars long before the latter were seen in England. A more probable explanation would seem to be that while the French workman is perfectly competent and ready for the work, the French manufacturers themselves are not altogether satisfied with the types of the motor-car yet evolved, and are holding back. An instance of the ingenuity with which this idea of the automobile has been elaborated by the Paris designers and makers has just been furnished by a firm in the Avenue Victor Hugo. The finishing touches are being put in the workshop there to an auto-mobile cottage. The movable habitation thus constructed contains two bedrooms, a dining-room, a bath-room, and a kitchen, with a balcony on the first floor."

OUR contemporary, the *Graphic*, has shown a commendable enterprise in obtaining an electric cab for the use of its staff. Instead of its reporters having to rush hither and thither in noisy and dangerous "hansoms," they now proceed on their business in the swift and secure automotor. Needless to say, the appearance of this cab in Fleet Street has evoked feelings of the most intense jealousy among the journalists. It has been said—we know not with what truth—that since the acquisition of this cab, the *Graphic* men refuse to recognise common journalists who ride in vulgar hansoms. While counselling humility to the scribes of our contemporary, we would suggest that other newspapers might also purchase automotors, and thus remove any chance for what the servant girls call "stuckupness." As regards the performances of the new vehicle, the *Graphic* men speak highly of it. One man writes: "I had the advantage of a long trial of the new vehicle on the occasion to which I refer, and I had experience of its capabilities in crowded thoroughfares, in open roadways, up hill and down dale, and I must say that I was perfectly surprised with the result. The driver seemed to have the most perfect control over his vehicle; the ease with which it could be turned, and the small space it could turn in, the way in which its pace could be moderated, and the quickness with which it could be brought to a full stop, was in the highest degree commendable. One of the drawbacks—which I am told, in time, will be got rid of—is the burr of the machinery. Another is that a different bell should be provided; the present bell is too much like that of the cycle, and when foot-passengers turn round expecting to see a bike and find instead a horseless cab they are naturally somewhat startled. When these two defects have been remedied, one will be able to thoroughly enjoy the ease and the gondola-like movement of the new invention, which ought to achieve a tremendous success."

CONTINENTAL NOTES.

THE De Dion firm has started a line of tractor omnibuses between Melun and Meaux.

A COMPANY is being formed to take over the business of M. Delahaye, the well-known automotor manufacturer. The capital will be 6,000,0 0 francs.

AN association of automobilists for Central Europe has been formed at Berlin, and it rejoices in the name of Mitteleuropaisoher Motorwagen-Verein.

THE municipality of Bordeaux has decided to establish lines of automotor-omnibuses. The London County Council does not know what these things are—apparently.

THE Self-Propelled Traffic Association has become affiliated with the Automobile Club of Paris, and membership of the one carries honorary membership of the other.

HERR THIEN, a Berlin electrician, has built an electric drosky, which will go 42 miles, on one charge, at a speed of 13 miles an hour. The accumulators are of the Currens type.

IT is said that an English firm has taken premises at Puteaux for the manufacture of electric automobiles, capable of going 120 miles without recharging. We should like to see that cell. By the way, Puteaux has been christened by *Les Sports* Automobilopolis.

SINCE the French Government has decided to tax motor-vehices on the pretence that they are articles of luxury, why, it is asked, should not yachts be taxed? The answer is simple, the French Government is extremely desirous of doing all it can to increase its naval strength, and actually gives bounties to shipbuilders and shipowners.

THE French military authorities have recently put the "Scotte" tractors through some very severe trials in hauling baggage, wagons, cannons, &c. The experiences have been most satisfactory; the military men are loud in their praises of this new adjunct to warlike operations, and it is certain that automotor vehicles will ere long form an indispensable part of the equipment of every modern army.

LES POIDS LOURDS.—After a somewhat lengthy delay the commission appointed by the Automobile Club to conduct Les Poids Lourds trials has issued its report. The report is a compendious volume of 55 pages, and it contains a large amount of useful matter. We shall deal fully with it in our next issue. M. le Comte de Chasseloup-Laubat is to read a paper on the trials at one of the meetings of the Société des Ingénieurs Civils.

IT will be remembered that on the occasion of the Paris-Dieppe race the special train broke down, and the intention was expressed of claiming an indemnity. That there was a good cause for action is apparent when it is remembered that the special train arrived after the race had been run, and thereby defeating the very object for which the "special" was chartered. The indemnity agreed upon was 10,000 francs, which has been paid to the Automobile Club.

M. MICHELIN has furnished some particulars to *La Genie Civile* as to the cost of running a steam brake, using coke as fuel and carrying six persons. The weight of the brake is 2,050 kilos. = 4,510 lbs. tare. It has journeyed over 7,700 kilometres, or 4,774 miles, and the cost works out at—for coke, ·0616 franc per kilometre, oil for lubrication, ·0346 franc per kilometre, and total cost of running, ·1065 franc per kilometre. The mean speed was 16 kilometres, or 9·6 miles per hour. The repairs are put at 50 francs per month.

ALEXANDRIA, which was the home of a high civilisation when London was an uncouth collection of mud huts, and which boasted of fleets and libraries when British naval architecture was represented by coracles made of wattles sheathed with skins, still maintains its ancient reputation. It has a modern and fully equipped electric tramway system. London is content with a wretched system of horse-drawn tramcars. We would suggest that a deputation of members of the London County Council should visit the ancient seaport of the Pharaohs and see how it's done.

MR. PENNINGTON is, perhaps, hardly sufficiently appreciated on this side, but in France he has at any rate succeeded in arousing the enthusiasm of *Les Sports*, which paper thus pours itself out:—"Pennington the great, the illustrious Pennington, he who has invented the war automobile," and so on, and so on. *Les Sports* then goes into raptures about the magnificent apartment which this distinguished gentleman occupies at the Grand Hotel, and loses itself over the contemplation of the boxes of cigars and the bottles of champagne produced.

OUR French friends have a genius for taxation. Is there any single article of commerce in France which is not taxed in some way? We think not. So long as motor-vehicles were in the experimental stage they escaped taxation, but a vigilant Minister of Finance had got his eye upon them, and when he saw that they were articles of regular manufacture and employed for commercial purposes, he, worthy gentleman, issued his decree, and in future automotor-vehicles with two places will pay 60 francs, and the others 100 francs; in communes of more than 40,000 inhabitants they will pay 40 francs and 75 francs respectively; in communes of from 20,000 to 40,000 inhabitants, 30 francs and 60 francs; in communes of 10,000 to 20,000 inhabitants, 25 francs and 50 francs; in communes of 5,000 to 10,000 inhabitants, 20 francs and 40 francs; in communes of less than 5,000 inhabitants, 10 francs and 20 francs.

THE reason for the imposition of the tax is that the Finance Minister is 30,000,000 francs to the bad in his Budget, and hence there is some excuse for it. At the same time, we fail to see why the residents of large towns or districts should be discriminated against in favour of those who reside in the small ones.

SOME time ago the French Minister of Public Works appointed a Commission to discuss the condition under which services of public motor-vehicles should be subsidised by the State. The Commission has reported that the State is authorised by law regulating public transport to pay subsidies to automotor companies subject to an engagement not exceeding a period of 10 years. Subsidies, however, can only be granted to companies possessing sufficient rolling stock to be able to carry daily over the whole length of the system at least 10 tons of merchandise at an average speed of four miles per hour, and of 60 passengers with two tons of luggage at an average speed of seven miles. The subsidy for each year is calculated according to the total distance covered by the vehicles, and their capacity for carrying passengers, luggage, merchandise, and the like. The amount cannot exceed 250 francs for every kilometre of road comprised in the daily service, or be more than half of the total subsidy allowed by the departments or the communes. Nevertheless, it can attain 300 francs and 350 francs per kilometre, and the three-fifths and two-thirds of the total subsidy respectively in departments where the amount received in taxation does not exceed a certain figure, that is to say, districts which are only poorly or sparsely inhabited. The report is very generally approved in Parliament.

Automotor Cabs in Paris.—The Paris correspondent of the *Daily Telegraph* writes:—The London electric cab that was recently sent over to Paris has been tested with success. It has been taken up the steepest hills, has made the round of Paris, has created no little sensation among the promenaders in the Bois de Boulogne, and has exceeded the 70 kilometres agreed upon with a run of 80 kilometres, after which its motive powers were moreover not exhausted. Representatives of some of the principal companies and a number of engineers have followed these experiments with equal interest and delight, and the problem of ways and means is being attentively studied. It is believed that something can be done towards reducing the weight of the vehicles, nor will the entire cab system be revolutionized at once. A certain number of these cabs will be started as an experiment, and if the public, as is expected, takes kindly to them, they will be rapidly increased. It is affirmed, by the way, that the reason why more horseless vehicles have not been brought out in Paris is that the manufacturers have great difficulty in procuring the requisite amount of skilled labour, so that all the local builders together do not produce between them at the rate of more than one horseless carriage a day.

An Electric Delivery Wagon.—Our American contemporary, the *Electrical Age*, gives an illustrated description of an electrically-propelled delivery wagon constructed by a Chicago firm. The electrical equipment consists of 44 storage batteries, having an individual capacity of 100 ampères per hour, weighing only 13 lbs. each, and connected with a 3½ H.P. motor, iron-clad and waterproof, of the four-pole pattern. The charging apparatus consists of an automatic stationary rheostat, which is equipped with meters indicating the proper volume of current and the number of ampères stored in the vehicle batteries. These have an apparatus which automatically disconnects them from the charging circuit when fully charged. The plugs of the connections, the binding posts of the batteries, and the rheostat are correspondingly marked positive (+) and negative (−), so that no possible error can be made in placing them. The guiding lever is at the driver's left hand, and a smaller lever at the seat on the right reverses the machinery. The wheels bear on frictionless ball-bearing axles, and have three-inch pneumatic tyres. One of the wheels carries an odometer, and this has proved that as great a distance as 64 miles has, under favourable circumstances, been run with one charging of the batteries. The batteries occupy very little space, and they can, therefore, be so placed as not to injure the appearance of the vehicle. It is stated that from the odometer record it has been found that the electricity costs about one halfpenny per mile. The wagons register from 30 to 42 miles a day each, and even then the batteries are not half empty at night.

Military Automotor Vehicles.—The Paris correspondent of the *Daily Telegraph*, writes:—"Military authorities in this country cannot be accused of neglecting to turn recent inventions to profitable account. Cycling has been encouraged in the army to a considerable extent, and now it is the motor-car which is claiming its share of attention. With a view to ascertaining how it could be utilized for the transmission of communications at a rapid rate and over long distances, Général Billot, Minister of War, has just got up a very practical experiment, which has been duly carried out by a committee of officers, under the direction of Colonel Feldmann. Two hundred kilometers were to be covered between dawn of day and night, with an hour's interval for rest. Such was the programme, and the worst roads that could be pitched upon were expressly selected for the purpose. The start was effected from the Place St. Thomas d'Aquin, between 6 and 6.30 a.m. Eight vehicles were pressed into the service, and the majority of them conveyed specially appointed delegates, among whom may be mentioned Captain Mangin, Commandant Sainte Claire-Deville, Captain Barisier, and Captain Parra. With the exception of one, all the cars were provided with motors of six-horse power. Each vehicle followed a separate road, there being three equidistant convergent points: to wit, Dreux, Fontainebleau, and Villers-Cotterets. Among the drivers of the cars were M. René de Knyff, Mr. Archdeacon, and Mr. Morse, and all were delighted with the expedition, which, moreover, gave the officers complete satisfaction. The roads were as bad as could possibly have been wished, and any amount of skill was needed to deal effectively with the obstacles which presented themselves on the various routes. The military committee has since visited the establishments of the chief constructors, in order to study the different types of vehicles under the superintendence of Colonel Feldmann.

SELF-PROPELLED TRAFFIC ASSOCIATION

(INCORPORATED).

LIVERPOOL AND DISTRICT CENTRE.

President of the Association: Sir David Salomons, Bart.

LIVERPOOL CENTRE.

President:

The Right Honourable The Earl of Derby, K.G., G.C.B.

Vice-Presidents:

H. Percy Boulnois, M. Inst. C.E.; Alfred Holt, M. Inst. C.E.; Alfred L. Jones, J.P.

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Honorary Solicitor:

Lawrence Jones, 6, Water Street, Liverpool.

Honorary Secretary:

E. Shrapnell Smith, Royal Institution, Colquitt Street, Liverpool.

Trials of Motor Vehicles for Heavy Traffic, May, 1898.

PARTICULARS OF COMPETITION.

(Issued by the Liverpool Centre and approved at Head Centre.)

Objects of Trials.—The chief object of the trials is to arrive at a type of heavy motor-wagon suitable for trade requirements in Liverpool and neighbourhood, which shall be capable of economically taking the place of horse haulage and of competing with the existing railway rates, in the transport of heavy loads of goods over considerable distances.

Nature of Trials.—Trial runs will be made from Liverpool, over minimum distances of 30 miles, on four successive days. All vehicles will be required to traverse the prescribed routes, without alternative, and to perform such manœuvres as are hereinafter specified. No route longer than 40 miles will be selected.

Route-maps will be issued for each course on the mornings of the respective runs.

Date of Trials.—The trials will begin on the morning of Tuesday, May 24th, 1898, and will conclude on the afternoon or evening of the Friday following.

Judges.—Three members of the Liverpool Council and two members of the General Council will be chosen by their respective Councils to act as judges. As soon as these gentlemen have been appointed their names will be published.

Awards.—Money prizes of £100, £75, and £50, also certificates of merit, will be given at the discretion of the judges.

A full and exhaustive report on the trials will be issued by the judges and circulated by the Association.

Intending competitors are also referred to the special notice below.

General Regulations Applicable to all Vehicles.

(I.) The vehicle shall be self-propelled. The part carrying the generator or motor, or both, may be articulated and detachable, but the propulsion shall be effected by utilising the load for adhesion.

(II.) The vehicle shall be propelled by mechanical power alone, but (with the reservation that the judges may disqualify and prohibit from competition any vehicle or motor which, in their opinion, is faultily constructed or dangerous from any cause whatever) there shall be no restriction on the source of such power or the nature of the agents used.

(III.) The vehicle shall be capable of going anywhere that a horse-drawn vehicle carrying the same load can go, and of being placed in the same positions and withdrawn therefrom without external assistance.

The particular manœuvre most generally called for is to work into and out of a loading berth when "cramped" for room. This requirement arises in the case of embayments, or of confined spaces between other vehicles in a line receiving or discharging goods. Carters usually back into such positions obliquely, and bring the vehicle into line by turning the leading wheels at right angles to the rear wheels and again backing.

(IV.) The vehicle shall be capable of working into and out of an embayment of one-and-a-half times its own length.

(V.) The vehicle shall conform in all respects to the requirements of the Locomotives on Highways Act, 1896, and, in the case of its being oil-propelled, of the "Regulations as to Petroleum," issued by the Home Secretary under Section 5 of this Act.

(VI.) All working parts shall be properly encased.

(VII.) The tare of the vehicle shall be recorded, both inclusive and exclusive of any water, fuel, or accumulators used for the purpose of propulsion.

Vehicles Eligible for Competition.

Class I.—Vehicles capable of carrying a minimum load of two tons of goods. (Vehicles entered in this class may be open or covered.)

Class II.—Vehicles capable of carrying a minimum load of five tons of goods. (Vehicles entered in this class shall have level platforms only without any covers.)

Regulations Applicable to Vehicles According to Class.

(I.) The average speed during the trial runs, inclusive of stoppages, shall reach—

(*a*) In Class I, six miles per hour.
(*b*) In Class II, four miles per hour.

(II.) The vehicle shall have a level platform area of not less than—

(*a*) In Class I, 60 square feet.
(*b*) In Class II, 110 square feet.

(III.) In Class II the height of the floor line from the ground shall be not less than 3 feet 9 inches, and shall not exceed 4 feet 3 inches.

RULES AND CONDITIONS.

(I.) The vehicle shall carry at least the minimum weight of goods, or any weight in excess declared by the competitor, throughout the continuance of the trials. Suitable ballast will be provided by the Association.

(II.) Each competitor shall himself make all arrangements for the necessary staff and appliances to work his vehicle or vehicles. Accommodation for the vehicles, in Liverpool, will be provided by the

Association. Vehicles intended for trial shall be registered as "arrived," at this depôt, not later than 3 p.m. on Monday, May 23rd, 1898.

(III.) An official observer will accompany each vehicle during the trial runs, to take notes of behaviour, fuel and water consumption, &c., and no repairs will be permitted without his knowledge and consent.

(IV.) Any vehicle withdrawn from competition during the trials, except under the written authority of the judges, shall not be eligible for a prize or for commendation.

(V.) Six photographs of each vehicle, together with one perfect negative, shall be furnished by the competitor, not later than May 16th, 1898.

These must be delivered in good order at the Liverpool Royal Institution, addressed to the Honorary Secretary, Self-Propelled Traffic Association.

(VI.) Full drawings of any vehicle shall be submitted to the judges in confidence, if required by them, prior to the final adjudication.

(VII.) Entries shall be made on printed forms (to be obtained from the Honorary Secretary) at any time prior to 12 noon on the last day of March, 1898, and shall be accompanied by an entrance fee as under:—

	£	s.	d.
For one vehicle	5	5	0
For each additional vehicle by the same competitor	1	1	0

Entries shall be addressed, under cover of a registered letter, to the Honorary Secretary, Self-Propelled Traffic Association, The Royal Institution, Colquitt Street, Liverpool.

(VIII.) A complete list of particulars shall be lodged with the Honorary Secretary not later than May 16th, 1898.

The description must be type-written or printed, and six copies must be furnished. The tare weight of the vehicle, both exclusive of any water or fuel and in complete running order, must be given, also, as briefly as possible, any peculiarities of construction or of working to which the competitor desires to draw the attention of the judges.

(IX.) Each competitor shall arrange to have his vehicle or vehicles ready for inspection by the judges at 9 a.m. on the morning of Tuesday, May 24th, 1898, in the depôt that shall be used as head-quarters during the trials.

(X.) All vehicles shall be stored over-night at the depôt or depôts provided by the Association.

(XI.) Lots will be drawn to determine the order of starting. It is intended to begin the runs shortly after 9 a.m. on each of the four days, the vehicles following one another at intervals of about 10 minutes.

(XII.) At the conclusion of the trials, any vehicle, or motor, or part thereof, shall be opened up, in confidence, for inspection by the judges, if required.

The judges reserve to themselves the right of absolutely disqualifying any competitor for any infraction of these rules.

While obeying in all respects the instructions of the judges and the conditions of the competition generally, it is to be fully understood and agreed by every competitor that no responsibility, legal or otherwise, is to attach either to the judges or to the Self-Propelled Traffic Association, in respect of anything, or for any damage or injury caused to any person or thing, but that all responsibility of every sort and kind, whether pecuniary or otherwise, is to attach to the competitor, and is to be borne by him.

THE FOLLOWING ARE THE POINTS WHICH WILL BE TAKEN INTO CONSIDERATION BY THE JUDGES IN MAKING THE AWARDS.

(a) *Cost.*—Economy of working, including attendants.

(b) *Control.*—Stopping, starting, changing speed, steering and reversing, particularly under adverse conditions, such as on inclines or in confined spaces.

(c) *Working.*—Noise, smell, visible vapour, dust, or other nuisance when travelling; number of mechanical operations requiring attention from the driver; efficiency of brakes; time occupied in preparing the vehicle for service on the road; ability to start from rest on an incline of 1 in 16; speed—within legal limits; distance run without taking or receiving supplies of fuel, oil, gas, electrical or chemical materials or electrical current, water, or of any agent employed for actuating the motor or assisting its working; ability to complete the course without stopping to effect repairs, adjust parts, apply lubricants, or for any other purpose or cause not provided for in the itinerary; freedom from a break-down of any nature.

(d) *Construction.*—Strength of frame and working parts; quality of workmanship; efficiency of springs; freedom from complicated or over-refined parts; facility with which repairs can be effected; capacity of bunkers, oil and water tanks; ratio of available to total platform area—preference will be given, as regards vehicles entered in Class II, to a system that gives the entire platform, from end to end, free for goods; ratio of tare to power of motor; ratio of tare to weight of freight carried during the trials.

(e) *Steam-propelled Vehicles.*—Action of feed-pumps or injector; ample supply of steam; consumption of fuel and water per mile; leakage of steam or water; arrangements for stoking.

(f) *Oil-propelled Vehicles.*—Efficiency of ignition; regularity of carburation and explosions; range and gradation of speed of vehicle, and smoothness with which changes of gear are effected; circulation and weight of cooling water; consumption of oil per mile; leakage of pipes or tanks.

The decision of the judges, expressed in writing on any point, shall be final and binding on all parties, and they may withhold any award, or any portion thereof.

Three printed copies of these rules will be issued with each form of entry, one of which, signed by the competitor, must accompany each entry when forwarded to the Honorary Secretary. In signing and returning this copy of the rules, the competitor shall accept all the conditions herein imposed upon him, and shall agree to be bound in all respects by them.

Each vehicle will be allotted an official number which must be displayed during the continuance of the trials.

LAWRENCE JONES, Honorary Solicitor.
E. SHRAPNELL SMITH, Honorary Secretary.

Royal Institution, Liverpool,
November 16th, 1897.

SPECIAL NOTICE TO COMPETITORS.

A prominent member of the Association has intimated to the Honorary Secretary that he is willing to receive, on the recommendation of the judges, one or more vehicles to work in the heavy goods traffic of Liverpool and neighbourhood, on trial, during a period of one month, and, further, that he is prepared to purchase fifty vehicles in all.

Provided—

(a) That the vehicle shall carry five tons of goods during the official trial runs, and that it is capable of carrying up to ten tons when required.

(b) That the vehicle shall comply with the regulations applicable to Class II.

(c) That during the month's trial, the vehicle shall work generally to his satisfaction.

(d) That during the month's trial, the cost of working shall not exceed 3·5*d.* per net ton-mile, calculated on the basis set forth below.

During the continuance of these additional practical trials, the expenses of working, up to 3·5*d.* per net ton-mile, will be borne by the member in question.

This offer is not to be taken in any sense as a contract of a binding nature at law.

SCHEME [referred to in Provision (*d*)] FOR ASCERTAINING THE COST OF WORKING.

The cost of working per net ton-mile, inclusive of interest at 5 per cent. per annum, depreciation at 15 per cent. per annum, maintenance, attendance, and all other charges shall not exceed 3·5*d.* This cost shall be calculated on the basis of 60 per cent. of maximum load (10 tons) being carried 15 miles per day, and the same distance being traversed "light" (*i.e.*, without load), on 260 days per annum. An example of the method of calculating this figure is appended:—

Load designed for	5 to 10 tons.
Active work per annum	260 days.
Distance traversed with 60 per cent. of load (6 tons)	3,900 miles.
Distance traversed light	3,900 miles.
Prime cost, say	£600.

Assumed Expenditure.

		£ s. d.
Interest at 5 per cent. per annum, say		30 0 0
Depreciation at 15 per cent. per annum, say ..		90 0 0
		120 0 0
*Fuel—13 lbs. of furnace coke per vehicle-mile, 13 lbs. × 30 × 260 = 45 tons at 15s. per ton	33 15 0	
*Oil, grease, and waste	10 0 0	
*Wages—Driver at 30s. per week ...	78 0 0	
Boy at 7s. 6d. per week ...	19 10 0	
Stabling—Proportion	5 0 0	
*Water	10 0 0	
Licence	5 5 0	
*Repairs	20 10 0	
		182 0 0
Total per annum		£302 0 0

TRAFFIC—
6 × 3,900 = 23,400 net ton-miles.
Cost = 3·10d. per net ton-mile.

* Cost determinable during the month's trial.

The Second Session of the Self-Propelled Traffic Association (Liverpool Centre) will be opened at 8 p.m. on Friday, November 26th, when the President of the Association, the Right Hon. the Earl of Derby, K.G., G.C.B., is expected to take the chair. The meeting will be held at the Royal Institution, Colquitt Street, Liverpool. The inaugural address—"Self-Propelled Vehicles, 1896-7" (with lantern illustrations)—will be delivered by Mr. W. Worby Beaumont, M. Inst. C.E., M. Inst. Mech. E., Cantor Lecturer on Modern Road Vehicles, and Member of the General Council of the Self-Propelled Traffic Association. The hon. President during his visit upon this occasion will be the guest of Mr. Alfred L. Jones.

London Cab Fares.—A writer in the *Daily Telegraph*, discussing the question why cabs are dear, says:—"But the great recommendation of the omnibus is its cheapness; and the great drawback to the cab is its admitted dearness. Moreover, taking the cab system of the metropolis and contrasting it with the facilities obtainable abroad, or even in our own provincial cities, the deficiencies of London are at once apparent. The real trouble rests in the difficulty of adjusting fares, and herein lies the whole secret of the failing tendencies of the cab trade. It wants a person having the courage of his convictions to pay a cabman no more than his legal fare, and it is only a man who knows his London well who would dare to dispute, at the risk of being publicly insulted in the streets, cabby's dictum as to distances. Many men, rather than incur odium of the kind, wilfully pay the driver much more than his due, and thus encourage him to expect the next fare to be equally liberal; whilst many ladies, rather than pay more than is just, avoid the cabman altogether, and thus it happens that his custom diminishes and his prospects tend to grow more gloomy, with the keener omnibus competition, and that of the network of underground railways already in existence, or now in course of construction. It may also be recollected that the new electric cabs have come to stay. In the view of competent judges they are doing very well, and it is expected that as the winter approaches these weather-protected coaches will be preferred to hansoms. The advent of the electric cab, it is no secret, is necessitating an entire revision of the regulations applying to licensed public carriages, but the Secretary of State and the police have no power whatever to revise fares, and only a magistrate can settle a dispute as to any hiring. Recent alterations in the law, by what is called the Bilking Act, no longer oblige a cabman to drive his fare to a police-station, should any quarrel arise between them. But in the interests of the public, and if cabs are to continue to exist as licensed vehicles, reform is demanded; and it is argued that the electric cab proprietors, as they become firmly established, instead of falling into the old rut and letting out their cabs, as though they were hansoms or 'growlers,' at a daily charge, might take steps to obtain the Parliamentary revision of cab fares. In the best informed quarters motor-cabs are expected to bring about a reduction of fares, and it is also thought that the four-mile radius must shortly be extended to five. If cabs could be run as 'buses or trams then a charge by distance, as recorded by the cab itself, could be made."

AN IMPROVED DIFFERENTIAL GEAR FOR MOTOR-VEHICLES.

Mr. R. Jas. Urquhart, C.E., of Liverpool, has effected several improvements in ordinary differential or "Jack-in-the-box" gear, which we herewith illustrate and describe.

His invention relates to differential reducing gearing for the high-speed engines of automobile vehicles, and consists in improvements in the construction and arrangement of such gearing which embodies an epicycloidal train, the object being to produce a compact gearing from which can be obtained several reduced speeds in both directions without reversing the direction of the primary shaft. In the arrangement illustrated the primary shaft drives the secondary or low-speed shaft through an epicycloidal train, which may gear directly with the primary shaft or indirectly by means of intermediate gearing. One element of the epicycloidal train is fixed so as to drive the low-speed shaft; this is the carrier which carries the intermediate or planet pinion or pinions. The other two elements of the train are so arranged that they can be driven from the primary shaft in both directions.

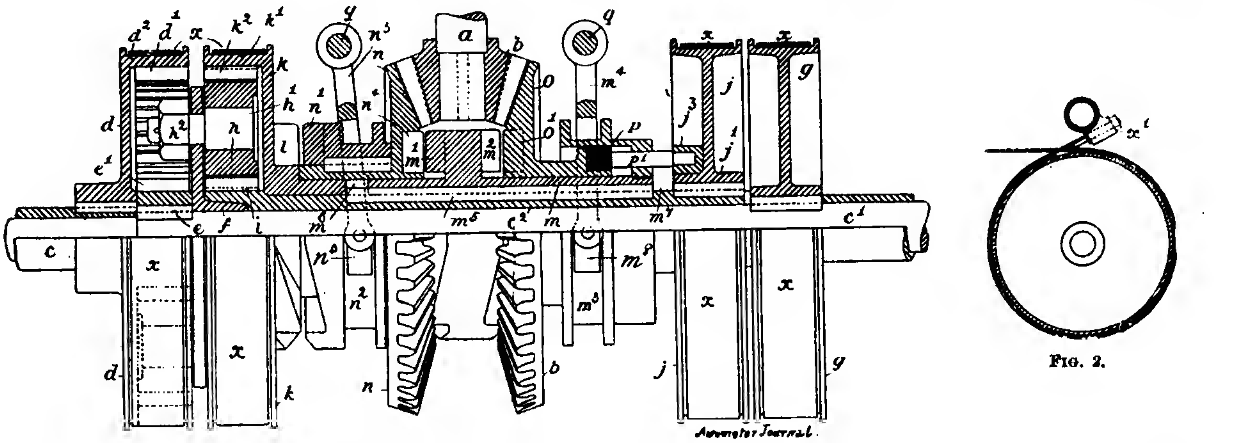
Each of the two elements driven from the primary shaft is provided with a brake drum and band or equivalent friction clutch, by which it can be fixed or allowed to slip at will. When it is required that the primary shaft shall continue to rotate without the epicycloidal train, the primary shaft is provided with a suitable clutch or clutches by which such train may be driven or not as desired. The elements of the train are the two differential wheels and the planet wheel.

The accompanying drawings illustrate the best method of construction of the improved arrangement of gearing. Fig. 1 illustrates an elevation of the gearing showing the upper half or so in section. Fig. 2 shows the method adopted of securing or fixing the two elements of the epicyclic train to prevent their rotation and checking their rotation. In the arrangement illustrated, bevel gearing is employed to rotate the two elements of the epicycloidal train, the latter being preferably formed with spur wheel teeth. The arrangement is also shown as applied to the axle of two driving wheels of a road vehicle, and as driving through a differential or balance gear to allow of one wheel over-running the other when the vehicle is passing round a curved path.

Referring now to Fig 1, a is the high-speed shaft, and it may be the motor-shaft or a shaft in direct gear with the motor-shaft. In many cases it will only rotate in one direction, but in some cases it will be required to rotate in either direction. When it is required to rotate in either direction the motor is provided with reversing gear or the shaft, d, is driven from the motor through a reversing clutch arrangement. The bevel pinion, b, is keyed to the shaft, a. The travelling or driving wheels' axle is in two parts, c and c^1; to each part is keyed one of the travelling wheels. To the part c is keyed the element, d, of the differential or balance gear, which is preferably formed with spur teeth. To the part c^1 of the axle is keyed the spur pinion, e, and freely on the axle is mounted a carrier or disc, f, upon which are mounted a stud or studs. Each stud carries a spur pinion which gears with the teeth, d^1, of the element, d, and the teeth, e^1, of the element, e, at the same time.

The element, d, of the balance gear is provided with a flanged rim, d^2, fitted with a band brake, x, of ordinary construction, the band of which is fixed at one end, x^1, Fig. 2, to the structure carrying the gearing, and at the other end is attached to any suitable lever arrangement by which it can be drawn tightly round the flanged rim. By so gripping this part of the balance gear, the travelling wheel fixed to the part, c, of the wheel axle can be braked. The part, c^1, of the axle to which is fixed the second travelling wheel, is also provided with a flanged rim or pulley, g, fitted with a brake band, x, operated in a similar manner. The two brake bands are preferably so coupled together by rods and levers that they operate in unison.

The elements of the epicycloidal train are arranged that the angular speed of the last or driven element, f, has the lowest value. The element, f, forms the carrier for the planet wheel, h. Preferably three planet wheels are arranged round the disc, f. Each planet wheel, h, is carried upon a stud, h^1, fixed to the disc, f, preferably by a screwed nut, h^2. The element, i, or sun wheel of the epicycloidal train is mounted free upon the part, c^1, of the axle and has a long sleeve, c^2, at the end of which is keyed a flanged brake pulley, j, fitted with a suitable band brake, x, similar to those fitted on the flanged rims, d^2, and g^2, or other suitable known form of clutch, and by which it may be prevented from rotating or checked to the desired extent. The element, k, of the epicycloidal train is preferably mounted upon the sleeve, c^2, so as to revolve freely thereon. It is also provided with a flanged rim, k^1, and a band or other friction brake by which it may be held stationary or allowed to revolve at will. The internally cut teeth, k^2, are in gear with the pinion or planet wheels, h. A clutch box, l, is also formed on the element, k, by which it is rotated. A sleeve, m, provided with clutches, m^1 and m^2, is mounted upon the sleeve, c^2, and is provided with a shipping collar, m^3, and forked shipping lever, m^4. The sleeve, m, is fixed so as to rotate with the sleeve, c^2, by the key or feather, m^5, but is capable of a sliding movement in the line of the axle or shaft, c^1, spaces, m^6 and m^7, being provided as clearance. Upon the sleeve, m, are loosely mounted two toothed bevel wheels, n and o, in gear with the toothed bevel pinion, b. Each of these bevel wheels is provided with clutch boxes, n^4 and o^1. A clutch, n^1, is also keyed to the boss of the wheel, n, to rotate therewith but free to slide lengthwise thereon. This clutch is provided or formed with a shipping collar, n^2, and shipping forked lever, n^3. In order to keep the bevel wheel, o, in gear with the pinion, b, a collar, p, is fitted loosely upon the end of the boss of the bevel wheel, o. A similar loose collar, j^3, is also fitted upon the boss, j^1, of the pulley, j, the two collars are fixed together by rods, p^1, passing through openings formed in the collar, m^3. The shipping levers, n^3 and m^4, are fixed to rods, q, which are moved by hand levers or



IMPROVED DIFFERENTIAL GEAR.—FIG. 1.

FIG. 2.

equivalent means. The clutches, n^1, m^2, and m^1, and the corresponding clutch boxes, l, n^4, and o^1, are formed in the case illustrated to drive each in one direction only, but in other cases when the same speeds are required when travelling in either direction the clutches and clutch boxes are formed accordingly. Sliding boxes, m^8 and n^5, are disposed in the grooves of the shipping collars, m^3 and n^2, and the forked ends of the shipping levers, m^4 and n^3, are pivoted to them. Also when the element, k, is free to rotate through its brake drum, k^1, not being clutched and the element, i, is driven through the clutch, m^1 or m^2, being in gear with the bevel wheel, n or o, or when the element, k, is driven through its clutch, n^1, and the element, i, is free to rotate through its brake drum, j, not being clutched, the gearing may rotate without communicating motion to the shaft or axle, c^1. If, however, the elements, k and i, be clutched to the bevel wheel, n, so as to rotate therewith an aggregate speed in the disc, f, or the same as that of the bevel wheel, n, is obtained; but by clutching the element, i, to the bevel wheel, o, so as to rotate therewith a certain differential speed of the disc, f, is obtained. According to this arrangement of gearing two further different speeds of the disc, f, in one direction can be obtained, first by clutching the element, k, to the bevel wheel, n, and fixing the element, i, by its brake drum, j, and, secondly, by clutching the element, i, to the bevel wheel, n, through the clutch, m^2, and fixing the element, k. Also the disc, f, can be made to rotate in the opposite direction by fixing the element, k, and clutching the element, i, to the bevel wheel, o. It is obvious that in some cases the balance gear can be dispensed with, as when one travelling wheel only is driven, in which case the element, f, is fixed directly to the hub or axle.

The claim made by the inventor is the improved construction of gear for transmitting the motion of a shaft rotating at a uniform angular speed to produce certain reduced angular speeds in the travelling wheel or wheels of a vehicle in both directions substantially as described and illustrated in the drawing.

The specification is numbered 19,559 of 1896.

LAW REPORTS.

J. R. FREEMAN, of J. R. Freeman and Sons, cigar manufacturers, Hoxton, was, at the City Summons Court, on November 5th, fined 10s., including costs, for causing a motor-van to be used without having the name and address of the owner painted on it according to law.

ON the 10th inst., before Mr. Justice Wright, sitting as an additional Judge of the Chancery Division for the purpose of hearing petitions for the winding-up of companies, a petition was presented by Mr. E. R. Evans, a shareholder, for a compulsory order to wind up the Ward Electrical Car Company (Limited). The Company was formed in 1888. It had, said counsel, never done any business, never owned any omnibuses, nor had any commercial existence. There was no opposition, and his lordship made the necessary order for winding up the Company.

THE petition of Messrs. J. K. and R. Lord for an order for the compulsory winding-up of New and Mayne (Limited), of London, electrical engineers, was before Lord Justice Vaughan Williams recently, in the Companies' Winding-up Court. Mr. Baker appeared for the petitioners, and explained that they were judgment creditors for £159 11s. He had received support for the petition from eight other creditors, but no notice of opposition, except from the liquidator and the debenture-holders. Mr. Hamilton, who appeared for the liquidator, asked that the petition should stand over until there had been held a meeting of the creditors to consider a scheme of arrangement. The liquidator would show that if there was a forced sale of the property, the unsecured creditors and the shareholders would receive nothing; whereas if the scheme of reconstruction were entered upon, not only the creditors would be paid, but the shareholders would also benefit. The further hearing of the petition was then adjourned until the first petition day after November 10th.

ON the 8th inst., at Highgate Police Court, Bernard Boverton Redwood, residing at Slewathen, Ballard's Lane, Finchley, was charged on a summons with driving a light locomotive—viz., a motor-tricycle—and refusing to stop when called upon to do so by Police-constable Coe, 101 S. Mr. Paterson, solicitor, defended. Coe deposed that at 12.30 p.m. on Sunday, October 24th, he was on duty in Ballard's Lane, Finchley, when his attention was called to a horse attached to a landau which had bolted down the lane. He succeeded in bringing it to a standstill, and was trying to quiet the animal down when the defendant approached from behind on a motor-tricycle. Witness held up his hand and called on defendant to stop, but he took no notice, and, in passing the horse, frightened it again. Jonathan Hunt, a coachman, said that he was engaged to take a customer home from chapel on the day in question. He was waiting outside the chapel when defendant passed him on a motor-tricycle. His horse was frightened, but, notwithstanding that, he passed him four times. The fourth time the motor-car caused the horse to bolt. The policeman and a man named Bell stopped the horse, after the horse had smashed the fore-carriage of the landau. Whilst the horse was being held by Coe the defendant rushed by again, and refused to pull up when called upon to do so by the policeman. Dr. Orton told defendant that the full penalty was £10, but, as this was the first case of the kind brought before the Court, the defendant would be fined 20*s*. and costs only.

REVIEWS OF BOOKS.

We have received No. 1 of Vol. XVII of *The Indiarubber World*, which abounds in well-written matter of great interest to trade readers.

We have also received the *Journal of the Western Society of Engineers of Chicago*, which contains, among other useful matter, a paper on "Causes of the Variable Efficiency of Steam Boilers and their influence on Tests."

The Carriage Monthly (Philadelphia) is, as usual, worth the attention of carriage builders. Some novel and well-worked out designs of typical American vehicles are given, accompanied by working drawings and specifications. A new motocycle by the Block Manufacturing Company of Indianapolis is illustrated and described, and there are also some good articles on varnishes, colours, &c.

"Birch's Manual of Cycle Companies."—This is the first edition of what will doubtless prove a "hardy annual." That a good work of this kind is needed is apparent when we consider that at the time of publication there were no less than 223 Limited Companies, having an authorised capital of £30,000,000, engaged in the cycle industry. At the present time this amount has been largely increased by the formation of other Companies. The work before us comprises a list of companies, giving the names of directors, officers, capital, dividend, &c. This is accompanied by an index, so as to facilitate reference. There is also a chronological list of registrations, and a directory of directors' officials. A chapter is devoted to the law of cycles and motor-vehicles, and another to patents. The imports and exports of, and duties levied on, cycles and their component parts follows, and a copious index concludes the volume. The work is well arranged, and the printing, &c., excellent; but the list of motor companies is sadly deficient.

The Thames Ironworks Quarterly Gazette.—This quarterly is to hand, and, as usual, it abounds with instructive matter for all connected with nautical automobilism, but is more interesting to those connected with the great shipbuilding works on the Thames. There is a good account of the career of the unfortunate H.M.S. "Captain," contributed by that veteran naval designer, Mr. G. Mackrow, who has, next to Sir W. H. White, designed more warships than any other man living, and remarkably good ships they have proved themselves to be. This gentleman also describes the final departure of his latest creation, the Japanese battleship "Fuji," and excellent photographs of this vessel and the "Captain" are given. A good picture is that of the Queen reviewing the Baltic Fleet in 1854 from the yacht "Fairy," also built at this historical shipyard. It is not generally known that this Company, the "Thames (Limited)," as it is usually designated, is a centre of light in the East End. Mr. A. Hills, the chairman, is a model employer, and strikes are unknown under his rule. There are science classes and cricket and football clubs in connection with the works, while the encouragement of thrift is a great feature. Savings-bank, medical, and other clubs, are established, to which all have to belong. We have only one wish for the "Thames (Limited)," and that is, may its yard be full of work!

The Engineering Magazine for October contains no less than ten original articles on subjects which are just now largely occupying the attention of the capitalist, the engineer, and the general public. Professor Geo. Forbes discusses the problem of electric power for trunk-line railways. After referring to some early American lines, the professor says:—"It can be proved that if the railway companies of Scotland were to combine to work their trunk lines by means of electric locomotives, the electric current being developed by the water power which exists in that country, then the whole of that service might be carried on without the use of steam locomotives." This is a direct statement, and no doubt Professor Forbes has not made it without due consideration. If we accept it, then it follows that the Scottish railway directors are neither studying the interests of their shareholders nor the public. Few people are more conservative than railway and tramway directors, and they really seem to think that a locomotive and a two-horse tramcar represent the most perfect means of locomotion. As showing the advantages of electric traction, Professor Forbes gives the following particulars:—The cost of running the City and South London Electric Railway is 6·48*d*. per train mile; that of running the Liverpool Overhead Railway is 3·84*d*. per train mile; while the Metropolitan District Railway is 11·76*d*. per train mile. "Modern Wharf Improvements," by Foster Crowell, is interesting in view of the present crude methods of loading and discharging vehicles in London. One hundred years ago wagons were backed up against the street kerb—just as they are now, and brewers lowered their casks of ale into publicans' cellars by means of a rope stretching across the pavement—just as they do now. One has to go to a port such as Marseilles or Hamburg to see how freight can be and ought to be handled. In Liverpool and London the art is not known or imperfectly understood. "The Enormous Possibilities of Rapid Electric Travel," by Messrs. Charles Davis and F. S. Williamson, is the discussion of a scheme for placing New York and Philadelphia, which are 85 miles apart, within 36 minutes of each other—in other words, trains are to be run by electric means at an average speed of 141¾ miles per hour. Of course, very special plant is needed for this. The cars are to have no less than 12 7-feet diameter wheels each. The axles would be 15 inches diameter. The details seem to be boldly worked out, and no doubt the general scheme is feasible enough. "Cost-Keeping Methods in Machine Shop and Foundry" may be studied with advantage by the clerical staffs of large engineering works. No magazine which pretends to be up to date can well avoid discussing Klondyke, and under the title of "Exploring and Exploiting a Gold Country," this new El Dorado is described by Mr. Albert Williams. From this we learn that gold mining is by no means the easy digging that many imagine. "Progress in the Perfection of the Rock Railway," by Mr. E. L. Corthell, gives a succinct account of the various mountain railways in existence, principally in Central Europe. "The District Distribution of Energy," by Mr. Chas. Emery, is an account of the steam supply to the public in New York, but no new developments are mentioned. "The Esthetic (*sic*) Treatment of Engineering Work," by H. Heathcote Statham, has already been criticised in the engineering Press. The author's ideas may be gathered from his opinion of the Tower Bridge:—"It is the most terrible and monstrous piece of sham ever erected." As our readers know, this bridge is really a steel cantilever and suspension structure clothed in a masonry garb. If, as Ruskin, Carlyle, and other teachers have it, truth is the basis of all art then, and we agree with Mr. Statham, his strictures are merited. The Forth Bridge, in its naked simplicity, is a noble thing. Clothe the central towers in masonry as was proposed so as to make it harmonise with its environment (to use the spurious art jargon), and it would be, as Carlyle would say, a sham. We are glad that Mr. Statham has entered his protest against this kind of thing—it is badly needed at present, when it is deemed necessary that the latest railway coaches on the London and North-Western Railway and Great Western Railway shall resemble as much as possible the obsolete mail coach of 50 years ago. A very different subject is "Ericsson's First Monitor and the Later Turret Ships," by Geo. L. Fowler. This is a readable and well-illustrated article, but the writer, with pardonable patriotism, makes the common mistake of attributing the invention of the turret to Ericsson, whereas it was that of Captain Cowper Cowles who practically demonstrated the advantages of the turret in the Crimean War of 1854, whereas Ericsson's "Monitor" did not appear till 10 years later.

CATALOGUES.

WE have received from the Pope Manufacturing Company, of Hartford, U.S.A., a handbook containing directions for the care and advantageous operation of their motor carriages. This contains many useful hints to those who own or operate any kind of electric automotor vehicle. The value of the work would be enhanced if it were accompanied by drawings showing the connections, &c.

AMONG the more successful designs of gas-engines the "Forward" occupies a deservedly high place both for excellence in construction and economy in consumption. Messrs. T. Barker and Co., of Birmingham, have sent us their catalogue, which gives full particulars of this motor, the indicator diagrams being specially interesting. We note the consumption is as low as 21·9 cubic feet per B.H.P.

M. Th. CAMBIER, of Lille-Saint-Maurice, a well-known manufacturer of automotor vehicles and launches, sends us his catalogue of motors, &c. He makes six distinct types of vehicles, ranging from the "Duc à two places" to the "Diligence à 18 places," all operated by horizontal petrol motors. The information given is, however, of a very general kind, and hardly sufficient to decide an intending purchaser.

JUDGING by the price list to hand of the Motor-Car Company, 15, Red Lion Square, W.C., there should be no difficulty in the public obtaining practically any type of motor-vehicle for which they may be in search. There appears to be every class of machine, new and second-hand, from £30 upwards, and the Company are also prepared to deal upon the "Hire System." No doubt the Company are endeavouring to fill the usual "long-felt want," and their example should speedily find a host of imitators.

THE names of Edison and Swan are inseparably connected with the practical introduction of electric lighting, and the "Ediswan" Company have taken advantage of the present Jubilee year to issue a special catalogue, which includes a well written "Historical Review of the Introduction of the Electric Light into England," prefaced by an "Historical Review of the Company." There is also an interesting chapter upon incandescent lamps and their use. The Ediswan Company claim to be the only one which manufactures a lamp right through. From the prices given we should say that good incandescent lamps are now within everyone's reach.

WE have received from Messrs. Measures Brothers, the well-known iron and steel merchants of Southwark, a large sheet containing full-sized sections and dimensions of angle, tee-iron, channel, and other bars; also a handsome little pocket book, forming a useful catalogue of iron and steel work in general. Steel is now largely employed in situations in which a few years ago it was unknown; for instance, in building construction, steel girders and cast-iron columns have entirely replaced masonry and timber. Similarly, for railway carriages, trucks, and carriage work generally, steel is replacing timber. For motor-wagons it seems to us a *sine quâ non* to use steel channels or angles for the frames.

THE Electrical Power Storage Company's latest catalogue is of special interest just now, having regard to the large use of secondary batteries for motor-vehicle propulsion. This Company has succeeded in producing a cell which, so far, has given every satisfaction for this purpose. This cell is, we learn, the joint production of M. Faure, the original inventor of the secondary cell, and Mr. F. King, the Company's manager. It is fully described in the catalogue, as are the other cells made by the Company. The business in secondary batteries is really a very large one. Central stations can hardly be said to be properly equipped without a large amount of current stored in cells. And now that electric vehicles are becoming common, the E.P.S. Company will, we are sure, have a prosperous career. This catalogue is excellently got up, and printed on very superior paper.

MESSRS. ROBEY AND Co., of Lincoln, made a reputation very many years ago as manufacturers of high-class motors, and have steadily increased this by keeping well abreast of every modern improvement. In their latest catalogue, which by the way is a fairly thick, well printed, and copiously illustrated book of 150 pages, is an interesting account of their vast works. We note that Messrs. Robey make everything about their engines except the iron ore, and no doubt they would make this if they could, and so be quite independent. As regards their various types of motors, these are so well known and appreciated both by farmers and central station engineers—to mention two extreme classes of customers—that it is not necessary to say anything of them. We note that Messr.s Robey do not manufacture traction engines, and that they rate their boilers by nominal horse-power—a vague and meaningless term. On the other hand, the principal point of excellence about this catalogue is that dimensions, weights, &c., are given not only in British units but also in metric units, a great convenience to the foreign buyer. Manufacturers would do well to imitate Messrs. Robey in this respect.

EXPLOSION OF A TRACTION ENGINE.

THE following is an excerpt from the official report of an inquiry held under the Boiler Explosions Acts, as to the cause of an explosion of the boiler of a traction engine that occurred on June 14th, while the engine was going from Netherton to Halesowen.

The engine was owned by Messrs. H. and T. Danks and Co. (Limited), Crown Boiler Works, Netherton.

The engine driver, William Thomas, was scalded.

The boiler is of the locomotive type, and forms part of a traction engine. It is made of mild steel, with the following exceptions:—Fire-hole ring, foundation ring, and internal stays, which are made of wrought iron.

The cylindrical portion of the shell is 2 feet 6¾ inches in diameter and 5 feet 5¼ inches long; the shell plates are ⅜ inch thick, the longitudinal joints being double riveted and the circumferential seams single riveted. The rivets are ⅝ inch diameter and 1⅞ inches pitch. The mean length of the outer shell of the firebox is about 3 feet 4½ inches by 2 feet 8½ inches mean width, and its height about 4 feet ¾ inch; the back, front, and top plates are ⅜ inch thick, and the sides are ½ inch thick. The firebox is about 2 feet 11 inches long by 2 feet 3 inches mean width, and it is about 3 feet in height. The crown, front, and side plates are about ⅜ inch thick, and the sides are supported from the shell by 42 screwed and riveted stays, ⅞ inch diameter, made of Yorkshire iron, and pitched 4 inches by 4½ inches apart. The crown plate is supported by 35 stays about ⅞ inch diameter, which are screwed into the plate and fitted with nuts. The ends of the boiler are supported in the steam space by longitudinal stays attached to tee-iron brackets. The tube plates are $\frac{9}{16}$ inch thick; the one at the smoke-box end of the boiler is flanged to meet the shell, the other is also flanged and forms the back plate of the firebox; 41 tubes, 2 inches diameter and 12 B.W.G. thick, made of wrought iron, are fitted. The barrel is connected to the firebox "throat plate" by a single riveted joint. The mountings of the boiler consist of:—One pressure gauge, one glass water gauge, two test cocks, three blow-off cocks, four mud doors, one manhole door, two feed check valves, one filling plug, one fusible plug, two safety valves, 1½ inches diameter, loaded by springs to 140 lbs. per square inch.

The traction engine was built in 1892 by Messrs. John Fowler and Co., Leeds. No big repairs have been necessary, but a new internal feed pipe was fitted about six months previous to the explosion. The boiler was not insured; it was inspected periodically by Mr. Joseph Jewkes, foreman fitter to the owners of the engine, Messrs. H. and T. Danks and Co , and the last inspection was made on the 1st July, 1897.

The cause of the explosion was that the thread on the feed pipe gave way, and the check valve was blown off, steam and water escaping with great force through the orifice, and this was brought about by the defective condition of the thread upon the feed pipo.

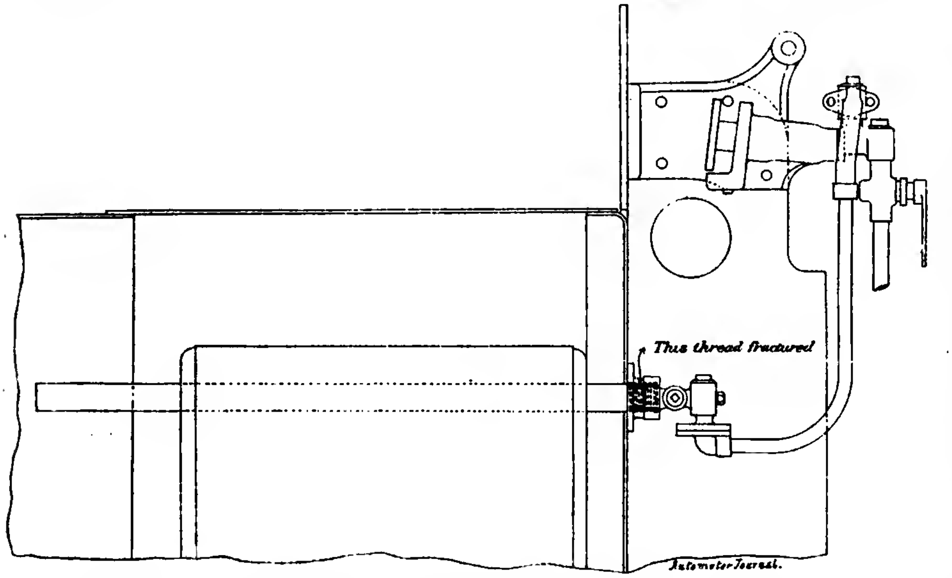
General Remarks.

The pipe which gave way was fitted to the boiler six months previous to the explosion on account of the internal part of the old pipe being split, the screwed part, it is said, being in good condition; the new pipe was made of iron, and was 2⅜ inches outside diameter, and $\frac{3}{16}$ inch thick, screwed at one end for a length of 2¼ inches, with 11 threads to the inch; this end is screwed through an iron plate riveted to the boiler front, and projects 1 inch; to this projecting part the check valve is screwed, and a joint is made between the nut on the valve chest and the plate on the boiler front; the remainder of the pipe, 3 feet 6 inches long, acts as an internal feed pipe.

The rough work that these engines do, and the vibration set up by their passage over bad roads, necessitates the constant overhauling of the machinery. Messrs. H. and T. Danks and Co. give instructions to their drivers that in case of any repairs becoming necessary, a report is at once to be made to the foreman fitter, who is responsible for doing what is required.

Observations of the Engineer Surveyor-in-Chief.

This explosion appears to have been caused by the failure of the thread of the feed pipe to which the check valve was attached. The joint of the valve was reported to be leaking, and was remade on the morning of the explosion, when the thread in question was observed to be defective, and it is said to have been arranged that a new pipe should be fitted, although no immediate danger was apprehended. The thread on the pipe appears, however, to have been in a worse condition than was thought, and its holding power proved to be insufficient to resist the vibration caused by the engine passing over rough roads.



Unfortunately one man was injured, and the case furnishes another illustration of the importance of insuring that the means by which all such fittings are attached to a boiler are in good condition.

THE electric tramway system of Montreal comprises 75 miles of track, traversed by from 170 to 200 motor-cars per diem; these cars run about 7,000,000 car-miles per annum, and carry in round numbers 30,000,000 passengers. The speed at which they travel through the streets is 7½ miles an hour, and the service is kept up, according to the requirements of the town, from 5 a.m. until 2 o'clock the next morning. The averages of some three years' operations of the power station are appended :—

Coal consumed per car-mile	7 lbs.
Coal consumed per ton-mile	1 lb.
Coal consumed per electrical horse-power	2·75 lbs.
Power consumed per motor-car mile	2,000 watt-hours.
Power consumed per ton-mile	293 "
Resistance to haulage per ton (draw-bar pull)	147 lbs.

CORRESPONDENCE.

*** *We do not hold ourselves responsible for opinions expressed by our Correspondents.*

*** *The name and address of the writer (not necessarily for publication)* MUST *in all cases accompany letters intended for insertion or containing queries.*

THE ENFIELD STEAM CARRIAGE.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

DEAR SIR,—I have had great pleasure in reading your very able report upon the heavy self-propelled vehicles in France. It proves one thing: that an omnibus of four tons tare, carrying 20 persons, can be propelled 14·7 miles at the cost of 8*d.* for fuel, and if we say water and oil at one halfpenny, total 8½*d.*; it is therefore a little over one halfpenny per mile. The tanks hold 100 gallons, which would be sufficient for a journey of 23 miles.

Please compare the above with the vaunted economy of the spirit motor. Coventry Bollée, weight 3¼ cwt., carrying two persons and a portmanteau, cost per mile said to be one halfpenny; Sterling motor, carrying three persons and 100 lbs. of baggage 100 miles, 4*s.* 7*d.*, which is over one halfpenny per mile.

I wish to bring to your notice the splendid performance of the Enfield Steam Carriage which ran in the year 1849. Number of passengers on carriage, 50; average speed, 37 miles per hour; average consumption of coke per mile, 11·48 lbs., or under 1*d.* per mile. We must not forget our worthy friends, Messrs. Merryweather and Shand and Mason, who, I think, in the year 1862 stood a very severe trial at the Crystal Palace with their fire engines, 100 lbs. pressure of steam from cold water in 10 minutes 25 seconds in the one case, and 10 minutes 51 seconds in the other.

What a lot we have learned since the above periods when we are obliged to fit our warships with a French boiler.

That the De Dion and Bouton omnibus gave every satisfaction is a great credit to the designers, but to me there are some very grave errors in the construction, both in the vehicle and the boiler.—Yours faithfully,

HENRY SPORTON.

Enfield.

[Our correspondent must not forget that the more important advances in engineering science during the last 30 years have with few exceptions been of French or German origin. French boilers, viz., the "Belleville," Du Temple, Niclausse, and others are fitted in British warships simply because of their practical advantages. The De Dion boiler is in our opinion one of the most suitable boilers for road locomotion, as it provides the maximum of heating surface with the minimum of weight.—ED.]

A WORD FOR ELECTRICITY.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

SIR,—Though it is not to be doubted that for heavy, long-distance traffic on common roads, steam-power will eventually be employed in some form or other, it must be admitted that for lighter work it is totally unsuitable. For steam machinery, with its numerous complications, skilled attendance is a necessity, and two responsible officials will always be required on a steam vehicle: one to drive and the other to attend to the boiler and engines; and for a small private vehicle this is quite out of the question. Where steam fails, however, there electricity may perhaps step in. Storage batteries are terribly heavy, no doubt, and not suitable for extended journeys into remote wilds (at least, not at present), but against this manifest weakness on their part may be set the following theoretical advantages that are perhaps not impossible of practical attainment :—

1. The employment of wind and water power in country districts to charge cells automatically — a most important economy not involving great outlay.

2. The possibility of converting the motor into a dynamo while descending hills (instead of using a brake) and charging the cells, thus regaining some of the energy expended before in going *up* hill.

Then of course there are the admitted advantages of non-vibration, cleanness, absence of noisome products, and ease of manipulation. If, as suggested before, we suppose *three* pairs of wheels to be provided, we obtain double battery space with the same steering facility as in shorter vehicles, and the weight of the cells disposed symmetrically on both sides of the central driving axle. There is no reason, surely, why we should not make our "horseless" vehicles quite as long as the horse and cart which now dominate our roads.—I am, &c., A. J. A.

November 3rd.

[There is no reason why three pairs of wheels should not be employed. We have always maintained that the effective length of a horse-drawn vehicle is the distance between the nose of the beast and the tail board, and motor-vehicles should be at least as long as this.—Ed.]

MOTOR-CARS AND THE LORD MAYOR'S SHOW.

To the Editor of The Automotor and Horseless Vehicle Journal.

Sir,—My directors will feel obliged by your inserting the following correspondence, which has taken place between us and the Lord Mayor and Sheriffs Company. My directors naturally feel they have been treated unfairly.—Yours faithfully,

The Elieson Lamina Accumulator Co. (Ltd.).
W. S. Naylor, Secretary.

4, Greenland Place, Camden Town, N.W.,
November 8th, 1897.

Lord Mayor and Sheriffs Committee, Guildhall, E.C.,
October 21st, 1897.

Dear Sir,

I am desired by Mr. Pannell to thank you very much for your letter and the photograph, and to inform you that upon full consideration the Committee do not see their way on the present occasion to include a motor-car of any description in the procession.

Yours faithfully,

W. S. Naylor, Esq., J. W. Sandy, Asst. Secretary.
Elieson Lamina Accumulator Co. (Ltd.).

On November 5th a printed circular to the following effect was received :—

Lord Mayor and Sheriffs Committee, Guildhall, E.C.,
November 4th, 1897.

Dear Sir,

I herewith enclose the Police instructions as to the time and place for your electric carriage to join the procession. Be kind enough to acknowledge the receipt, in order that I may be assured that all arrangements are completed, so far as you are concerned.

Yours faithfully,
J. W. Sandy, Asst. Secretary.

The previous circular was acknowledged on the 5th instant, and the following letter was received on the 6th instant :—

Lord Mayor and Sheriffs Committee, Guildhall, E.C.,
November 5th, 1897.

Dear Sir,

A letter intended for someone else was posted to you last night in error. The letter contained a direction for an electric carriage to be in Coleman Street, on Tuesday next, to take part in the procession.

Please to understand that this letter was intended for someone other than yourself, and that, as you have been already informed, the Committee cannot use your motor-car on this occasion.

Yours faithfully,

The Secretary, Wm. H. Pannell, Hon. Sec.
Elieson's Patent Electric Motor-Car Co.

THE BERLIN FIRE BRIGADE STEAM TRICYCLES.

To the Editor of The Automotor and Horseless Vehicle Journal.

Dear Sir,—In your October, 1897, issue, you say, on p. 15, that in Berlin the fire brigade employs steam tricycles. Will you be good enough to get us particulars of these to carry one and two persons, along with best cash prices to trade and illustrations, as we are open to buy if satisfactory, and take up agency to sell? Your kind attention will be much esteemed and oblige.

Harrison and Co.

Pocklington, *October 29th*, 1897.

[We would suggest to our correspondents that they write to the Berlin Municipal Authorities, and to the British Embassy, at Berlin. In both cases they will, we are sure, be given every information. They might also place themselves in communication with the nearest German Consul. Or again, they might communicate through their local Chamber of Commerce, or through the London Chamber of Commerce. We ourselves can hardly be expected to act as commercial agents for individual firms.—Ed.]

LOAN OF LECTURE SLIDES.

To the Editor of The Automotor and Horseless Vehicle Journal.

Sir,—Will you allow me to say that I shall be happy to lend my series of lantern slides of motor-carriages to any responsible individual for lecture purposes.

There is so much ignorance in some localities as regards this new means of locomotion that I hope lectures on the subject may be of some use.

My slides now number about 60, some unfortunately are rather thick, so a good light is necessary. John Henry Knight.

[We have much pleasure in giving publicity to our correspondent's offer, and quite agree that lectures such as he himself gave recently at the Camera Club would be of distinct educational value in the country districts.—Ed.]

DESIGN OF STEAM MOTOR.

To the Editor of The Automotor and Horseless Vehicle Journal.

Dear Sir.—As a constant reader of your interesting paper, I should be pleased to hear if you could help me with a steam motor-car I am having built here.

1. Can you give me address of maker of oil (paraffin) burners?

2. Is there any suitable condenser made for steam cars, and who should I apply to for design?

3. The car I am building is to have four wheels—ought the power be applied to the front or the back pair? which would give the most hill-climbing power?

Any information you can give me will be gratefully received.—Yours truly, Louis Knoblauch.

Leith, *November 2nd*, 1897.

[(1) and (2). Apply Liquid Fuel Engineering Company, Cowes, Isle of Wight; also to Thorneycroft's, Chiswick. (3) The power should be applied to the after-wheels.—Ed.]

WANTS AUTOMOTOR VEHICLES.

To the Editor of The Automotor and Horseless Vehicle Journal.

Dear Sir.—I am badly wanting to find the very best motor carriages for a foreign country, to carry two, three, or more tons slowly. Also light motor-cars and tricycles of the very best kind. I have heard of a foreign motor tricycle, said to be perfect, and of which there are some half-dozen in England, or coming, but I cannot trace them.

If you can help me by advising me where to apply please do so, or by sending me any copy or copies—back numbers of Journal—which give the requisite information, please send them, and I will send the money for them by return of post.—Yours faithfully,

Bexley, *November 2nd*, 1897. F. I. Cooke.

[We could not advise as to the "best" or "very best" motor vehicle. Most of the better-known makes of motor vehicles advertise in our columns, or, if our correspondent can wait till our Diary for 1898 is issued, he will find therein a very complete directory of makers, &c. Copies have been sent as requested.—Ed.]

THE VALUE OF ADVERTISEMENTS IN "THE AUTOMOTOR JOURNAL."

To the Editor of The Automotor and Horseless Vehicle Journal.

Dear Sir,—Please continue my advertisement this month and until further notice.

I am pleased to inform you I have received 165 answers up to now from the last advertisement, some of them from important business people whom I had previously no idea were in any way interested in motor-cars.

Wishing your much-appreciated journal continued success, I remain, yours sincerely, F. Frentzel.

November 10th, 1897.

FLASHING BOILERS.

To the Editor of The Automotor and Horseless Vehicle Journal.

Sir,—I duly received No. 1, Vol. II, of the Automotor, &c., Journal, and sent P.O. and stamps (6*s.* 6*d.*) in payment of the remaining numbers, and 7*d.* for a copy of the "A. and H. V. Handbook."

Can you give me any information about flash boilers?—Yours truly, Alex. Douglas.

Stranraer Foundry, Stranraer, N.B.

[The flash boiler, which is an old English invention dating from 1736, depends upon the principle of supplying a large excess of sensible heat to a very small quantity of water enclosed in a very strong chamber whereby the evaporation is instantaneous. In practice very thick tubes, ·39-inch to ·45-inch thick, are flattened or curved to a U section till the internal space is about ·125 inch in width. The tube is heated to about 800° to 900° C. (a red heat). Water is injected into the thin lamina-like space, and is instantaneously converted or flashed into steam. The pressure depends upon the heat supplied directly, and upon the quantity of water injected inversely. The best-known form of flash boiler is the Serpollet. This system has often been described in the technical journals, and a good account of it will be found in "Farman's Auto-Cars" (Whittaker and Co.). We shall in a near issue describe the Serpollet tramway system as used in Paris.—Ed.]

A VARIABLE SPEED GEAR.

To the Editor of The Automotor and Horseless Vehicle Journal.

Sir,—If I can produce a variable ratio and reversing gearing capable of reversing or varying the ratio from maximum to minimum in either direction from a motor running constantly in one direction, are you open, or can you tell me of anyone who would be, to negotiate for the patent rights in the same?

The variation is positive, and is not affected by the uncertain slip of a brake (although adaptable to that).

The whole of the operations of starting, stopping, reversing, or varying the ratio are controlled by one handle.

The gearing may be adapted to serve as anti-friction bearings for the shaft or wheel to which it is applied; and it is almost impossible for the motor to stop through being overloaded, as in one form the ratio is altered by the load itself when too great. There is scarcely any loss by friction in the gearing; I should say about as much in the entire gear as there is in a ball bearing.

It may be used either as tooth or friction gearing, or both. It will transmit a good power as friction gearing, because of the large number of contact points we are able to provide by this arrangement.

An exhaustive search has not found any anticipation.

Several cycle makers and engineers who have seen it pronounce it to be just what is wanted, and are negotiating for licences at varying royalties, but I want to get an influential gentleman who could put the thing on the market properly to take it up before accepting their offers of 5*s.* per gear.

The chief objection to all friction gears has been that the whole of the power has to be transmitted through one, or at most two, points of contact. I can use 20 or 30, or more.

Another fault is, so much pressure must be put on the bearings to give sufficient grip that the metal crushes, and also a lot of power is lost through friction in the bearings, due to the excessive pressure. Mine has none of these objections.—Yours respectfully,

5, Strand, Southampton. W. Woolidge.

[A good variable speed gear has undoubtedly a large field for employment. We could not take steps to negotiate any business matter, but no doubt the publication of your letter will cause some of those interested to communicate with you.—Ed.]

THE DURYEA MOTOR.

To the Editor of The Automotor and Horseless Vehicle Journal.

Sir,—Can you tell your readers what has become of the Duryea motor-car? After seeing the excellent running of these American cars on the trip to Brighton last year, one is surprised not to see them more in evidence here.

A report has been whispered that the inventor was bribed by another firm or rival company to take his ingenious vehicle back to the States. Perhaps you can tell me if there is any truth in the report. I enclose my card. N. Y. T.

November 2nd.

[We have no knowledge of the "bribery" mentioned by our correspondent. The Duryea motor-car was temporarily in the hands of Mr. McKim, of Cannon Street, who was adjudicated bankrupt some little time back, since which this car seems to have dropped quietly away. We believe, however, that a personal representative of the Duryea Company has for some months past been in England in connection with introducing the car to the British public, and no doubt he has carried on active negotiations with various people to that end, the result of which we shall probably see presently.—Ed.]

THE AUTOMOBILE CLUB OF FRANCE AND THE SELF-PROPELLED TRAFFIC ASSOCIATION.

The following letter has been received from Mr. Andrew W. Barr, the Secretary of the Self-Propelled Traffic Association, and we have very much pleasure in giving it publicity in our columns:—

To Sir David Salomons, Bart., *President of the Self-Propelled Traffic Association.*

November 4th, 1897.

Dear Sir,—I have the pleasure to inform you that at a meeting held yesterday, the Committee have finally appointed the Self-Propelled Traffic Association to represent the Automobile Club de France in Great Britain.

This step has been taken both as an acknowledgment of the interest of which you have given us so many proofs, and as a mark of sympathy with the Association over which you preside, and whose members include so many distinguished elements with whom we are happy to be identified.

As a result of this decision the members of your club when staying in Paris may, upon the written request of the President of the Self-Propelled Traffic Association, have extended to them for the time being all the advantages enjoyed by our colleagues of the Automobile Club of France.

Such members will receive for the purpose a personal card of invitation, signed either by myself or by a member of the Council of Administration.

Yours, &c.,

Baron de Zuylen de Nyevelt.

Ha hirdetök irják kérunk a "The Automotor and Horseless Vehicle Journal" gondolni.

For the Irish and Scotch Regulations of Motors, see The Automotor and Horseless Vehicle Diary and Pocket-Book for 1897, which contains over 100 pages of information. Price 6*d.*; post free, 7*d.*, of Messrs. F. King and Co., 62, St. Martin's Lane, London, W.C.

PROCEEDINGS OF TECHNICAL SOCIETIES.

Mechanical Propulsion on Canals.*—(*continued.*)

It is important to know how the resistance of the same boat, loaded to the same draught, alters in passing from a canal of one section to a canal of another. Some experiments upon this point were made in 1894, of which the following is a brief account. It may be premised that the ratio $n = \frac{\Omega}{\omega}$, which the wetted section Ω of the canal bears to the immersed midship section ω of the boat, obviously cannot sink below unity; and also that, the more nearly the ideal conditions of smooth water are approached, the more nearly does the ratio $n = \frac{\Omega}{\omega}$ approach infinity. As a limit, therefore, it may roughly be said in a general way that, when $n = \frac{\Omega}{\omega} = 1$, $\frac{R}{r} = \infty$; and when $n = \frac{\Omega}{\omega} = \infty$, $\frac{R}{r} = 1$. In Table 7 is given the values of the ratio of sections $n = \frac{\Omega}{\omega}$ and of the ratio of resistances $\frac{R}{r}$, obtained from experiments made with the "Jeanne," a boat of the "Flûte" class, 99 feet long and 16·44 feet wide, towed in the River Seine and in four different canals, with draughts of 3·28 and 4·27 and 5·25 feet, and at speeds of 0·82 to 4·10 feet per second or 0·56 to 2·80 miles per hour. In the River Seine, where the minimum value of the ratio $n = \frac{\Omega}{\omega}$ was not less than 72·5, the ratio $\frac{R}{r}$ which the resistance R in a canal bears to the resistance r in a river, can without appreciable error be taken as 1·00. From Table 7 it will be seen that, with a draught of 4·27 feet and at a speed of 2·46 feet per second or 1·68 mile per hour, the ratio $\frac{R}{r}$ of the resistances of the "Jeanne" is only 1·38 in the Dérivation de Joigny, where the ratio n of sections attains a value of 6·39; while in the Canal du Nivernais, where the ratio n of sections falls to 2·04, the ratio $\frac{R}{r}$ of resistances rises to 3·82: that is, for a reduction to a little less than half in the ratio of the sections, the ratio of the resistances is nearly tripled. This example shows how great an influence the ratio of the sections has upon the resistance. The figures given in Table 7 are purely experimental, and not arrived at by any mathematical calculation. At the speed of 0·82 feet per second it will be noticed that the resistances in the River Seine are the same at draughts of 3·28 and 4·27 feet; this is probably due to the fact that the resistances were measured to the nearest kilogramme, and therefore a difference of less than 2 lbs. would not be noticed in converting the readings from French into English measure.

Formulæ.—The foregoing results obtained by M. de Mas afford a means of checking the formulæ usually adopted for the resistance of boats to traction upon canals. The two following are believed by the author to be the formulæ most generally employed, in which $n = \frac{\Omega}{\omega}$:—

$$R = K\omega V^2 \frac{1}{n+2} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (1)$$

$$R = K\omega V^2 \left(\frac{n}{n-1}\right)^2 \quad . \quad . \quad . \quad . \quad . \quad (2)$$

The first formula was propounded by Du Buat in the last century, and has been applied by D'Aubuisson to the resistance of boats upon the Midi Canal. The second is deduced from the formula used for an open expanse of water—namely, $R = K\omega V^2$—by substituting for the absolute speed of the boat in open water its relative speed in relation to the water flowing backwards past it, on the assumption that the water would pass back from bow to stern at a uniform speed through the narrowed section $\Omega - \omega$. From the results now obtained by M. de Mas are deduced the three following conclusions:—First, for a boat hauled at a given speed, V, the resistance to traction is not proportional either to $\frac{\omega}{n+2}$ or to $\frac{\omega\, n^2}{(n-1)^2}$; second, for a boat kept at a constant draught the resistance to traction is not proportional to V^2; and, third, for a given boat the proportions $\frac{R\,(n+2)}{\omega\, V^2}$ and $\frac{R\,(n-1)^2}{\omega\, V^2\, n^2}$ are neither of them independent of the speed. Hence it will be seen that the two above formulæ can give only wrong results. Recently M. de Mas has been engaged on experiments with a view to determine the variation of resistance offered to a boat when the area of cross-section of a canal is kept the same, while its width and depth are altered; his results, however, have not yet appeared.

TABLE 7.—*Ratios of Sections* $\frac{\Omega}{\omega}$ *and of Resistances* $\frac{R}{r}$ *of boat "Jeanne" in different Waterways.*

R = resistance to traction in canal; r = resistance to traction in river.

Draught.	Waterway.	$\frac{\Omega}{\omega}$	0·82 ft. per sec.			1·64 ft. per sec.			2·46 ft. per sec.			3·28 ft. per sec.			4·10 ft. per sec.		
			R	r	$\frac{R}{r}$	R	r	$\frac{R}{r}$	R	r	$\frac{R}{r}$	R	r	$\frac{R}{r}$	R	r	$\frac{R}{r}$
			lbs.	lbs.		lbs.	lbs.		lbs.	lbs.		lbs.	lbs.		lbs.	lbs.	
3·28 feet	River Seine	116·04	26·5	26·5	1·00	28·7	28·7	1·00	145·5	145·5	1·00	244·7	244·7	1·00	383·6	383·6	1·00
	Dérivation de Joigny ...	8·31	26·5	,,	1·00	28·7	,,	1·00	149·9	,,	1·03	271·2	,,	1·11	458·6	,,	1·20
	Canal de Bourgogne ...	5·39	35·3	,,	1·33	103·6	,,	1·42	227·1	,,	1·56	407·8	,,	1·67	692·2	,,	1·33
	Canal de la Cure ...	4·64	37·5	,,	1·41	108·2	,,	1·43	233·1	,,	1·63	452·0	,,	1·85	795·9	,,	2·07
	Canal du Nivernais ...	3·82	39·7	,,	1·50	123·5	,,	1·70	284·4	,,	1·95	557·8	,,	2·28	1018·6	,,	2·56
4·27 feet	River Seine	89·30	26·5	26·5	1·00	83·8	83·8	1·00	172·0	172·0	1·00	295·4	295·4	1·00	474·0	474·0	1·00
	Dérivation de Joigny ...	6·39	30·9	,,	1·17	105·8	,,	1·26	238·1	,,	1·38	440·9	,,	1·49	756·2	,,	1·60
	Canal de Bourgogne ...	4·54	48·5	,,	1·74	154·3	,,	1·84	341·7	,,	1·98	621·7	,,	2·10	1073·7	,,	2·26
	Canal de la Cure ...	3·57	50·7	,,	1·92	178·6	,,	2·13	410·0	,,	2·38	813·5	,,	2·75	1501·4	,,	3·17
	Canal du Nivernais ..	2·04	70·5	,,	2·67	255·7	,,	3·06	657·0	,,	3·82	1389·0	,,	4·70	2645·6	,,	5·58
5·25 feet	River Seine	72·49	28·7	28·7	1·00	90·4	90·4	1·00	187·4	187·4	1·00	319·7	319·7	1·00	511·4	511·4	1·00
	Dérivation de Joigny ...	5·19	39·7	,,	1·42	141·1	,,	1·56	326·3	,,	1·74	619·5	,,	1·94	1124·4	,,	2·20
	Canal de Bourgogne ..	3·68	70·5	,,	2·46	244·7	,,	2·71	562·2	,,	3·00	1047·0	,,	3·28	1838·8	,,	3·59
	Canal de la Cure ...	2·90	72·8	,,	2·56	261·6	,,	2·93	687·9	,,	3·67	1532·0	,,	4·79	2965·2	,,	5·80

It has been found over and over again that, as the depth of a canal is augmented, the ease with which a boat can be towed is increased. In the discussion upon the late Mr. F. R. Conder's paper upon "Speed on Canals" ("Proceedings Inst. C.E.," 1884, vol. lxxvi, p. 160), it was stated by Mr. Robert Gordon (p. 198) that within the limits of his experience retardation of speed and deficient steering power "were much more strikingly developed in shoal water, with only a few feet between the bottom of the vessel and the bed of the canal, whatever the breadth of the stream might be, than in a restricted narrower section of greater depth." On the Forth and Clyde Canal, on which there is steam navigation, and where,

* Abstract of paper read by Mr. LESLIE ROBINSON at the Institution of Mechanical Engineers.

according to Sir Arthur Cotton, the ratio of wetted section Ω of canal to immersed cross-section ω of boat amounts to 3 : 1, it is found that a higher speed than five miles per hour cannot be adopted, because above this speed the water is not delivered quickly enough at the stern to admit of effective steering. In the discussion upon Messrs. Clegram and Healy's papers in 1866 ("Proceedings Inst. C.E.," 1866, vol. xxvi, p. 1) the two following conclusions were drawn by Mr. William Beardmore (p. 43):—"Firstly, that with any flat-bottomed vessel propelled by a screw, immersed to its full diameter in a canal where the sectional area of the vessel was less than one-seventh part of that of the whole waterway, the speed was sensibly affected (independently of the laws of motion of bodies through narrow canals) wherever the depth below the vessel's bottom did not exceed two-thirds of the diameter of the screw. Secondly, that when the sectional area and depth of canal were less than the above proportions, the velocity at which the screw could be worked with advantage was limited by the speed with which the water could pass beneath the boat so as to feed the screw. In other words, if a speed were obtained beyond that at which the water would pass to the screw, the engine power was wasted in churning the bottom water."

Speed.—The speed attainable upon a canal must necessarily be limited by the consideration of the preservation of the banks. Up to a speed of three miles per hour it was found by Dr. Pole that no waves were formed which had an injurious effect on the sides of the canal; but above that speed breaking waves became developed, and had a most destructive effect upon the banks. At moderate speeds it has been found that the wasting of the banks extends only about 1 foot above and below the water level. The difficulty of preserving the banks was one of the great hindrances to the use of steam power upon canals. When it was first determined about 1860 to try towing by steam upon the Ashby-de-la-Zouch Canal, the railway owning the canal objected; and the matter was referred to Dr. Pole, who tried a boat propelled by a screw at different speeds, with the result already mentioned, namely, that no damage was done up to three miles per hour, but that above this speed breaking waves were formed. The highest speed allowed in France is from six to eight kilometres, or about 3¾ to 5 miles per hour, while in England three miles per hour is the usual speed. In narrow canals, and in tunnels such as that on the Canal de Saint-Quentin, the speed has to be further reduced, owing to the heaping up of the water in front of the boat. An instance is cited by Lermoyez in 1863, in which the last of a train of barges was left on a dry keel, owing to the water not being able to flow backwards past the boats quickly enough to supply the void caused by their passage. They acted indeed like the plunger of a pump, forcing the water before them: and the only way in which they could be moved along was by waiting for intervals of 20 minutes until the water had returned to its normal level in the canal. Even in a moderately wide canal, by keeping the traffic moving continuously in the same direction over a distance of 30 miles for a whole day, Scott Russell found the water raised 18 inches higher at one end of the canal and lowered 18 inches at the other, making a total difference of level of three feet.

With regard to altering the shape of the boat in order to gain increased ease of traction, the experiments of M. de Mas may be again referred to. He has experimented with two builds of boat already mentioned, which are known locally as a "Péniche" and a "Toue" (ferry-boat), having the same length of water line and the same width amidships. The "Péniche" is but slightly rounded at each end, and the bottom is only slightly cut away at the stem and the stern; the boat is therefore full-bodied, the coefficient of fineness being 99 per cent., that is, the ratio which the volume of the displacement bears to the parallelopiped circumscribing the immersed hull is 99 per cent. The "Toue" is square at the stern, but rather more cut away at the bow than the "Péniche," and its coefficient of fineness is consequently reduced to 97 per cent. Both these builds of boat have flat bottom and parallel sides. With a draught of 4·27 feet and at a speed of 1·68 miles per hour the resistance of the "Toue" is 232 lbs. less than of the "Péniche," while with a draught of 5·25 feet and at the same speed the decrease is 366 lbs. The loss of carrying capacity in the "Toue" consequent on the difference in shape, is 5·9 tons; so that for this small reduction in carrying capacity there is a considerable diminution of resistance to traction, and a consequent increase in speed might be obtained. The resistance of boats to traction is also increased in going round curves; and M. Flamant ("Annales des Ponts et Chaussées," 1881, vol. i, p. 214) has shown that the power required to tow a boat round a curve of 328 feet radius is just double that required on a straight stretch of canal having the same cross section as the curve. French canals, however, are usually made of extra width in curves; and it is then found that a curve of 328 feet radius does not materially increase the resistance to traction on a canal intended to carry boats of 125 to 128 feet length and 16½ feet width.

Mechanical Propulsion.—There are four different methods in use for the mechanical traction or propulsion of boats upon canals, which will be taken in the following order:—(1) propulsion by screws worked either by steam, by petroleum motors, or by electricity; (2) hauling upon a submerged chain or wire rope lying along the bed of the canal; (3) attachment to an endless running rope working along the canal bank; (4) towing by a locomotive running along the canal path. These the author believes are the only plans at present in use on canals, or passing through the experimental stage. Upon the Continent a few stern-wheel steamers are in existence on rivers; but they are seldom used on canals, because they occupy so much room in the locks, and the stern wheel takes up a good deal of valuable space that might be occupied by cargo.

(To be continued.)

Some Points in Cycle Construction.*

THE rapid development of the modern bicycle is mainly if not entirely due to the influence of the racing track in securing the extinction of the least fit. The advance has been made by a lengthy and expensive process of trial and error; but this process would have been far more tedious and expensive, if it had been left to the judgment of the average rider to decide what constituted fitness. It is in the final struggle at the end of a well-contested race that the fine shades of difference in the speed of machines have been discriminated. This method of experiment may eventually give place to others more scientific and more exact; but the latter are hardly likely to be so popular. It is now generally understood that the property of speed, possessed in such various degrees by cyles, is mainly a negative property; that is, it is the absence of any means of dissipating the energy transmitted through the mechanism; in fine, the whole question is one of efficiency. The best machine both for racing and for ordinary riding is that which is most efficient. The principal causes of inefficiency in a cycle are—want of rigidity, and friction:—A cycle which should be absolutely rigid and entirely without friction would have an efficiency of 100 per cent.; that is to say, it represents an ideal perfection which cannot be exceeded, and cannot actually be attained.

Rigidity.—Of these two sources of inefficiency, it is probable that want of rigidity is the most important. It is in this particular that cycles differ far more than in friction; and it is invariably found that the more rigid machine is also the faster. The cause is twofold. Firstly, the work done in springing the frame out of shape at each stroke of the foot is not spent in driving at the end of the downstroke, but only in lifting the foot at the beginning of the upstroke. The amount of exertion wasted in this way may be fairly estimated by sitting on a machine with the wheels fixed, and alternately applying and relieving the pressure of the foot on the pedal; the more springy the machine, the greater will be the fatigue experienced. Secondly, the springing of the frame causes a general condition of instability, due partly to the alteration of the balance through lateral movement of the pedals, and partly to the wheels being forced out of line, thereby causing the machine to swerve from side to side, instead of running a true course. Although the loss of efficiency from this cause may seem slight, the sense of instability has a disastrous effect in marring a sudden effort or in aggravating a steep hill.

Friction.—In a machine with well-constructed bearings, friction is mainly due to the chain. The consequent loss has been variously estimated, as low as 1 per cent. of the total power has been recently given. If this were correct, chain driving would be the most efficient means of transmitting power at present known. Probably, however, the loss was measured when the chain was not doing any work, which would make the test fallacious. About 5 per cent. seems nearer the truth. The means of avoiding these various sources of inefficiency may be considered in detail; and at the same time the means by which the ordinary stresses in a vertical plane may be met with the minimum of material.

Factor of Safety.—It has been said that the factor of safety for a cycle frame is about 1¼. If this is understood to mean that a machine designed for a 12-stone rider should not be ridden by one exceeding 15 stone, it is probably not far out in most cases; yet

* Paper read by Mr. F. J. Osmond, of Birmingham, at the Institution of Mechanical Engineers.

a well-built frame will carry a steady load of at least 10 times this weight without injury. The difference between these two statements is due to the fact that the front part of the frame is exposed to shocks which must cause bending stresses near the head; for if the two front tubes are arranged so that their axes intersect vertically above the axle of the front wheel, the stresses are only pure tension and compression, so long as the force acting through the front axle is purely vertical. It is evident that this is not the case when the front wheel meets a brick or other obstacle which represents a force acting obliquely; whilst when the wheel drops on the other side of the obstacle there is a shock which is vertical. It is thus impossible to avoid bending; and the best compromise is obtained by making the axes of the two tubes meet some distance behind the perpendicular through the front axle. This consideration is sufficient to justify the present shape of frame with short head and horizontal top-tube. Any considerable obstacle surmounted by the front wheel causes two distinct shocks, the first oblique and the second vertical; and these shocks will in general tend to bend the front tubes first in one direction and then in the other. The bending moments are greatest close to the head, just where the tubes have been weakened by brazing; it is, therefore, necessary to provide some local strengthening. This, the author gives by shrinking a reinforcement about 4 inches long upon the outside of the tube ends; the tubes are brazed together at the ends, tapered in a lathe, and the whole then brazed into the lug. By this means the part weakened by the brazing is kept within the reinforcement, and breakage is practically impossible.

Large Tubes.—Although there is an evident advantage in increasing the diameter of tubes subjected to bending and tension, yet, as the thickness must be reduced in order to retain the same weight, a limiting ratio of diameter to thickness is soon reached, which cannot be exceeded without danger of the tube failing through buckling induced by some small local stress due to dents, &c. This ratio is much smaller when the tubes are curved, as in handle-bars, which, if made of too thin metal, will fail at the bend, and not at the junction with the stem, where they ought to fail first if their strength is calculated from the bending moment only. In multicycles, where heavier tubes are necessary, the diameters may be considerably increased with great advantage to the general strength and rigidity. For tandem and triplet cycles the author makes tubes 25 per cent. larger in diameter than for single machines, which gives about 50 per cent. more rigidity for the same weight.

Aluminium Frames.—The advantages of aluminium and its alloys, as compared with steel, have been so often urged that a few facts may be interesting. The best aluminium alloys have about 16 per cent. less strength and rigidity when drawn into tube than a steel tube of the same weight and outside diameter; but owing to its much greater thickness the aluminium tube can be made of larger diameter without danger of buckling. For handle-bars aluminium has greater advantages, and if it could be readily plated, it would be really valuable for this purpose. The difficulty of jointing is much against it in most cases. For the comparison of strength and rigidity the tubes tested were both 1 inch outside diameter, and practically of the same weight per foot; the steel tube was 20 gauge or 0·036 inch thick, and the aluminium alloy 12 gauge or 0·110 inch thick. The superiority of the steel tube was due to its greater mean diameter; making allowance for this, the strengths and stiffnesses of the two materials are nearly equal. The maximum stress in the steel tube was 52 tons per square inch, and in the aluminium alloy 18·7 tons per square inch. The effect of a brazing heat was to reduce the strength of the steel by 45 per cent., thus bringing down its maximum stress to 28·6 tons per square inch; the stiffness was unaffected.

Testing of Tubes.—In testing tubes it is necessary to take special precautions in order to avoid buckling by local stress. For example, if the tube is supported at the ends and loaded at the centre, it should be of considerable length, say 3 feet for 1 inch diameter, and the load should be suspended by a broad leather strap, so as to distribute the pressure over a large surface. Through the neglect of these precautions the results of many published tests have been rendered entirely misleading. The advantages so often claimed for "webbed" tubes are apparent only when the tube is tested in short lengths and loaded in the centre. Under these conditions a plain tube is crushed in at the point where the load is applied, which is also the point of maximum compression stress due to the bending. It therefore fails prematurely from a local stress, which has no counterpart in the working stresses of a cycle. When tested with proper precautions, webbed tubes are both weaker and less rigid, weight for weight, than plain tubes, a result which accords with theory. The same may be said of various other sections. It is in many cases better to test by brazing a solid plug into one end of the tube, and having clamped this end, to load the other end; in this way all unfair stress is avoided. Corrugated tubes have the advantage of resisting local stress better than plain tubes; but they are less rigid, weight for weight, and present difficulties in jointing. Nickel steel is as rigid as carbon steel, and has the advantage of a higher elastic limit; it is therefore well suited for the two front tubes of a cycle, which are the most subject to vibration. In other parts, where the elastic limit is not so nearly approached, it has no advantage over ordinary steel. It is a mistake to suppose that the mildest steel is the safest under vibration; owing to its low elastic limit it is more liable to break off short from vibration than harder steel containing up to 0·8 per cent. of carbon.

Means of Securing Rigidity.—In considering the design of a safety bicycle frame, too little attention is generally paid to what may be called the driving stresses; that is, those set up by the pressure of the foot upon the pedal, which causes lateral distortion of the frame. There are two distinct cases to be considered—first, when the pressure of the foot is balanced by a pull at the handle on the same side; and second, when there is no pull at the handle. In the first case, when the pressure of the foot is balanced by a pull at the handle on the same side, the distortion is confined mainly to the front part of the frame, consisting of the head tube, the upper and lower front tubes, and the seat-socket tube. Each member of this quadrilateral is subjected to both torsion and bending. If any one of these members is so strengthened that its bending and twisting are diminished, then the strength of the adjacent members is also increased, so that much greater forces are required to produce a given distortion. Now the head tube being short compared with the other members, an increase in its thickness is accompanied by an increase in the stiffness of the frame out of all proportion to the increase of weight. This stiffness is also increased up to a certain point by shortening the head tube. The long heads in vogue a few years ago rendered the frame more springy, while the present pattern of frame, with horizontal top tube and comparatively short head, is much better in this respect. The torsion of the seat-socket tube is greatly diminished if the rear part of the frame is rigidly connected, instead of being merely bolted together. When the torsion of the head tube and seat-socket tube is thus minimised, rigidity is secured by providing top and bottom front tubes of suitable diameter and thickness. In the second case, when the pressure of the foot is not balanced by a pull on the handle, the distortion is not confined to the front part of the frame, but every member is twisted and bent simultaneously. The rigidity thus depends mainly on the joints throughout the frame. In a machine wanting in rigidity, the wheels and the frame are no longer in the same plane; the wheel inclines to one side of the vertical and the frame to the other, and the direction of the inclination alters at each stroke of the foot. The stresses thus set up are much the same as if the wheels were fixed, and the frame twisted by means of the seat pillar. If the joints are made merely by flattening the ends of the tubes and then bolting up, the frame is liable to be rickety, because under bending and twisting stresses such joints will give more than the whole length of the tube. This source of weakness is avoided in the author's practice by brazing the back forks and chain stays together, without any flattening or weakening of section, and by reinforcing the joint with a wrapping of sheet steel. At the junction of the seat-socket tube the back forks are also brazed on, and the solid end-piece, after brazing in, is recessed to take the seat-pillar bolt. This connection is so rigid as to permit of dispensing with the usual bridge above the back wheel. In the same way the ends of the front fork are stiffened so as to increase the lateral rigidity greatly, as compared with the usual make of flattened-tube fork-end. In the fork crown the weakest feature of the ordinary double-plate pattern is the smallness of the brazing surface, which sometimes results in the tearing apart of the joint. This is remedied by fitting the fork blades into a practically continuous socket joining the crown plates, thereby so greatly increasing the brazing surface as to reduce the maximum stress on the solder, and to eliminate all chance of breakage.

Chain Stays.—The chain stays are perhaps the most important part of the frame of a cycle; they are certainly the part about which the greatest difference of opinion exists. Before the extreme importance was realised of a narrow tread for constituting a straight-running machine, round chain stays of ⅞ inch diameter were often used, which gave ample stiffness; but now that there is a premium on every ⅛ inch under 5 inches clear width between the pedals, it is necessary to reduce this diameter to about ⅝ inch. Now a tube of round section ⅝ inch diameter is only abont half as stiff as one ⅞ inch diameter of the same weight, and has only about 70 per cent. of the strength. It therefore becomes necessary to use a section giving greater rigidity and strength than the ordinary round tube. The choice lies between oval, rectangular, and D sections. The last of these has been chosen by the author as the most suitable, in consideration of the nature of the stresses to be met. The weight of the rider puts the chain stays in tension; but this tension is small compared with that produced when the foot is exerting its maximum pressure on the pedal. The nature of the deformation produced by the chain tension may be investigated by tightening up the chain, and then squeezing its upper and lower spans together. It will be seen that both of the chain stays are thereby bent towards the chain side, because, being connected by the back axle, one cannot move without the other; and the final result is a bending in four places, two on each side, namely, close to the bridge and close to the back axle. The chain stays designed by the author are shaped with a slight bend in the middle, so as to clear the crank end. This construction has been criticised as causing a bending moment at that point, tending to buckle inwards the stay on the chain side; but experiment shows that the total bending moment is not a maximum at that point, and that consequently the slight inward bend does no harm. On the other hand a sharp bend near the bridge is a source of weakness, which is best guarded against by using a steel casting at this point, instead of merely bending the tube. The bending moment, which is due to the back axle not being exactly in line with the back forks in some portions of the "chain adjustment," amounts in extreme cases to about 70 inch-pounds, which means only a small stress on the D tubes that are used. The stress, moreover, is perfectly symmetrical, and causes no lateral distortion of the frame. The advantage claimed for the radial or swinging adjustment—namely, that the axle is always in the centre line of the back forks—is thus of small account, and is far more than counterbalanced by the want of lateral stiffness in that adjustment. By the "chain adjustment" is meant the path of the back axle along the slot provided for the purpose of adjusting the tension of the chain; when the back forks are bolted to the axle, the weight of the rider is taken direct by the axle; but when the frame is brazed together at this point, the axle moves away from the point where the centre lines intersect.

D Tubes.—On the subject of D tubes for chain stays there exists some amount of misapprehension. They were introduced by the anthor partly because the flat inner surface is convenient for the nut on the back axle to be locked against, and partly because, for the same width and weight, they are more rigid than either round or oval tubes. It must be borne in mind that, in order to attain the requisite rigidity, it is necessary in general to increase the section of chain stays beyond what is required for mere strength; it is therefore the rigidity of the different sections that has to be compared, and not their strength. It has been argued by a recent writer on cycle construction that, weight for weight, a tube of semicircular section is only 1 per cent. stronger than a tube of circular section, if both are of infinitesimal thickness. Now the D tubes employed by the author are not of semicircular section, and they are at least 20 gauge or 0·036 inch thick. A semicircular tube is about 16 per cent. stiffer than a circular tube, weight for weight, if both are of infinitesimal thickness; and when the thickness becomes finite, the advantage is still greater. A ⅞ inch semicircular tube of 20 gauge or 0·036 inch thickness is about 25 per cent. stiffer than a ⅞ inch circular tube of the same weight, since the thickness of the latter must be about 17 gauge or 0·054 inch, and its mean diameter is therefore less. The section used by the author, however, is not semicircular, but much more resembles the shape of the letter from which it takes its name. Theoretically, a rectangular section is the best possible; but its appearance on a cycle is so hideous as to be out of the question. If for equal weight the relative stiffness of a tube of circular section, ⅞ inch diameter and about 17 gauge thickness, be represented by 100, then the results of tests of oval and D and rectangular sections, all three rolled from a round tube of $\frac{13}{16}$ inch diameter, will compare as follows:—

Round tube,	0·85 diameter	× 0·054 thickness,		relative stiffness,	100.
Oval ,,	0·65 wide ×	1·125 deep ×	0·036 thick,	,, ,,	119.
D ,,	0·65 ,,	1·070 ,,	0·036 ,,	,, ,,	136¼.
Rectangular	0·65 ,,	0·825 ,,	0·036 ,,	,, ,,	146½.

It will thus be seen that the D section now adopted is only about 7 per cent. less stiff than the rectangular, which is the best that can be rolled out of a round tube of the same diameter and to the same width.

Various webbed sections have from time to time been proposed and advantages have been claimed for them on the strength of tests which mainly show resistance to local crushing in one particular direction, and give no indication whatever of the value of the section when made up into a cycle. Tests made on webbed D tube, by brazing a plug into one end and loading the other, show that it is 6 per cent. less strong and 15 per cent. less stiff than plain D tube of the same weight and external size. It is important to realise that the material of a tube should be kept as far away from the neutral axis as possible.

Multicycles.—The necessity for lateral rigidity is even more apparent in multicycles than in single machines. It is found that any want of unison in the efforts of the riders has a disconcerting effect, which greatly detracts from the pace and from the power of going up hills. It is only by the employment of tubes of larger diameter that the increased distorting stresses can be properly met. The form of frame now generally adopted was first used by the author in 1895, and has for its principal feature a horizontal tube running from the bottom of the head, parallel with the top tube which starts from the top of the head; the lower line of tube is braced by means of light diagonals to a single bottom tube of 1¾ inches diameter. This form of frame, whilst not superior in strength or rigidity to that having diagonals running from the top tube to the bottom without an intermediate tube, possesses a great commercial advantage in the fact that frames can be built of different heights without altering the angles of the lugs simply by raising the top tube. It is advisable to unite the rear end of the intermediate tube to the back forks by a short fork, which increases the lateral rigidity. There seems to be a general tendency to duplicate the back fork in multicycles; but greater rigidity can be secured by means of a single fork of large section, provided that it is properly connected to the top of the rear seat-pillar lug. In the same way a single tube of 1¾ inches diameter connecting the various crank-brackets gives greater rigidity than the more usual arrangement of two 1-inch tubes, placed either side by side or one above the other. The method devised by the author of fixing the back axle by nuts locking against the inner surface of the chain stays, gives a rather wider spread to the back forks than is usual, which is an advantage in improving the bracing between the axle and the seat-pillar lug.

Chains.—The great advantage of a roller chain, when exposed to mud or dust, led the author to consider why the block chain was so generally admitted to be the faster of the two; and the conclusion he came to was that it is a question of smoothness of running. The roller-chain links were at least 1 inch long from centre to centre of eyes, whilst those of the block chain were alternately 0·4 inch and 0·6 inch. By shortening the links, therefore, to half an inch, he concluded that the roller chain would run more smoothly, and consequently be faster than the block chain. It was found indeed that roller chains of ⅝-inch pitch were already contemplated by the chain makers; but as this length is slightly in excess of the longer of the block-chain links, there is no advantage in smoothness or speed. It was questioned whether the chain and wheel of ½-inch pitch could be made a success in practice, but experience has fully justified the expectations on this point. The smoothness of running with gearing of this pitch is remarkable, whilst its excellent behaviour when covered with mud or dust renders a casing almost superfluous.

Gear and Crank Length.—The question of gear is so closely connected with that of crank length that they cannot properly be considered separately. For it is evident that a gear of 60 inches does not represent the same conditions with a 6-inch crank as when one of 7 inches is used; and similarly it would not be reasonable to expect that a leg 36 inches long will be suited by a length of crank which suits a leg 32 inches long. The length of crank must be decided by the rider's natural length of stride, and the ratio of multiplication of gear to length of crank must depend upon his muscular development, both of which data may be approximately ascertained by measurement. The gear is then the product of the two factors so determined. The maximum ratio of multiplication for road riding is about 12 times, and the minimum about nine times. The maximum length of crank may be taken as about 7½ inches, and the minimum 6 inches. Hence the gear may vary from 90 inches down to 54 inches.

NEW INVENTIONS.

Claiming particularly to apply directly or indirectly to Motor Vehicles, &c.

Compiled for "THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL" by HERBERT HADDAN and Co., Registered Patent Agents, of 18, Buckingham Street, Strand, W.C., London.

*** *At the request of a number of subscribers we are pleased to announce that for the future we have arranged to more thoroughly cover the field of completed Patents referring to the Motor-Car Industry, by reproducing the latest Specifications and Diagrams.*

Patents Applied For.

Abbreviations: Impts., Improvements in; Relg., Relating to.

1897.			
Oct.	1.	22,565.	J. HARPER. Impts. tractors for vehicles and motor-cars.
,,	2.	22,578.	R. F. MOORE. Speed alarm and recorder.
,,	2.	22,590.	J. J. SLACK and W. HOUGHTON. Impts. saddles for motor-cars, &c.
,,	5.	22,785.	A. ECKFORD. Impts. relg. motor street-sweeping machines.
,,	5.	22,795.	A. JORDON and J. G. H. BROWNE. Application of three-cylinder engines to vehicles.
,,	6.	22,932.	E. H. HODGKINSON. Impts. velocipedes and automotor-carriages.
,,	8.	23,067.	F. WOODCOCK. Chains for cycles and motor-cars.
,,	8.	23,094.	BOWDEN, HOYLE, and URQUHART. Impts. motor-propelled vehicles.
,,	11.	23,280.	C. LEE. Impts. motor-cars.
,,	11.	23,357.	W. E. SIMPSON. Impts. motors and motor-driven vehicles.
,,	11.	23,367.	W. KLIEMT and A. HEINEMANN. Impts. driving gear.
,,	11.	23,368.	KLIEMT and HEINEMANN. Impts. motor-cars, &c.
,,	13.	23,502.	W. H. TYE. Spring wheel for road vehicles.
,,	13.	23,528.	H. C. L. HOLDEN. Controlling and regulating motors.
,,	15.	23,723.	W. HOUGHTON. Impts. saddles for cycles, motor-cars. &c.
,,	15.	23,792.	F. W. SCHNEIDER. Impts. relg. electric propulsion of vehicles.
,,	15.	23,803.	DELEGEON et CIE. Mechanism for varying the speed of automotor-vehicles.
,,	16.	23,822.	E. C. BLECHYNDEN and R. Y. MCINTOSH. Impts. self-propelled vehicles.
,,	18.	23,974.	J. N. CAREY. Variable speed driving gear.
,,	19.	24,032.	C. TENNETT, W. AMBLER, and A. J. RILEY. Impts. self-propelled vehicles.
,,	19.	24,066.	A. S. BOWLEY. Frame fittings for auto-vehicles, &c.
,,	19.	24,076.	H. O'REILLY. Impts. cycles, motor-cars, &c.
,,	21.	24,295.	J. B. HEAL and S. H. HEAL. Acetylene gas generator for road vehicles, &c.
,,	21.	24,355.	C. H. HALL, Junr. Impts. mudguard bridges.
,,	22.	24,473.	W. C. PLAYER and J. PEARSON. Impts. joints of cycle and motor-car frames.
,,	22.	24,494.	H. J. LAWSON. Impts. relg. motor-vehicles.
,,	23.	24,597.	W. S. SMITH and H. T. ROBERT. Multiple speed gear and driving mechanism.
,,	25.	24,656.	T. MOODY. Impts. driving gear.
,,	25.	24,712.	P. E. DOOLITTLE (W. J. STILL and T. BENGOUGH). Motor apparatus for propelling vehicles.
,,	25.	24,813.	C. H. BARROWS. Impts. motor road vehicles.
,,	29.	25,062.	A. HODGKINSON and F. REDFORD. Impts. relg. to handle-bars.
,,	29.	25,066.	J. B. MORGAN. Impts. driving gear.
,,	30.	25,168.	G. A. J. SCHOTT. Safety guard for motor-vehicles.
,,	30.	25,189.	E. S. BOND. Acetylene gas apparatus for motor-vehicles, &c.
,,	30.	25,235.	The Hon. R. T. D. BROUGHAM. Roller bearing locking or under carriage for electrical vehicles.

Specifications Published.

14,756. Oil Engines for Propelling Carriages, &c. James Roots, 100, Westminster Bridge Road, London. July 3rd, 1896.

Fig. 1 shows the method of connecting the valve and power countershaft to the motor.

Fig. 2, the plan of a portion of the frame of an oil motor vehicle, showing the friction discs and rollers.

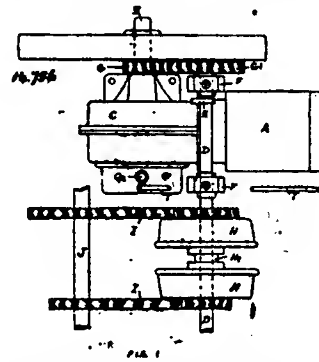
Fig. 4 is an elevation of a portion of an engine, showing the arrangement of the starting and automatic burners.

In **Fig.** 1, A is the cylinder, B the crank shaft, C the enclosed and airtight crank pit, D the half speed shaft, E the cam for operating the exhaust valve, F the bearings carrying the half speed shaft, which are fixed to the motor, a third bearing not shown is fixed to the vehicle frame, G, the chain wheel on the crank shaft, having half the number of teeth of the chain wheel, G 1; H, H, are friction clutches operated by a fork lever not shown, fitting in the groove, H^1, by which either of the chains, I, I, are thrown into gear to drive the axle or shaft, J.

The exhaust valve and the method of operating it by the cam, E, are not shown, and may be of the usual construction.

The bearings, F, are fixed to brackets which are bolted to the motor. The countershaft, D, is parallel to the crank shaft, and is driven by the chain and chain wheels, G and G 1, at half the speed of the crank shaft. It carries the cam, E, for operating the exhaust valve, and transmits the power of the motor to the shaft or axle, J. The countershaft, D, thus serves the double purpose, it is conveniently placed parallel with the other, and runs more silently, being driven by a chain.

In Fig. 2, K is the frame of the vehicle. L L the vehicle wheels, rigidly fixed to the portions of the axle, L 1 and L 2; M, M^1, are the friction discs fixed at the other ends of the axle shafts, L 1 and L 2; N, N^1, are the friction rollers, O is a toothed wheel keyed to the shaft, P, which is driven by the motor, it gears with the wheel, O^1, which is fixed to the shaft, P^1. The gear wheel, O^1, has the same number of teeth as the wheel, O, the shaft, P^1, therefore rotates at the same speed as the shaft, P, but in the opposite direction. The rollers, N, N^1, slide on feathers on the shafts, P, P^1, and are simultaneously operated by a lever (not shown) from the seat of the carriage. In the position of the friction rollers, N, N^1, shown, if they are moved nearer the bearings, P 4 and P 5, they cease to drive as the pressure lessens at the peripheries owing

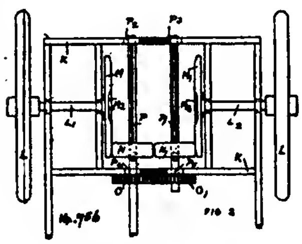


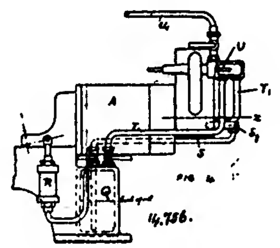
to the turned away edges of the discs, M, M^1. If the rollers, N, N^1, are moved toward the centre of the discs, they increase the speed of the vehicle until they reach the hollowed out centres, M^2, M^3, when they again cease to drive, if the movement be continued toward the bearings, P 2, P 3, then the vehicle is reversed. Means may be provided (not shown) for compressing the shafts, P and P^1, together when it is desired to reverse or to place the rollers at a different position on the discs.

The shaft bearings are fitted in a guide and pressed apart by a spring, but prevented from exceeding a certain adjusted distance by set screws, so that the shafts need not be out of the parallel by more than $\frac{1}{16}$ inch. One shaft may be the counter shaft of the motor, or may be driven by the motor in any convenient manner such as a chain and chain wheels, or flexible coupling.

A ratchet and pawl may be fitted, if desired, in some intermediate position between the wheels.

In Fig. 4, Q is the lamp reservoir which is not more than half filled, so as to allow room for compressed air at the top of the reservoir. R is the air pump operated by means of a bell crank lever connected to the side shaft of the engine (not shown). S is the pipe conveying the oil under pressure to the burner, S 1, a pressure burner of usual construction. T is the pipe conveying the air blast from the reservoir, Q, to the oil feeder, U (U 1 is the oil supply pipe). In the space round the oil feeder, U, which is operated in the usual manner, described in my former specifications, may be fitted cotton or other absorbent material.





From U the blast of air carries the oil fed thereto, by means of the pipe, T I, to the pipe or channel surrounding the flame and ignition tube within a casing. The pipe or channel terminates in a nozzle which directs the air blast flame upon the ignition tube. In starting the engine, Fig. 4, the cock on the pipe, T, is closed, air is pumped to a pressure of a few pounds per square inch in the reservoir, Q, the cock on the pipe, S, is opened and the burner, S 1, started in the usual manner.

After the engine is started, to obviate the uncertainty of the type of burner, such as S 1, the automatic burner is brought into action, by closing the cock on the pipe, S, and opening the cock on the pipe, T.

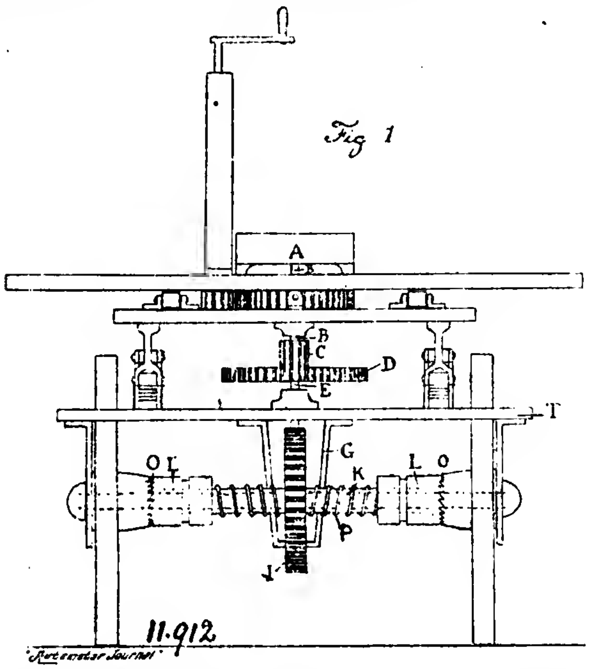
The engine continues to pump air by the pump, R into Q, which is conveyed by the pipe, T, and sweeps off the oil fed by the feeder, U, and both are conveyed by the pipe, T 1, to the coil, V.

In Fig. 1, the motor is started by the usual starting lamp with a separate reservoir. The air chamber, Q 1, is used as a cushion chamber only for the air blast, to prevent variation and intermittence in the air supply, and no oil is placed in it. Q 2 is the cap of the suction and delivery valves of the air pump formed by the front face of the working piston and the enclosed air-tight crank pit chamber, C. Air is delivered from the crank pit, C, to the chamber, Q 1, by the delivery valve under the cap, Q 2, and conveyed by the pipe, T, to the oil feeder of the same construction as U, in Fig. 4. The rest of the automatic burner is of the same construction as in Fig. 4.

11,912. Autocars, or Self-propelling Vehicles. Charles Casman, 4, Chaussée d'Aerschot, Louvain, Belgium. June 1st, 1896.

This invention has reference to autocars, or self-propelling vehicles, with a turbine as the motor.

A is the turbine (for instance, a steam turbine) for imparting motion to the vehicle. B is a vertical shaft, on which is a fluted or toothed pinion, C, by means of which it transmits the motion of the turbine to a fluted or toothed wheel, D, keyed on the upper part of a vertical shaft, E, which extends through the frame, T, of the vehicle, and whose lower end is mounted in a



hanger, G, in such a manner as to rotate freely therein. The vertical shaft, E, is, on a level with the axle of the vehicle, provided with an endless screw or worm, which gears with the teeth of a toothed wheel, I, keyed on a hollow shaft, K, in which or through which passes the axle of the vehicle. The hollow shaft is square in cross section, and each of its ends is provided with a clutch adapted to slide freely along the said shaft, and to engage with a toothed rim or ring of teeth, O, on the boss or hub of the adjacent wheel of the vehicle. Springs, P, arranged preferably around the hollow shaft, K, act to constantly press the clutches, L, into gear with the toothed rings, O.

The motion of the toothed wheel, I, is thus transmitted to the wheels of the vehicle by means of the shaft, K, and the clutch mechanism or coupling, L, O.

9,982. Gas, Oil, or other Internal Combustion-engines. Howard Lane, 184, Corporation Street, Birmingham. May 11th, 1896.

Consists in the application of a regenerator or heat interceptor within or in continuation of the cylinder of the motor placed in such a way in relation to the piston and the inlet and outlet orifice or orifices that all incoming air or combustible gases must pass in one direction through the regenerator to obtain access to the piston, and after ignition and expansion the products of combustion or the greater portion of same must pass in the reverse direction through the regenerator. The regenerator is constructed of layers of metallic wire gauze or other sheet material or of other permeable and subdivided form of rapid conducting and absorbing power offering a large surface, yet of such a structure that although individual portions of the fabric will quickly receive heat yet they will not readily impart that heat from one portion of the structure to another. Metallic gauze is suitable in that the points of contact formed by the places where the wires cross each other offer very small surfaces of contact between the sheets.

To intercept the heat that would otherwise be lost in the exhaust or discharge of the motor cylinder and by connection through its end, the regenerator in size and shape may coincide with the cross section of the cylinder and cover the end.

15,832. Motors for Road Carriages, &c. William Henry Dugard, Vulcan Mills, Bridge Street West, Birmingham. July 17th, 1896.

The motor consists of a turbine actuated by steam or other fluid pressure, the bucket disc of which turbine is arranged on a vertical spindle or shaft.

The invention also consists of providing the vertical spindle or shaft of the bucket disc with loosely-fitting bearings so as to permit the bucket disc and shaft to partake of a slight radial sliding or lateral motion under the centrifugal force of the rotating bucket disc, the space between the ends of the spindle or shaft and its bearings being occupied by steel springs for limiting and controlling the radial sliding motion or lateral movement of the spindle or shaft; the addition to or combination with the turbine of one, two, or more supplementary nozzles, the communications between which and the steam passage of the turbine are opened and closed by valves controlled by the pressure of the steam; the use of the variable speed belt gear consisting essentially of a series of pairs of pulleys on which loose bands are situated, one or other of the said pairs of pulleys being put into gear by the pressure on the band of a tightening or jockey pulley; and, lastly, of arranging the bottom bearing for the driving pulley shaft in a lever capable of being turned in the direction proper for bringing the periphery or acting surface of one of the driving pulleys in direct contact with the periphery or acting surface of the corresponding pulley on the driven shaft so as to obtain a reverse motion of the said shaft and effect the backing of the vehicle.

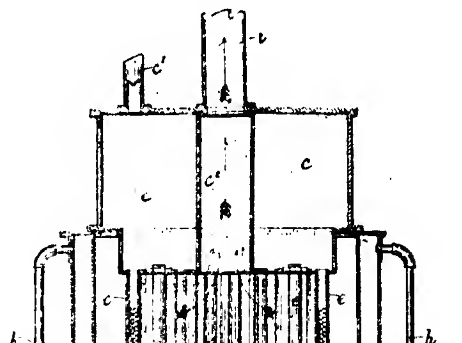
4,284. Cycles and Motor Cars. Laurence Redmond, 126, Sandford Road, Ranelagh, Dublin. February 11th, 1897; Accepted, May 29th, 1897.

This invention relates to improvements in cycles and motor-cars, and has for its object the application of leverage for the purpose of applying pressure to break rods.

It consists of the combination with a preferably curved handle pivoted to transverse handle bar with ball bearing joints or with loose, adjustable, detachable collars, or other joints, which are free to move on said transverse handle bar of a central lever also pivoted to transverse handle bar with ball bearing joints, or with loose, adjustable, detachable collars, or other joints, which are free to move on said transverse handle bar and engaging in said preferably curved handle. The depression of said preferably curved handle causes central lever to be also depressed, the lugs of central lever pressing against vertical piece of an inverted T-shaped crank, thus causing the other arms of said crank to rise and fall respectively, thereby applying pressure to break rods.

11,713. Steam Generators and Furnaces for Road Carriages, &c. Preston Davies, Spencer House, West Hill Road, Southfields, Surrey. May 29th, 1896.

A cylindrical or other casing, *a*, has a second casing or jacket, a^1, at a certain distance therefrom, so as to form an annular space, *b*, wherein is placed the naphtha or other volatile liquid intended for fuel. Upon or at the upper end of this annular casing is fixed a hollow ring, *c*, which communicates with a conical-shaped vessel, *d*, placed centrally and apex downwards, within the space contained by the casing, *a*, and which vessel, *d*, is suspended by and communicates through a set or series of tubes, *e*, *e*, with the above-mentioned hollow ring. The ring, *c*, is intended to form a steam space or dome, the tubes, *e*, and conical vessel, *d*, form the water or liquid space of the boiler, and the space, *f*, contained or enclosed by the annular casing, *a*, forms the furnace or combustion chamber of the generator; c^1 is the steam pipe for conducting the steam from



the steam space or dome, *c*, to the engine or the like; d^1 is a blow-off pipe, fitted with a suitable stop-valve for blowing off sediment or dirt from the conical vessel, *d*. The feed-water or other liquid is preferably introduced into the water or liquid space through one or more tubes, *g*, entering the lower extremities of one or more of the tubes, *e*, and the normal water level in the latter might advantageously be situated at a point about three-quarters of their length, as shown.

To introduce the vaporised liquid fuel into the furnace or combustion chamber, pipes, *h*, lead from near the upper part of the annular casing, a^1, at two or more points opposite each other; their free extremities terminate in nozzles, h^1, so situated as to impel the blow-pipe flames that would result from the burning vapour against the conical-shaped vessel, *d*, after impinging against which they take an upward course, and having passed between and enveloped the tubes, *e*, connecting the said conical vessel with the hollow steam ring or space, *c*, would finally pass away to the uptake, *i*, through the central aperture, c^2, in the said hollow steam ring, *c*.

THE AUTOMOTOR

AND

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A RECORD AND REVIEW OF APPLIED AUTOMATIC LOCOMOTION.

Circulates amongst Makers and Users of Motor-Cars, Cycles, etc., in the United Kingdom, the Colonies and the Continent.

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CONTENTS.

ACCUMULATOR TRACTION ON RAILS AND ORDINARY ROADS.*

WHILE electric traction on the trolley system has proved on the whole an unqualified success, both from a technical and financial point of view, traction by means of accumulators could, until quite recently, only be pronounced a failure, and all that even its most ardent advocates can plead for is the substitution of the term "qualified success." However, at the present time, signs are not wanting that promise at last success for accumulator traction. The progress made in the manufacture of secondary batteries, and the experience gained with regard to the best mode of using them, not only warrant that belief, but, what will no doubt prove more convincing, relatively good results have already been obtained.

It will be remembered that ever since accumulators were produced on a commercial scale attempts were made from time to time to use them for traction purposes, but all these experiments up to a short time since—although frequently hailed with great enthusiasm—only led to disappointment, from a commercial point of view.

An investigation of the causes which militated against success might prove useful, and will show that they may be divided into two classes, viz., inherent defects in the accumulators themselves and mistakes in the mode of their application.

The various difficulties and losses can be obviated by adopting a system which will allow of the batteries being treated as a mechanically and electrically well connected whole, either by being placed in the cars or preferably slung to the frame, or carried on a separate car—apart from the sub-division in groups for coupling in parallel or series during discharge. Where the conditions of working render it desirable, the motor, or motors, could also be fixed in the battery car, which would then assume the character of an electric locomotive; but in any case, whether carried in the car itself or slung to the frame, or carried on separate wheels, the battery should not be sub-divided and handled in the old way, but should always be treated as an indivisible unit. The obvious advantages gained by this method are the absence of lifts or similar contrivances, good connection between cell and cell, no corroding contacts, no loss of current through leakage, less wear and tear of the batteries, and consequently easier management and reduced expenditure. The importance of obviating the exchanging of batteries has been fully recognised on the Continent, and the methods of working in Hanover and Paris offer interesting illustrations of how this object has been attained.

In Hanover, as is well known, a combined system of trolley and accumulators is in use. The batteries are charged from the trolley *en route*, and an additional charge is given to them on their return to the car shed. This installation is on a sufficiently large scale to render the financial results of commercial value, and it is gratifying to see from the official report that the results for the year 1896 were pronounced to be in every respect satisfactory. The cost of maintenance is said to have been accurately ascertained, and found to average per car and month 40*s.*, which, at an average mileage of 90 per car and day, corresponds with ·177*d.* per car mile. The directors anticipate that this cost will be increased somewhat, but they are also confident that it will in no case exceed 60*s.* per car and month (which amounts to ·266*d.* per car mile) even in those years when the quicker deterioration of the plates will occur. It must be understood that the cost of maintenance includes renewals of plates to keep the latter always in good condition, so that the additional depreciation is reduced to a rate not higher than that of the renewal of other parts of the machinery. Based on the actual experience gained, this rate has been fixed at 6 per cent., and with an accumulator car covering between 31,000 and 34,000 miles during the year on this mixed system, accumulator traction incurs an additional expenditure of ·4*d.* per car mile, as compared with the trolley. Taking into account that in the absence of the accumulators the trolley system would have to be installed throughout the whole line

* Excerpt of a paper read by L. EPSTEIN, Esq., M.I.E.E., &c., before the Institution of Electrical Engineers, November 11th, 1897.

at an outlay of £2,000 per mile of track, and further considering the maintenance of the overhead system and the saving in the wear and tear of the trolley, which is, of course, at rest while the accumulators are supplying the current, it is computed that even on the most unfavourable assumption the extra cost of the combined system compared with the overhead system alone does not in Hanover exceed ·2*d*. per car mile.

It may be of interest to mention here that the running expenses of the electrical system, including driver, amounted to 2·22*d*. per car mile.

This system, although so far satisfactory, is open to certain objections, the foremost being the dead-weight of the accumulators carried on the trolley wire section. It might be found more advantageous to place the batteries in a frame slung to the car, or in dummy cars, either of which could be picked up at the end of the trolley section, while the charging of the accumulators could still be effected in the same manner from the trolley wires, the only difference being that the charging would take place at fixed points instead of *en route*.

A different system is employed in Paris, where the Société des Moteurs have installed and are working a line about 12 miles long at the same cost, including depreciation, as horse traction.

Never losing sight of the object in view, viz., to approach in the mode of working as far as possible the overhead or conduit system, the special method to be adopted will depend upon local circumstances. While in one case the batteries may be advantageously carried in or slung to the car, in others it will be found desirable to place them in dummies, which latter might also carry the motors, as an alternative to the motors being fixed in the cars. A dummy with a battery sufficient to propel a 52-passenger car for about eight hours will weigh, complete, about three tons, the dummy itself, with axles and wheels, weighing about three-quarters of a ton. As each ton propelled under normal conditions incurs an expenditure of about ·4*d*., the extra weight of the dummy would increase the expense by about ·3*d*. per car mile. It is, however, obvious that this increase represents only a small fraction of the expenditure which is incurred when the accumulators are handled in the old manner, apart from the saving in wear and tear of the cars and of the batteries.

However excellent the method of using the battery may be, it will avail but little if the battery itself be lacking in the necessary qualities, and it may safely be asserted that the success or failure of accumulator traction will be decided by the merits of the accumulator. In order to lend itself satisfactorily to traction purposes, an accumulator must, in addition to all the good points possessed by a successful lighting cell, present special features of its own. Although lightness may not be the main consideration, yet it is a very important one. Again, the cell must not only be able to withstand jolting without shedding of material and high discharge rates without buckling, but, moreover, it must not decrease in capacity while in use, as this would necessitate alteration in the time-table relating to the charging of the batteries, and interfere with the general arrangement. The battery, furthermore, should not require frequent overhauling, and the repairs should be neither more numerous nor more costly than those of any other part of the machinery. We all know that in the past batteries left very much to be desired. Some of the positive plates deteriorated much sooner than others, and this led first to the practice of replacing them by less damaged plates taken from other cells, and finally to that of converting part of the negative section into positives. After some time the original array had dwindled down to a small fraction, consisting of the least injured remnants, which were occasionally referred to as a proof of the long life of the type they represented. As a battery naturally consists of a large number of cells, and each cell again consists of a large number of plates, the overhauling and repairing proved a very serious item—in fact, in many cases the heaviest item of expenditure.

The nearest approach to an ideal cell for traction purposes will probably be one in which the positives are of the Planté type, with a large extent of surface, the layer of active material relatively thin, but in most intimate contact with the metallic lead out of which it has been formed. As is well known, while the capacity of a plate is determined by the volume of active material, the rate of charge and discharge depends upon its surface, and as it is quite feasible by means of ribs or protusions, without unduly interfering with the mechanical strength of the plate, to extend its area to about 10 times that of the plain surface, it follows that the current densities obtainable will be increased in the same ratio. It is further essential that the acid should have free access to all parts of the active material, and such is naturally much more the case with a Planté plate, offering a largely extended surface with a thin coating of peroxide than it would be in a plate with a plain surface, where the active material forms a relatively thick layer. Not only is the contact between active and conductive parts less perfect in the pasted plate, but in addition thereto, as the acid in the pores of the active part is liable to become exhausted, especially with heavy discharge currents, while the interstices are too narrow to allow of a quick diffusion of the electrolyte, the electric action may be seriously interfered with, although there may still be a sufficient quantity of undischarged active material.

As regards good negative electrodes, positives of the above description, after having been reduced, may be employed with advantage, or lead oxides or salts may be used, as the finely reduced lead is a much better conductor than peroxide of lead; but care should be taken to secure the best possible contact between such material and its support, and so to select the materials intended to become active that they will, after full formation, produce a layer of the highest possible porosity consistent with mechanical coherence.

It has been found by experiment that the exhaustion of a positive plate or section of a cell effects a gradual falling in the E.M.F., while as soon as the negative electrode is exhausted the E.M.F. falls very rapidly. For this reason, and as it is obviously advantageous to have as little variation in the E.M.F. of the battery as possible, I would suggest, for traction purposes, to use negative sections of higher capacity than that of the corresponding positive sections.

In the interest of economy, the formerly much-recommended overcharging must not be too freely indulged in. Such overcharging can easily be guarded against by using recording instruments, or by other suitable means, while when charging at constant potential the battery will itself guard against over-feeding by effectively opposing, at the proper time, the charging current. The recommendation to overcharge the cells *occasionally* may, however, be followed with advantage, the beneficial result consisting not so much as was formerly supposed in the actual improvement of the electrodes, but in the thorough mixing of the electrolyte, which is liable to vary in S.G., being densest at the bottom of the cell and decreasing towards the surface, thus leading to unequal action in different parts of the plate. Another device for equalising the action over the whole surface consists in making the electrodes taper towards the bottom, with the object of compensating for the higher density and better conductivity of the electrolyte there by increasing the distance between electrodes of opposite polarity.

We are now, however, confronted with the all-important question of the cost of depreciation of the batteries. If we consider a battery in a car for 52 passengers with an average running weight of about 12 tons and an average mileage of 100 per day, equal to 1,200 ton miles per day, we find that at the rate of 80 watt-hours per ton mile the daily electrical expenditure is 96 units, or, if working at 400 volts, 240 ampère hours. It is, of course, immaterial for our calculation what the voltage is, as the cost of renewal of either a small number of large electrodes or a larger number of small electrodes will be practically the same for the watt-hour capacity. The cost of renewing the positive section of a cell of such capacity should not exceed, including manufacturer's profits, 10*s*., and, assuming two discharges or their equivalent a day, we may reasonably expect a useful lifetime extending over 1,500 discharges. The battery doing work, therefore, during 750 days and covering 75,000 car miles, the cost of renewing the positive sections in 220 cells will amount to £110 or ·35*d*. per car mile. That this estimate errs on the safe side is borne out by the experience gained in Hanover, although it seems that the batteries used there are of greater weight than is necessary.

Given a good battery and having adopted a system best suited to the conditions of a given line, and in any case obviating the necessity for handling the batteries, we should arrive at a working cost approximately the same as on the trolley system—the extra expenditure caused by the greater weight of the self-contained car being balanced, as is shown in Hanover, by corresponding advantages gained.

While on tram-lines accumulator traction must prove its superiority over rival systems in order to be adopted, there is another large field in which the use of batteries is a matter of necessity. I refer, of course, to traction on ordinary roads.

The tractive force on ordinary roads is naturally subject to much greater variations than that on rails. I think, however, that on good roads paved with asphalte or wood and in fairly good condition, the tractive force of vehicles as hitherto built should, on the level, not exceed 60 lbs. The weight of an electrical vehicle to carry from two to four passengers, with motor and battery complete, will be about 30 cwt., which includes a battery with a weight of 9 cwt. A battery of such weight ought to be sufficient to supply current for a four or five hours' run, at an average speed of eight miles on the level and four miles up a gradient of 1 in 24. The power on the driving axle will be about 2 effective H.P. in the former case, and about 3 effective H.P. in the latter; and, assuming a combined efficiency of motor and gearing of 65 per cent, the battery will have to furnish discharges at the rate of 2,208 watts and 2,812 watts respectively.

With a battery efficiency of 70 per cent., the charge to supply one hour's actual run requires about three units, which, at an estimated cost of 2*d.* per unit (a sum that should certainly not be exceeded, whether the current be generated at the Company's own stations, or taken from a public supply), corresponds with a cost of ¾*d.* per mile. It may therefore be anticipated that electric carriages plying for public hire should be able successfully to compete with horse-drawn vehicles for a similar purpose, provided that the wear and tear of the accumulators is not excessive. The favourable financial results would not be impaired even if the cost of maintaining the accumulators should exceed the rate of 10 per cent. per year, said to be quoted by some manufacturers. The time during which such accumulators have been at work is probably too short to prove whether the batteries can be maintained at such a remarkably low rate.

Reliability of the battery, obviating the necessity for frequent examinations and tests, and for remedying partial defects, is again of much higher importance than—within reasonable limits—the lifetime of the whole battery, as will become evident from the following consideration. Assuming the average mileage made with one charge to be 40, and estimating the cost of renewing the positive section at 10*s.* per cell, or £20 per battery of 40 cells, the cost of renewal per mile would be as follows:—

If renewed in 8 months = 240 days, after 9,600 miles, ·5*d.* per cab mile.
If renewed in 12 months = 360 days, after 14,400 miles, ·33*d.* per cab mile.
If renewed in 16 months = 480 days, after 19,200 miles, ·25*d.* per cab mile.
If renewed in 24 months = 720 days, after 28,800 miles, ·166*d.* per cab mile.

If the average cost of a battery be £60, and if it should become necessary to renew all the positive sections—even after as short a time as 12 months after having run 14,400 miles—it is true that the cost of renewals (£20) will equal 33 1-3 per cent. of the first cost, but this only equals one-third of a penny per cab mile. On the other hand, even with batteries having a longer life but necessitating supervision and slight repairs, the wages incurred and the cost of material would, judging from the experience gained in tramway work, certainly amount to a much larger sum than the cost incurred in renewing the positive sections, even in a comparatively short time. Besides, in such cases more sets of batteries per car would become necessary, increasing not only the first outlay but the charge for interest and depreciation, and thus considerably swelling the total cost.

Lightness of batteries for ordinary roads is of much more importance than it is on tram lines, not only on account of the heavier energy expenditure which is necessary to propel a given weight, but the more so as the battery will represent a larger portion of the total weight of the vehicle as compared with tramcars. In large towns it would be an advantage to use batteries which are interchangeable, and to make arrangements with public supply companies to charge the batteries and always keep a number ready for use.

Worm Gearing.—There seems some prospect of worm gearing coming into favour again where a large reduction ratio is needed. Such gears have the advantage of being comparatively noiseless, but have, in the past, had an evil reputation, says *Engineering*, for excessive frictional loss. More recent work with accurately-made wheels has shown that this loss need not necessarily be very large. Professor Stodola, of Zurich, has obtained an efficiency of 87 per cent. when using worm gearing to transmit 21 H.P., the worm running at 1,500 revs. per minute. This worm was 3·15 inches in diameter, the pitch being 3·2 inches, and the wheel, which was of gun-metal, had 28 teeth. Similarly, Mr. E. Kolben has also obtained excellent results with worm gearing; whilst in America the Sprague Company, using the Hindley form of worm, have, it is stated, got remarkably high efficiencies with this class of gearing, which they use for electric lifts.

THE AUTOMOBILE CLUB.

This club, founded by Mr. F. Simms and other gentlemen, was formally opened on the 8th inst. by Mr. R. Wallace, Q.C. It is unnecessary to say anything as to the necessity of establishing an influential Automobile Club, as this is self-evident. The new club has secured very handsome and commodious premises at Whitehall Court, overlooking the Embankment Gardens. These premises, which consist of six rooms on the ground floor, appear admirably suited to the requirements of a club of this kind, inasmuch as in addition to being most centrally situated, they are exceptionally suited for the approach of motor carriages, from the fact that they are surrounded by roads which are practically free from ordinary traffic.

The opening of the club was made the occasion for a reception by the chairman, Mr. R. Wallace, Q.C., who in the course of an able and eloquent speech put forward the objects and aims of the club, which, judging from the enthusiasm and spirit with which its birth was acclaimed, bids fair to become a great success.

The chairman announced that the organising committee had already received about 200 applications, amongst which he noticed the names of the Earl of Shrewsbury and Talbot, the Lord Suffield, Sir Douglas Galton. Professor Kennedy, James Swinburne, Esq., Sir Bernard Samuelson, K.C.B., A. J. Walter, Esq., J. C. Graham, Esq., Captain Ironside Bax, W. Worby Beaumont, Esq., Earl of Carnarvon, the Earl of Galloway, General Sir Arthur Ellis, K.C.M.G., Sir William Neville Abdy, Bart., Sir Trevor Wheler, Sir George Thomas, Bart., Major-General England, Major-General Montgomery, the Hon. Evelyn H. Ellis, the Hon. Reginald Brougham, the Hon. F. St. John, the Hon. Captain J. H. Berkeley, the Hon. Cecil Duncombe, the Hon. C. S. Rolls, Colonel Magrath, Colonel Lee, Captain Cragg. Captain George D. Sampson, Lieut.-Colonel Wheler, Major Wheler, W. H. Preece, Esq., C.B., H. E. Sherwin Holt, Esq., Paris Eugene Singer, Esq., John Henry Knight, Esq., Frederick R. Simms, Esq., Hiram S. Maxim, Esq., George Edwardes, Esq., Herr Gottlieb Daimler, Jesse Ellis, Esq., Walter Arnold, Esq., Arthur Paget, Esq., the Rev. E. S. Lawrence, Dr. Leadam, Dr. Hutchinson, Dr. Shelly, &c., &c.

It will thus be seen that the club does not lack influential support

The solicitor, Mr. John B. Purchase, having reported about the registration and legal matters as to the constitution of the club, the secretary *pro tem.*, Mr. C. Harrington Moore, submitted the rules for adoption and confirmation on the meeting, which were unanimously carried. A discussion on the club's programme for 1898 followed, in which some excellent suggestions as to lectures, &c., during the present season, as well as competitions, prizes for designs, &c., tours for members, the erection of signposts on highways, and other matters were put forward.

Just before the close of the meeting Colonel Lee proposed a vote of thanks to Mr. Frederick R. Simms, on whose initiative the club was formed, and who had in such a spirited manner taken upon himself to guarantee the first year's expenses of the club to a considerable amount, and had taken such a prominent part in the organisation of the club, and devoted so much time to the same.

Mr. Simms replied, and said he could not take all the praise so kindly given him, because he certainly thought a large amount of the credit belonged to Mr. C. Harrington Moore, secretary *pro tem.*, who had worked so indefatigably and assisted him in such a very able manner.

The chairman then formally declared the premises open for the use of members, and a hearty vote of thanks was accorded him for having presided at the meeting. The meeting was followed by a display of motor carriages, arranged for members and their friends. This started at Whitehall Court and was confined to the Embankment. All the general arrangements made by the club committee worked admirably.

The Motor-Car Club Meet.—The second annual meet of this club took place on Monday, November 29th. About 39 automotor vehicles put in an appearance as against more than 100 which had been expected. The Hôtel Métropole was the rendezvous, and Sheen House, Richmond, the objective. As for the vehicles themselves there was little that called for remark; most of them had Daimler motors. There was an "Arnold-Benz," a "Headland," four electric cabs, a couple of Bollée voiturettes, and a De Dion tricycle, and a few other makes. Nothing in the shape of novelty was shown, and beyond the fact that the only progress made since last year was an improvement in details there was little to note.

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THE IDEAL TRACTION CELL.

In commenting upon Mr. L. Epstein's paper read recently at the Institution of Electrical Engineers, an excerpt of which will be found in our present issue, the *Electrical Review*, in a leading article, says:—"Mr. Epstein's ideal cell for traction purposes is not exactly what we look forward to. We quite agree that such a cell must be able to withstand jolting without shedding and high discharge rates without buckling, and that, moreover, it must not decrease in capacity while in use; but our ideal cell is very much lighter than anything Mr. Epstein has in view. No positive plate will, in fact, come up to our ideal until local action between the active material and its support has been so far obviated or reduced as to allow of this support being of no greater weight than that requisite for conduction, whilst at the same time its permanency is greatly increased. These may be hard conditions, but we believe that they are attainable. In regard to the negative element, there appear to be no great difficulties to overcome; but we do not agree with Mr. Epstein that a reduced Planté positive is the best that can be provided. The positive element tends always to increase in capacity; the proposed negative, initially of comparatively low capacity, would tend always to decrease in this direction. It seems obviously desirable—as, indeed, Mr. Epstein himself elsewhere points out—that the capacity of the negative element should initially be considerably greater than that of the positive element, so that at no time it should fall below it."

The American Society of Mechanical Engineers.—We have received copies in advance of the papers read last week in New York. Many of these papers, although not of immediate interest to automobilists, are of high scientific and technical value to engineers, and we hope to give some excerpts from them.

The London Electric Cab Cells.—According to a statement made recently by Mr. Manville at the Institution of Electrical Engineers, it appears that the cabs carry 40 cells, and the current on level wood pavement was 30 ampères with 80 volts pressure, and this increased up to 40 or 45 ampères on rough roads. He had seen the ammeter point to 120 on the Savoy Hill.

THE COULTHARD STEAM WAGON.

Messrs. Coulthard and Co., of Preston, have been working on the heavy steam wagon question for some time, and have succeeded in building a vehicle which is characterised by many good features, and which is likely to be largely used for heavy van traffic. As will be seen from the accompanying illustration, the driving-wheels are carried in horn plates—the only proper method in our opinion; and are, moreover, placed in the rear; the fore-wheels are also carried in a very strong frame, and this enables the severe lateral stresses to be withstood. There are two independent brakes which give full control over the vehicle when descending gradients. The motive power is supplied by an oil-fuel tubular boiler placed on the fore part, the oil used being ordinary burning oil or paraffin. This wagon can carry with ease a load of two tons on any ordinary country road, and where the roads are good and the gradient not steep, as much as three tons can be carried. It will thus be seen that for cities such as London this wagon could be most usefully and economically employed. The speed is from 4 to $4\frac{1}{2}$ miles per hour loaded, and from six to seven light. Owing to the excellent reversing and steering gear the wagon can be manœuvred much easier than any horse-van. Messrs. Coulthard also make steam tipping carts and lorries.

The Coulthard Steam Wagon.

Messrs. Peek, Frean, and Co. Adopt Motor-Vans.—Messrs. Roots and Venables, of 100, Westminster Bridge Road, S.E., have obtained an order from Messrs. Peek, Frean, and Co., biscuit manufacturers, London, for an oil motor-van to carry one ton. The van is required for the delivery of biscuits. Great competition took place among motor makers for this order, as it is understood that if the first van gives satisfaction to Messrs. Peek, Frean, and Co., further orders are to follow; and as this firm uses 170 vans for the delivery of their goods, the order is worth having. We understand that the benzoline spirit vehicles, including the Daimler and Anglo-French, and the known steam vans of this country were among the competitors, and that Messrs. Peek, Frean, and Co.'s representative tested them. The order, upon somewhat stringent conditions, has been given to Messrs. Roots and Venables chiefly owing to the fact that they make a practicable oil motor using heavy oil. Messrs. Peek, Frean, and Co. considered that safety of working and running was the essential condition, and this they thought could not be obtained with a benzoline spirit motor.

TRACTION ENGINE BY MESSRS. CLAYTON AND SHUTTLEWORTH.

Messrs. Clayton and Shuttleworth commenced the manufacture of traction engines about 40 years ago, and, although many different forms of road engines have been invented since that date, the principle introduced by them has continued in practical use.

In Clayton and Shuttleworth's early traction engines the cylinder was placed at the smoke-box end of the boiler, while the crank-shaft was at the fire-box end of the engine. The power was transmitted from the crank-shaft to the main axle by spur gearing. When the Stamp End firm were making traction engines on the above lines, the other firms engaged in this branch of engineering were using pitch-driving chains, and in most cases the engines were arranged the opposite way about—viz., like the portable engines of the day, the cylinder was placed on the raised fire-box shell, and the crank-shaft at the smoke-box end of the boiler; a long driving chain transmitted the power from the crank-shaft to the main axle or the driving wheels. The driving-chains were retained till about 1871, when spur gearing was introduced by some other firms; while Clayton and Shuttleworth had been using spur gearing since 1860.

Messrs. Clayton and Shuttleworth have introduced a new design of traction engine, which we illustrate herewith, in which are embodied every modern device for obtaining the best results. The engine is distinguished for great strength in all the parts subject to strain, the most excellent workmanship, and the highest economy in fuel and repairs. The boiler is constructed throughout of steel, and stayed in a similar manner to the best railway locomotives. It is of ample capacity, and of extra strength for working safely at 140 lbs. per square inch. The top of the fire-box is not strengthened by the ordinary heavy and faulty roofing bars, but is stayed directly to the arch-plate in an efficient manner, thus enabling the fire-box top to be kept free from scale and sediment. The smoke-box is constructed independently of the barrel-plate, so that it can be easily renewed when corroded, without having to cut out the tube-plate.

The cylinder is efficiently steam jacketed, the jacket space forms a dry steam receiver, the circulation of the steam is secured in the jacket by the working steam from the top rushing into the stop-valve, which is placed at the highest point.

All tendency to prime is removed by the manner in which the steam is conducted into the cylinder, coupled with the internal arrangement of the cylinder and the proportions of the boiler. Dry working is obtained under the heaviest loads at all speeds. The flange of the cylinder is extended beyond the ends of the cylinder so as to increase the bearing surface on the boiler barrel. There is no steam joint under the cylinder, yet it is bedded most accurately to the boiler plate and held down by cone-headed bolts. Great attention has been given to the areas of the ports and passages in the cylinder in order to procure satisfactory working under the most trying conditions.

The governor is of the high-speed, spring-weighted, cross-armed type connected to an equilibrium throttle-valve of large area. The valve gear has been most carefully proportioned, the link motion details have large wearing surfaces which are deeply case-hardened. All the bearing brackets for the crank-shaft, countershafts and axle are of great strength; they are each fitted into bored holes in the sides of the firebox shell, which are carried upward and backward for the purpose. Transverse plates, riveted to the boiler shell, connect the side plates together. The gearing used throughout the engine is of best cast steel, the first motion wheels are placed inside the box brackets between the bearings. The fast and slow speed wheels are cast together, and slide in and out of gear on a square shaft, the use of feather keys let into the shaft or keys cut out of the solid material are discarded. A square shaft is a far more satisfactory arrangement.

Strong section steel tee rings are used for the driving and leading wheels. A slip winding drum and 50 yards of strong steel wire rope are provided. A case-hardened ball-and-socket joint on the fore-axle reduces the friction to a minimum, and enables the steering to be effected with facility and certainty. The steerage hand-wheel is placed on the fly-wheel side of the engine, the steersman can see clearly to sight the fly-wheel in line with the pulley of the machine to be driven. It is also the most convenient for steering close to the edge of the road so as to give as much room as possible to passing vehicles.

A continuous action feed-pump is used, the valve boxes, valves, and bonnets are of gunmetal, the passages and pipes are proportioned so as to reduce noise.

The tender has a large storage capacity for coal and water. The sides of the tender are connected to the horn-plates by turned bolts in rimered holes, independently of those which keep the brackets in place. A channel iron drawbar extends across the back of the tender, to which deep straps are welded on each side; by this means the hauling strains are transmitted to the strong horn-plates, and no pull passes through the plates of the tender or tank. A series of holes is provided in the drawbar, so that the draft pins may be moved out of the centre of the bar for turning sharp corners with a long train behind.

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Sliding fire-doors are fitted, as they take up no room in the tender. A deflector plate is provided so as to conform with the Act of Parliament, as far as possible, in having provision for consuming the smoke.

The workmanship throughout is faultless. All the bolts are turned and driven into rimered holes with heavy hand-hammers. No black bolts are used. The machine work and the fitting will bear the strictest investigation. No expense has been spared to produce a perfectly satisfactory engine in every way.

THE DESIGN OF AUTOMOTOR VEHICLE ENGINES.

Writing in the *Engineering Magazine*, Mr. Worby Beaumont says:—During the coming year there will be great activity in connection with the endeavour to make a satisfactory motor-wagon for carrying from two to five tons. For the purposes of an example, let us look at the problem from the steam power point of view. The first requirement is an engine which must be exceedingly economical, if possible more economical of the steam supplied to it than any engine of any kind yet made. Yet the engine must be smaller than any economical engines yet made, and this involves a disregard of adverse experience to the present time as to economy and small engines. Of all the highly efficient engines yet made there is not one suited to the purpose. They have too many parts, and are far too complicated when fitted with reversing gear. They must be most economical when giving out the maximum power, which may not be more than, at the most, 15 minutes at a time, and not one-fifth or, may be in some countries, one-tenth of the whole time of running. Economy at maximum load must be attended with almost equally low consumption at mean load, if not at light load, and the difference between full load and light load cannot be economically effected by throttle valve governing. It is not necessary that the steam consumption shall be equally low for both directions of running, running backwards seldom lasting more than a very small fraction of the forward running time. The reversing arrangement must not, moreover, introduce a form of valve gear which is less efficient than the best possible.

The engine must be capable of running many hours at high speed under the worst conditions as to stresses other than those which necessarily attach to its performance of work, and yet must be very economical at the lower, perhaps half, speed of the periods when it is doing its utmost. With all these essentials the engine itself must be very simple, even if it have not the minimum number of parts, and its manipulation must be of the simplest kind, one lever or handle only, if possible, in addition to a stop valve. Just as a higher type of engine reliable for long periods of running has been developed for electric lighting, so must an engine be evolved which, while answering all the requirements above set forth, will be so trustworthy that the driver of the motor-vehicle may be able to disregard its existence. For many minutes at a time he must be as free to forget that his manipulation of steering and regulating levers depends upon an engine somewhere hidden in his car, as a horse-driver is to forget that obedience to his pull of the reins depends on the heart stowed away inside the horse. The necessity for economy is not, however, primarily the reduction of the cost of fuel to the lowest limit as it is with the electric-lighting engine.

The first necessity in a road-vehicle engine is economy in steam rather than in fuel. In fact, the cost of fuel, even with engines and boilers at present readily available, is no bar to progress in the construction of acceptable motor-vehicles. With a boiler which only generates six or seven pounds of steam per pound of, say, coke, the weight of fuel to be carried per mile would be small with a good engine. It is because the boiler must be of very small dimensions per horse power and because the condenser must be small that the quantity of steam to be generated and subsequently liquefied must be lower than with any small engines yet made. In order to avoid carrying more than a minimum of feed water and of cooling water, the condenser should be capable of liquefying all the steam exhausted when the engine is working its hardest with a full load up a long stiff hill. This maximum capacity of the condenser which must be provided, and its weight, size, and the weight of water to be carried for its use, all alike depend on the efficiency of the engine.

LES POIDS LOURDS.

Report of the Commission.

The following is an excerpt from the paper on this subject read by M. Jentaud before the French Society of Civil Engineers:—

It will be remembered that out of the 15 vehicles entered only 10 were ready to take part in the competition, and that out of these 10 there were three which were prevented by accidents on the way from doing the whole of the stated course. The Commission thinks it best not to give the names of their constructors in the report.

This report is divided into three parts: the general considerations, the account given by the judges of the competition, and the results.

General Considerations.

At the present time in every department the representatives of the people are frightened at the heavy burdens which must be imposed for many years on the budgets of the departments, as well as of the State, by the railways and tramways already made, and those about to be made. However, it is no use refusing to complete the links of our iron roads by a network of lines connecting the various stations.

Struck by the results of the Paris-Bordeaux and Paris-Marseilles lines, the general Councils, as well as the people, hope that automobilism will give them an easy solution of the problem.

This is an interesting question, not only for omnibus companies but also for the War Administration.

Classification of Vehicles.—The Commission established the following classification:—

I.—*Public Transport for Passengers.*

(1) Automotor Vehicles (Steam).

(No. 2.) Scotte omnibus.
(No. 14.) Omnibus by Dion and Bouton.

(Petrol.)

(No. 10.) Panhard and Levassor omnibus.

(2) Vehicles by Bogie Motor.

(No. 13.) Pauline by Dion and Bouton (steam).

(3) Automotor Vehicles Towing Others.

(No. 3.) The Scotte train for passengers (steam).

II.—*Transport for Merchandise.*

(1) Automotor Vehicles.

(No. 8.) Camion by Dietrich & Co (petrol).

(2) Automotor Vehicles Towing Others.

(No. 2.) Scotte train for merchandise (steam).

From this it will be seen that carriages for parcels delivery did not run in the competition. By the professional man it will be seen that a passengers' vehicle could easily be turned into a delivery carriage without having to alter the motor and its transmissions. The Commission regret a scruple, mentioned in the programme, hindered a commercial carriage from taking part in the competition. The interest with which the public attends at the Place d'Armes de Versailles, to follow the evolutions of a carriage from the Grands Magazins du Louvre, which is its regular route every day, makes it to be wished that, in the approaching year, those vehicles will enter for the competition.

Before discussing the merits and the statements made by the Commissioners relative to each vehicle and the cost per ton-kilometre or passenger-kilometre, it is necessary to explain the method of calculation adopted.

From the kilometric statements of the Commissioners we have deduced the average commercial speed, that is to say, that which corresponds to the different capabilities of the vehicle. This average speed corresponds to the number of kilometres capable of being run in a journey of 10 hours, for example. The total weight circulating on every journey, multiplied by the length of the way, gives the number of ton-kilometre which, compared with the total consumption of coke and water, determines the weight of the fuel and the volume of water necessary for the transport of a kilometric ton.

This obtained, in order to obtain the cost it is necessary to add to the outlay for fuel that resulting from the personal expenses, interest, the redeeming of the capital, the cost of maintenance, as well as the cost of repair of the vehicle.

Determinations of the Commercial Speed.—This is the quotient of the number of kilometres gone over by the time taken. From the total time the following must be deducted:—

1. Stoppage at different places for fuel, &c.
2. Stoppage at stations for loading and unloading.
3. Accidents on the way.

Calculation of the Work Done.—The work has been calculated in kilometric tons, by multiplying the average weight expressed in tons by the distance really run, taking into account accidents on the way. The average weight is that of the vehicle carrying half its load.

In dividing the quantity of fuel consumed in six days by the sum of the kilometric tons for six journeys, the average consumption of fuel necessary for a kilometric ton is obtained. An analogous calculation gives the average consumption of water. The consumption of fuel and water necessary for the transport of a kilometric ton of luggage, or for a passenger kilometre, is easily obtained.

Calculation of the Cost.—The expenses must be divided into two groups:—

(1) Those scarcely varying with the greater or lesser use of material, such as the redeeming of the capital, personal salary, fuel for lighting, greasing, and general expenses.

In this category, for one cent. of the capital the cost of repair and maintenance of the material, as well as the special expenses, may be regarded as a fraction of the intensity of the traffic.

(2) Others essentially variable, and dependent on the work effected, are the consumption of fuel and water.

In order to estimate them, after having determined, by right of its commercial average speed, the number of kilometres that the vehicle can run in a journey (of 10 hours), we have calculated how many kilometric tons, corresponding to the following conditions—

(*a*) The vehicle was worked at one-third loaded;
(*b*) The vehicle was worked at two-thirds loaded;
(*c*) The vehicle was fully loaded.

In applying to each of these numbers the coefficients for consumption as it has been stated above, we obtain the necessary quantities of fuel and water; then, applying to the proper costs, the corresponding expenses. To these are added the fixed expenses, being given the total expenses for the day's work.

Lastly, in dividing the total expenses by the number of corresponding kilometric tons, we obtain the price of transport for the kilometric ton, and of the transport of one kilometre for a passenger with or without luggage.

It is necessary to remark that all our calculations and estimations only apply to those vehicles placed in working conditions identical to those which we found during the competition.

(*To be continued.*)

MESSRS. JESSE ELLIS & CO.'S AUTOMOTOR.

We are indebted to the *South Eastern Gazette* for many of the following particulars:—

This vehicle, which Messrs. Jesse Ellis and Co., agricultural engineers, of Maidstone, have just completed, is designed for the expeditious transport of produce by road, and to judge from a series of trials that took place on the London Road, near Maidstone, recently, it is admirably suited for the purpose. This motor-wagon is one that has been specially manufactured for South Africa, and is considerably heavier than those to be constructed for this country. It weighs about five tons, and is of 25 I.H.P. Its form is not unlike that of a street ambulance, the machinery being in the rear. Oil is used, and a journey of some 50 miles or so can be covered before this needs replenishing. The speed varies from three to six or seven miles, the latter being easily attained on ordinary roads. The carrying capacity is about five to six tons. The wagon was entirely under control, easily manipulated, could be steered to a nicety, and started or stopped instantly.

THE GULZOW-FIEDLER ACCUMULATOR.

A secondary cell for which very high efficiency, small weight, and great durability are claimed is the Gulzow-Fiedler, which is being introduced by a company bearing that name and whose offices are at 199, Drummond Street, London, N.W. Much has been attempted in the direction of improving secondary cells in recent years, but the actual progress made has not been very great. Owing, however, to the rapid extension of electric lighting and the large field for electricity as a propelling agent in vehicles and boats, inventors have every inducement to produce a cell which shall combine large capacity with durability and small weight. The problem is admittedly a difficult one, as mechanical considerations have to be governed by chemical ones. It would seem, however, that a considerable advance has been made by the Gulzow-Fiedler Company, and if their cell stands the tests which we are informed are being made there will be a large demand for it, especially for use in motor-vehicles. The cell in question has, it is claimed, not a few important electrical advantages over existing ones. For instance, the charging and discharge can be either slow or rapid as may be desired, and a very rapid discharge does not induce disintegration or buckling; on the contrary, rapid discharging positively improves the plates, and we understand that they actually become denser and more perfect the longer they are used. The plates are formed of a hard lead and are shaped not unlike a warehouse window, but in the rectangular spaces or windows a salmon-coloured composition is forced while in a soft state, but on drying this paste becomes hard and seems to form a kind of stone. Its manufacture is a secret process, but we should say that chromium oxide is, at any rate, one of its ingredients. Mechanically, these plates are very perfect. They can be thrown about or dropped without producing any sign of breakage. After charging, the paste turns quite black and apparently becomes denser, resembling retort carbon. We failed to break a plate which had been used in a cell for some time. Dilute sulphuric acid is the electrolyte. When new the plates require about 30 hours while being formed; after that they can be charged in 10 hours with a current of 1 ampère or in 1 hour with 12 ampères. They can be discharged at any rate up to 12 ampères per square decimetre. Short circuiting does not adversely affect the cells, and there is no rise in temperature of the electrolyte while charging.

The following are the leading particulars of the Gulzow-Fiedler cell:—

Number of plates, 13.
Dimensions of cell, 124 mm. × 165 mm. × 305 mm.
Weight of cell, 28 lbs.
Weight of acid. 6 lbs.
Specific gravity of electrolyte, 1·15.
Maximum charge, 60 ampères.
Maximum discharge for 5 hours, 50 ampères.
Maximum discharge for 8 hours, 35 ampères.

The weight per kilowatt-hour is about 70 lbs., which is certainly a low figure.

Cost of Locomotion in Paris.—In connection with the electric cabs in Paris, the following costs of various methods of locomotion made by the Compagnie Générale are instructive:—

Horse cab, 15 francs 44 cents. per day.
Petrol cab, 13 francs 20 cents. per day.
Electric cab (Kriéger's) 8 francs 13 cents. per day.

There is an economy of 47 per cent. over the horse and 32 per cent. over the oil motor.

Talcine.—We have received from the Dynamo Brush Company, of Finsbury Pavement, London, a sample of a lubricant called *Talcine.* On examination this seems to us to be a compound of ground mica and astaki. It is unquestionably a good lubricant; it is intended for dynamos and motors, and should be invaluable to users of electric motor-vehicles, as in these the motor is apt to get dirty and spark a good deal. The practice of putting oil in the commutator is very detrimental, yet the continual rubbing between two dry metallic surfaces necessitates the use of some suitable preparation such as Talcine; by its use the friction of the brushes is allayed, the efficiency of the machine is increased, sparking stopped, and the commutator assumes the dark burnished skin indicative of careful running. This compound does not deteriorate by clogging the brushes, carbonising, &c.

NAUTICAL AUTOMOBILISM.

"The Nymph."

If the reader can imagine an ordinary river wherry carrying a number of cells under the thwarts and being connected by a short length of pipe to the stern of a small floating body shaped above the waterline like a swan and carrying within it a small electro-motor, the whole thing reminding one of the swan scene in "Lohengrin," he will have a very good idea of the craft on board of which a representative of the Automotor recently had a trial trip at Reading. Although called an "invention" it really is nothing more than a tug attached to a larger craft by a rigid connection. At the same time, for picnic and other pleasure purposes, the idea underlying "The Nymph" design has a good deal to recommend it. Regarded in this light there is undoubtedly a good deal in it. Of course from the naval architect's and shipmaster's point of view it leaves much to be desired. There is nothing that calls for remark in the arrangement of the machinery. The cells are arranged in sections, and by means of a simple switch can be coupled up in certain combinations so as to give full or half-speed ahead or astern, the current going by leads to the motor contained in the body of bird or other fanciful form, such as a mermaid or dolphin, that may be attached to the bow. The motor drives a small two-bladed propeller having stepped blades. As might be expected, there is considerable wave-making disturbance set up, and there is a considerable loss of power. In fact, except for pleasure purposes, the system has no advantage. Steering is effected by reins attached to a bit held in the mouth of the swan; this bit, by simple mechanism, actuates two wire tiller ropes which lead aft to the rudder at the stern of the towed vessel. No doubt a number of these fanciful and strange craft will be seen on the upper reaches of the Thames next summer. It is a curious point with us whether this vessel, really two vessels, is to be considered as one or two vessels. If the latter, then the regulations of the Rule of the Road at sea apply, and the swan or dolphin will have to carry side-lights and a masthead light, and these would have to be attached to the beak and wings respectively. The novel craft is to be seen at Bona's Yard, at Reading.

38-knot Torpedo Boats.

Orders have been placed by the Russian Admiralty with the firm of Hawthorn, Leslie, and Co., of Hebburn-on-Tyne, for two 38-knot torpedo-boats with turbine motors, on the principle invented by the Hon. Charles Parsons, and carried out in his vessel the "Turbinia." Each torpedo-boat will be propelled by 12 screws, three on a shaft. They will be the fastest boats in the world.

Those who were present at the Jubilee Naval Review at Spithead will, says the *Pall Mall Gazette*, remember the mild excitement caused by the appearance of the "Turbinia" amid the fleet. It dashed down the lines and round the great assemblage of warships at phenomenal speed, taking special delight in outpacing that sturdy old stayer, the "Victoria and Albert," from the bridge of which the Prince of Wales watched its antics. Before the review the "Turbinia" made a passage from Cowes to Portsmouth at an estimated speed of 32 knots, and at its trials on the Tyne maintained 32¾ knots. It is lightly constructed as a torpedo-boat, 100 feet in length, and depends for its surprising agility on a new steam turbine—an adaptation of the principle of the water-turbine—attached to each of its three shafts. Each shaft carries three screws, so, in all, the vessel has nine screws to propel it.

[We described this vessel in our last issue.—Ed.]

Explosion of a Boiler.

The following is an excerpt from the official report of the inquiry held under the Boiler Explosions Acts as to the cause of an explosion of a boiler which occurred on board the steamship "Contest" on July 25th, when the vessel was off the Mumbles Head:—

The "Contest" is a screw tug boat of 82 tons gross register tonnage, and is propelled by engines of 50 H.P. The vessel was built in 1883, and last year was bought by the present owners, Messrs. Wedlake, Towers, and Co., Swansea, who have employed her for general towing purposes in the Bristol Channel. The engineer stated that, in accordance with the owners' instructions, it was his practice to examine the boiler both internally and externally every three months. His last examination was made on May 2nd last, when a slight leakage was observed from the overall patch at the bottom of the boiler, which he did not deem of sufficient importance to report to the boiler maker. At 11 a.m. on July 24th last, the vessel left Swansea, "seeking." The following day, at about 9.30 a.m., the engineer was on watch and heard a report, which he described as being like that caused by a gauge glass breaking. On examination, steam was found to be issuing from the bottom of the boiler, and as the supplementary feed and the donkey pump failed to maintain the proper water level, the fires were drawn and the vessel brought to anchor in Swansea Bay. It was then found that a rivet had been blown out at the patch already referred to. The steam gauge at the time of the explosion indicated about 75 lbs. per square inch. The vessel was eventually towed to Swansea, where repairs were effected.

The boiler is of the ordinary cylindrical single-ended marine type, with two plain furnaces. The usual mountings are fitted and the safety valves are loaded to a pressure of 80 lbs. per square inch. The Certificate of Registry of the vessel shows that she was built and engined in Hull by Mr. E. Wailes, in 1883, but no particulars of the boiler are given. Several repairs have been effected during the last three years.

The "Contest" is insured with the United Kingdom Steam Tug Trawlers' Association, North Shields.

The boiler was inspected by Mr. John Smart, acting for the above Society, in October last, before the vessel came into the hands of the present owners. It has also been examined on their behalf by Mr. E. Rickard, the foreman boiler maker of the Ocean Dry Dock Company, Swansea, and periodically by the engineer in charge.

Nature of the Explosion.

One of the rivets which secured the patch at the bottom of the boiler shell was blown out. Through the hole thus left open, which was about ¾ inch in diameter, the steam and water escaped with considerable force.

Cause of the Explosion.

The fractured rivet was not found after the explosion, but as there had been slight leakage at this spot for some time past, it is probable that the rivet was originally defective, either through being overheated, or being fractured during the process of riveting.

General Remarks.

In his observations the Engineer-in-Chief of the Board of Trade says:—

The explosion in this case was not of a very serious nature, and consisted in the blowing out of a rivet from the bottom of the boiler shell. Slight leakage had, at the last examination of the boiler, been observed in the vicinity of this rivet, and it is probable that had this been attended to at that time the defect which subsequently caused the explosion might then have been discovered. Although but little damage was caused by the explosion the vessel was totally disabled, and, under the circumstances, might have been placed in a position of considerable danger.

Inland Navigation in Germany.

No one who studies the underlying causes of German industrial progress can fail to notice the important and rapidly-increasing rôle that is played by the canal and navigable rivers which are being improved and extended year by year, and which carry freights at such low rates that, according to the United States Consul-General at Frankfort, protective economists begin to complain that they render the importation of foreign merchandise altogether too cheap and easy. A few figures will show the enormous development of inland water transportation in Germany during the past 10 or 20 years. Prior to the canalisation of the River Main, from Frankfort to its confluence with the Rhine at Mayence, which was finished in 1886, only small boats ascended the river to this point; and Frankfort had a total river traffic of not more than 150,000 tons, against 930,000 tons of freight received and sent annually by rail, the percentage of each being as 14 to 86 respectively. During the first five years after the river was canalised the water traffic rose to 700,000 tons against 1,400,000 tons by rail—an increase of 467 per cent. by river to 50 per cent. increase by rail. Since then the river traffic has steadily increased year by year to a total of 1,753,799 tons in 1896, to which is to be added 225,253 tons of logs and lumber arriving in the form of rafts from the Upper Main. Similarly the trade of Cologne rose from 200,000 tons in 1876 to 1,000,000 tons in 1896, and the grand aggregate of the German Rhine ports grew from 5,100,000 tons to 16,250,000 tons during the same period. The total length of German canals and inland waterways is 8,700 miles, and important extensions—such as the Oder Canal group and the Elbe Trave Canal—are still in course of construction. The Danube-Oder and Oder-Moldau-Elbe Canals will, when completed, form a continuous waterway nearly 2,000 miles long, and will connect the waters of the Baltic with those of the Black Sea.

M. Tellier, a French naval architect, is building several launches fitted with the De Dion et Bouton oil-motor of 1¼ H.P.; the speed attained is 11 kilometres and the displacement of the boat 180 kilogrammes.

An electric launch of fair speed has recently left the yard of Messrs. Smit and Zoon, of Kinderdijk, Holland. It is 52 feet long, 5 feet 7 inches wide, and 3 feet 11 inches deep It carries under the floor 80 Tudor Planté cells, and from these 8 H.P. is developed, given a speed of 7½ miles an hour, maintainable, without recharging, for 7½ hours. Propulsion is by a single screw.

THE LIQUID FUEL COMPANY'S AUTOMOBILE TRAIN.

This road train was built to run between Cirencester and Fairford, Gloucester, a distance of eight miles, in connection with the Midland and South Western Junction Railway and the Great Western Railway. The train consists of a powerful motor-van capable of carrying 2½ to 3 tons of goods and luggage coupled to a passenger car or omnibus capable of seating 20 passengers inside.

The total length of the train (an illustration of which we shall publish next month) coupled together is 35 feet, and can easily be turned within a radius of 20 feet. The coupling arrangement is made elastic, and there is no unpleasant jerking motion when the train is started suddenly.

The van is 14 feet 3 inches long, 6 feet 3 inches wide, 9 feet 6 inches high, and with 250 cubic feet capacity; it is fitted with double folding doors at the back, and sliding doors at either side for greater convenience in handling goods.

The boiler is the Company's type designed especially for motor-cars, and is a combination of the smoke-tube and water-tube, with 100 square feet of heating surface, and is fitted with a 35 H.P. "Lifu," automatically regulated by the steam pressure in the boiler at 225 lbs. pressure per square inch. The largest part of the boiler is below the body of the van, and that part extending through the body is only 20 inches in diameter, and is lagged with asbestos and covered with teak staves; there is practically no heat in the goods compartment of the van from the boiler.

The engine is a double tandem compound-reversible, designed especially for motor-car purposes, capable of developing 20 I.H.P. working compound, and 35 I.H.P. by letting high-pressure steam into the low-pressure cylinders. The engine is securely fastened underneath the body of the van and power is transmitted to a counter-shaft by means of steel cut bevel gears through a telescopic shaft which allows for the action of the springs and unevenness of the roads; the counter-shaft is fitted with a compensating gear and is securely fastened to a pair of steel reaches, steel pinions are fitted to either end of this counter-shaft which run in large internal cut gears fastened to the spokes of the hind wheels, each of these gears being protected with dust-proof guards. The speed ratio of the engine is 12 to 1; all of the shaft gears run in dust-proof oil cases. The exhaust steam from the engine first passes into an exhaust box, thence through a feed-water heater, condenser, and separator combined, the small quantity of steam not being condensed passes into the funnel where it is superheated and made invisible. There are two pumps for feeding the boiler, one being double acting with reduced speed gear working direct from the engine crank shaft, the other an auxiliary duplex pump placed beneath the driver's seat for feeding the boiler when engine is at rest, or which can be used as a hand pump when the boiler contains no steam.

Two water tanks capable of holding 85 gallons are fitted in the van, one above the platform and one below in front of the driver's seat. This is a sufficient quantity of water for a run of 15 miles over rough country roads; both tanks are filled by means of a steam injector in about six minutes. There are also two fuel tanks, capable of holding 20 gallons each, fitted underneath the body of the van at the extreme rear end and are both filled from outside. These may be worked independently or together, and supply can be changed from one tank to the other without letting the fire out. Indicating dials are fitted to each tank which show the exact quantity of oil at all times. The oil consumption when train is fully loaded is from half to one gallon according to the condition of the roads, and can be bought at prices varying from 3½*d.* to 4*d.* per gallon in London. All pipes are of solid drawn copper tubing and are connected by means of the Company's patent joint which can be repaired in about five to ten minutes if necessary.

The steering is controlled by means of a steel lever or tiller placed in a convenient position for the driver, and is connected to the pivoted axles by suitable steel rods; the vehicle is at all times under the perfect control of the driver.

A powerful steam brake is fitted to the van which is capable of holding the rear wheels fast at full speed.

The train in all respects is built according to the Locomotives on Highways Act of 1896, and to the Local Government Board's Rules and Regulations. The van, unladen (without fuel and water) weighs 1 ton 19 cwt.

The omnibus or passenger car weighs 25 cwt., and is fitted with powerful tramcar type of brake, and is worked by the conductor on the rear platform. The total of the train fully loaded is about eight tons, and will climb grades of 10 per cent. with ease, at the limited speed of six miles per hour. The van may be run singly at the rate of eight miles per hour. and is capable of climbing grades of 20 per cent., fully loaded. We may say that this automobile train was designed by and built under the immediate superintendence of Mr. H. A. House, the Company's manager, who is to be congratulated on having produced an exceedingly workmanlike job.

The Liquid Fuel Engineering Company are at present very busy at their works, East Cowes, Isle of Wight, building tradesmen's vans to carry 1½ to 2 tons, also steam lorries to carry 2½ to 4 tons, for prominent London firms; they are also building a steam wagonette to carry seven people, for a private gentleman.

Two New Chronicles of Automobilism.—If an industry is gauged by the literature it occasions there can be little doubt but that automobilism is going to be a very big one, not only in Great Britain but also in France. In the latter country the industry already supports quite a respectable number of papers, and this number has now been increased by the appearance of *Le Motocycle.* This seems to be a well written and arranged paper; it appears fortnightly. We wish it every success. Another new paper devoted to automobilism is the *Samokat*, which, as might be inferred, hails from Russia. If there is one country more than another suited to automobilism it is Russia with her vast plains and long roads, and absence of local railways. There is to be an exhibition of automotors in St. Petersburg next year, and this will, doubtless, give a fillip.

Acetylene.—Without in any way wishing to hinder a new and promising industry, we would caution readers from using acetylene in motor and cycle lamps, unless they thoroughly understand the nature of the chemical processes involved. In Paris a sad accident has recently occurred in which a bicycle manufacturer and one of his workmen were seriously injured through the explosion of acetylene caused by carelessness and ignorance in handling it. Acetylene should always be thoroughly tested, and the user should be assured that it is perfectly free from moisture. On this subject *The Engineer* remarks:—"Acetylene gas, under a pressure of one atmosphere, does not explode when a spark is applied to it, neither does it explode under two atmospheres when a spark is applied, but under a pressure of three atmospheres there is a sharp explosion, the violence of which increases with the pressure, and we have the law: the rate of decomposition increases with the pressure. The above facts are the result of an examination of acetylene gas described by Professor Mixter in an American scientific monthly. From this investigation it is concluded that when used with care acetylene is no more liable to explosion than illuminating gas, but should such an explosion occur the result would doubtless be more disastrous."

THE NATIONAL CYCLE SHOW.

What is undoubtedly the finest exhibition of cycles ever seen has just been held at the Crystal Palace. Something like 3,000 cycles were on view, while the vast amount of accessories and fittings displayed gives one a faint idea of the magnitude of the industry. It should be explained that all the exhibits were essentially British. As regards cycles little need be said, as there was a rather monotonous sameness about them. The Diamond frame is almost universal, while nine-tenths of the machines were fitted with the old unscientific and dangerous brake operating on the fore wheel by means of a lever under the handle-bar. Why does not some firm introduce a really scientific cycle brake? We saw several very crude things in the way of brakes, nothing worthy of special commendation. As regards gears, the bevel gearing, under various names and guises, seems to be coming into favour, but the chain transmission is still the best gear. One of the most interesting departures in gears was the "cam" gear. On the crank are two cams, upon which are mounted rollers at the ends of connecting rods, one on each side. On each side too, and near the end of the bottom strut, is a lug, to which is attached a swinging bar, at the end of which is a roller which engages in the grooves of cams. As the cams rotate the swinging bar oscillates and transmits the motion through the connecting rods to the rear crank.

The Pedusin frame merits a word for its exceeding lightness, but its appearance is not taking. The Howard gear is a novelty, the fore chain wheel being elliptical in plan, the idea being to obtain a greater turning movement when the foot is at the point of maximum effort. Jockey wheels take up the slack chain, and, we should say, absorb as much power as is gained by the device. Very amusing were many of the descriptions of novelties vouchsafed to the inquirer, especially if the latter were an engineer. Many of the voluble young men at the various stands seemed to entertain the ideas on power and speed such as cyclists usually do, and not a few "inventions" had as their *raison d'être* the obtaining of power or energy by some device or other which, needless to remark, was a kinetic impossibility. The various side shows were well worth a visit. Special lathes and tools for cycle manufacture and repair were exhibited by Herbert (of Coventry), Lloyd and Co. (of Birmingham), Melhuish (of London), and others, all these being distinguished by careful design and finish, and quite up to American models. The Mannesman Tube Company had a grand display of tubes of all kinds, ranging from boiler tubes for warships to the light cycle tube. The quality of the steel used for these tubes is superb; it is as soft as silk and as durable as gold, yet the strongest that can be made. The Standard Weldless Tube Company likewise had an excellent display of tubes and tools. Aluminium is largely being used for cycles, and also for engine castings. The British Aluminium Company are doing a big business in supplying the crank-pit chamfers, &c., to automotor manufacturers. Of the makes of lamps and saddles there was no end, but little variety. Altogether the National Cycle Show Committee is to be congratulated, as are the Crystal Palace authorities, on the success of the exhibition.

The Horse-Power of Automotor Vehicles.—In the *Revue des Transports Parisiens* M. Louis Mallant discusses the question of the power to be given to automotor vehicles. He says it is admitted that the tractive effort upon macadamised roads in good condition is 25 kilos. per ton, and each millimetre per metre of rising gradient augments this by 1 kilo. per ton; similarly each millimetre per metre of falling gradient diminishes the tractive resistance by a like amount. He proposes the following formula:—

$$E = \frac{Pv}{10}(7 \pm 3c)$$

where E is the total I.H.P.,

P the total weight of the vehicle in tons,
v the speed in metres per second,
c the gradient in centimetres per metre.

THE HEADLAND AUTOMOTOR.

We have recently had an opportunity of inspecting the electric automotor vehicle designed by and built to the order of the Headland Patent Electric Storage Company (Limited), of 12, Pall Mall, London, and of which we give an illustration. This vehicle, we may remark, took part in the Lord Mayor's Show—not that it thereby derived any special qualification for so doing, but the fact is noteworthy as it indicates the existence of a progressive spirit on the part of the civic authorities which we trust will eventually result in the Lord Mayor using an automotor State carriage, and no doubt Messrs. Headland will be glad to accommodate his lordship. As will be seen the present vehicle is most substantially constructed and of not unpleasing appearance. In all externals it resembles a rather favourite type of carriage much used in the country. It is mounted much in the same way but the wheels have rubber tyres. It has a seating capacity for four persons and can also carry a quantity of luggage. Its tare weight is 23 cwt. The fore part is made with a hood and there is a light splashboard. The starting, steering, and brake levers are placed close by the driver, who thus has full command over the vehicle. The interesting part of the vehicle is, of course, the motor mechanism. This consists of a 4 B.H.P. series wound motor, placed longitudinally, and its frame is pivoted at one end to the axle, hence any motion in the carrying springs does not affect the running. At the end of the armature spindle is a steel bevel pinion which gears into a bronze bevel wheel, the velocity ratio being 9 to 1. This bronze bevel wheel is mounted on the driving axle, and a differential gear is interposed. The arrangement is very good and compact and should wear well. Current for the motor is derived from a battery of 40 Headland cells which are carried in the body of the carriage or "boot." These cells are arranged in four groups of 10 each, and by a special switch can be arranged four groups in parallel or series, or in two groups in parallel, each with two groups in series. No resistances are used, the various speeds being obtained by the different groupings. The capacity of the battery is 150 ampère hours, and a single charge suffices for a run of about 45 to 50 miles. The charging current is 30 to 40 ampères, and the normal discharge is at the rate of 25 ampères. At the opening of the new Automobile Club this vehicle was much in evidence and was greatly admired. Our representative speaks highly of its smoothness of running and the absence of vibration and noise. It has three speeds, viz., 3, 7, and 15 miles per hour. We understand that the Headland Company are very busy, and are supplying their batteries to a car for the Duke of Orleans, and also to some electric barges being built for Messrs. Lever Brothers, of Port Sunlight, the well-known soapmakers.

Naval Automobilism.—Two lectures on the British Navy, illustrated with lantern slides, and adapted to a juvenile audience, will be given in the East Conference Hall of the Imperial Institute by Captain S. Eardley-Wilmot, R.N., on January 15th and 22nd, at 3 p.m.

DOINGS OF PUBLIC COMPANIES.

ALLOTMENT letters were posted on December 1st to the subscribers to G. R. Blot and Co. (Limited).

STIRLING'S Motor-Cars (Limited) is the title of a Scotch Company formed to take over the business of Messrs. J. and C. Stirling, of Hamilton, N.B.

MR. CHARLES OSBORN has resigned the secretaryship of the Horseless Carriage Company (Limited) on his appointment to a similar office in the Amalgamated Tyres Company (Limited).

MR. T. H. PARKER (son of Mr. Thomas Parker, J.P., of Wolverhampton) has sold his motor-car invention, and the five or six patents connected therewith, to a new company just registered under the title of "The Electric Street Car Manufacturing Syndicate." The capital of the Company is £25,000, which has been privately and locally subscribed.

IN the action by the Great Horseless Carriage Company's shareholders for the recovery of their money, being conducted by Mr. Hunter, circulars and counter-circulars in regard to the liability for costs have recently been scattered broadcast amongst those most intimately concerned. We should not personally like to give an opinion upon the ultimate legal liability of any of the litigants, but due weight should certainly be accorded to the very strong expressions of opinion and statements contained in Mr. Hunter's communications.

THE accounts of the Britannia Motor Company have been issued in anticipation of the general meeting to be held to-day, December 15th. They hardly present a satisfactory state of affairs, and we shall look with some curiosity to see what explanation can be given to place upon them a better construction than at present they bear. We notice that the *Star* is still pounding away as to the distribution of the item of commission which was paid to a Mr. Davis in connection with the sale of the Britannia Company's patents to the British Motor Syndicate. No doubt at the meeting reference will be made to this matter, which upon the face of it certainly requires clearing up.

THE statutory meeting of the Blackpool Motor-Car Company was held on November 27th, at the Victoria Hotel, Manchester, when the chairman reported that the board were fully satisfied with the public support given to their undertaking during the past season, and that they had been successful in letting out the whole of their cars for the winter season at such prices that a fair profit would be realised. They have under consideration the placing of further orders for larger cars for next season to carry more passengers than those at present in use, embracing all the latest improvements. It was also remarked that the directors hope at the end of the financial year to declare a good dividend.

THE report of the directors presented to the shareholders of Richard Hornsby and Sons, at the annual general meeting held a few days back, states that the balance-sheet shows a profit on the year's working of £2,595. This is after making reserve for doubtful debts amounting to £4,000, and after payment of debenture and other interest amounting to £5,703. The directors regret that they are unable to recommend that any dividends be paid, the balance to the debit of profit and loss being £8,189. During the past year 5 per cent. debentures amounting to £33,450 have fallen due, and have been renewed at 4½ per cent. interest.

Humber and Co.

AT the third ordinary general meeting of the shareholders in Humber and Co. (Limited), held on November 19th at the Cannon Street Hotel, under the presidency of Mr. A. R. Marten, Chairman of the Company, Mr. Martin D. Rucker, during his speech as managing director, said there was a matter he should like to touch upon. He did not like the words horseless carriage or motor car, but the directors felt that there would assuredly be a demand for these carriages here, and there was a very large and greatly increasing demand on the Continent. They had been inundated with letters from people asking whether they intended to go into the motor-car business, and he might state that they had been at work quietly at this for the past two years. They had not, however, put anything upon the market because they did not feel that the time was ripe, and they did not feel that they had got an engine which they would like to call by the name of Humber; in fact, they were not going to run any risk of failure at the start. (Hear, hear.) They felt they had now an engine which was superior to anything else which had been brought out; it had not been brought out yet, but they had been trying it for some considerable time past and they believed they had an engine that would supersede all others and make a tremendous trade for the Company. The directors were arranging to set apart a special department for this work, and he thought they would be exceedingly busy. He also believed it would bring very large profits to the Company; at any rate, for some time to come those who were seeking such carriages would be willing to pay any price for the best article. He had been a good deal in Paris lately, going thoroughly into this question, and there he heard of a most extraordinary result. One machine, which cost 6,000 francs to build, was sold originally for 6,000 francs. It was run for 3,000 miles, and then sold for 8,000 francs. It was afterwards bought by an agent for 10,000 francs, and sold the day he was there for 12,000 francs. That would give shareholders an idea of the demand which existed for such vehicles in France. He thought that was all he had to say with regard to the future of the business, but he might add that the directors believed they would be able to do as good if not a better trade in cycles than they had done before, and, in addition to this, they believed they were starting on a very large business in motor-cars.

London Electric Omnibus Company.

A MEETING of the shareholders of the London Electric Omnibus Company (Limited), convened by Mr. William Marshall, the late Deputy-Chairman of the Company, was held on November 25th at the Cannon Street Hotel, E.C., to consider the present position of the Company. The following was the circular sent to the shareholders:—

November 22nd, 1897.

To the Shareholders of the London Electric Omnibus Co. (Ltd.).

GENTLEMEN,—As late Deputy-Chairman of the above Company, I think it my duty to call your attention to the deplorable condition into which the Company has fallen owing to the incompetency of the management.

Your Company has now been formed nearly two years, and in the prospectus you were promised that 125 omnibuses would immediately be placed upon the streets. The Company took over one bus from me, and although the directors, I am informed, have spent something like £25,000, beyond this there is not a single omnibus yet ready to start running.

I have myself invested about £28,000 in cash in the undertaking, and, having influenced others in taking up shares, I am anxious that, before it is too late, the shareholders should take some steps to remedy the present unsatisfactory condition of the Company.

Under these circumstances I request your kind attendance at a meeting of shareholders to be held at the Cannon Street Hotel, on Friday next, November 26th, at 3 o'clock, when you will have an opportunity of judging for yourselves as to the requirements necessary for the future.—I have the honour to be, gentlemen, your obedient servant, WM. MARSHALL.

Care of Messrs. Haydon and Haydon, 16, Union Court, Old Broad Street, E.C.

MR. E. KIMBER presided, and explained that the directors had not called the regular meeting, which ought to have been called before this, to place before the shareholders the Company's present position. Although the circular issued to the shareholders by Mr. Marshall revealed an unsatisfactory state of things, the Company had in it the elements of great success; but, so far, nothing had been accomplished, although the prospectus was issued as long ago as May, 1896. The object of their meeting, therefore, was to give life to the undertaking, to preserve their property, and to place the Company on a better footing. The chairman then referred to various statements in the prospectus which he stated had not been fulfilled.

MR. MARSHALL stated that, according to the prospectus, the directors promised that 125 electric omnibuses were to be immediately placed upon the streets, but so far not a single bus was running. The directors, shortly after taking office, voted themselves £3,000 a year, with a bonus on the profits, and had also appointed Mr. Ward as engineer, at a salary of £1,200 a year. In their circular of August 24th the directors stated that the prospects of the Company were better than heretofore, and that they were buying an interest in the Solar accumulator, which had not been sufficiently tested. He believed the directors did not hold any more than their qualifications. Under the circumstances, he thought a committee of investigation should be appointed. He had heard that the London General Omnibus Company had entered into a contract to put 400 electric omnibuses on the streets, and therefore they were far behind that Company.

After some discussion, a resolution was passed appointing a committee, consisting of Messrs. Ware, Flaxman Haydon, J. E. Condiet, Edmund Kimber, and Colonol Turnbull, to investigate the affairs of the Company.

[The reference to the London General Omnibus Company having ordered 400 electric omnibuses is quite incorrect. Although we understand the directorate is very carefully watching the automotor movement, and is ready at any moment to run motor omnibuses when they consider they can do so with advantage, up to the present they have made no arrangements whatever of a practical nature.—Ed.]

British Motor Syndicate.

The ordinary general meeting of the British Motor Syndicate (Limited), was held on November 18th, at the Motor Mills, Coventry, under the presidency of Mr. Harry J. Lawson. In addition to transacting the ordinary business the shareholders were invited to consider a scheme involving the issue of debentures and preference shares, with a view to taking over the Great Horseless Carriage Company and its assets. About 40 shareholders attended.

The Secretary (Mr. C. Jarrott) read the notice convening the meeting.

The report was taken as read.

The Chairman, during his remarks, said:—To build such cars as you see about the streets, working as hard as we could, would take three or four months, and then it could only be done by working upon a system of interchangeable parts. At the present moment the motor-car industry, both here and in France, is not being carried on on a system that produces most profit; it is being done largely in half-dozens and dozens of cars, so that if you lose one piece you find you cannot get another to fit the machine. I hope that the time is approaching in the manufacture of motor-cars when we shall be able to get the work done under a system which will enable us to turn out any quantity, and at a popular price. Everybody said the coming motor traffic must be worth millions in time, and if it is quicker, cheaper, and altogether better, of course the argument is all on one side. Its success can only be a question of time. We are making as much progress as we possibly can, and before long we shall have cars that will suit the rank and file of the population. I have had a car in daily use for going to and from London for nine months, and the average daily cost has been 1*s.* If it had been working all day it would have cost 1*s.* 6*d.* or 2*s.* probably; but the average cost to me has been 1*s.* a day, using it as I would an ordinary carriage or brougham. I find, on reference to "Whitaker," that there was in 1895 £1,001,110,221 invested in railways, and over £80,000,000 in receipts, while in tramways there is over £10,000,000 invested; but we say that, except for long distances, such as London to Brighton, Edinburgh, or Glasgow, for the average wants of the greatest number we can do better than the railway. The cars will very shortly be in regular use for passengers at fixed fares—in fact, they are already in some towns. They are charging 6*d.* for a four-mile journey at Hamilton, in Scotland, and they are also in regular use by the Blackpool Company. The applications for cars are overwhelming, and they cannot make the cars for that sort of traffic fast enough.

Referring to the accounts the Chairman said:—On one side of the profit and loss account you see an entry of 290,000 shares, and on the other side is shown only an issue of 250,000, and about that I would point out that the 290,000 shares do not mean British motor shares, but they relate to several dealings we have had. In forming syndicates and companies—and a great number more will have to be formed before the country is half supplied—we have to take cash and shares according to the terms arranged. A question has been raised with regard to the dividends paid. These dividends were paid in May and July; but, of course, the more recent shareholders have not participated in them—they were paid before they came into the Company. I do not think it is unreasonable, seeing what sort of a year it has been, and that it would have been sheer folly to have started a fresh company during the present year, that we have no distribution at the present time. Everything in cycles and motors has been at its very lowest, and being Jubilee year there has not been anything like the usual demand for shares generally, quite apart from our kind of share. The gross profits have been £446,285. Of course, part of that is in cash, but a large portion is promotion profit. Then it will be seen that the cost of patents amounted to an enormous sum. Well, that is our whole existence; the whole reason of our being here to-day is that we own inventions and motor patents, and intend to farm patents and exploit patents. No doubt you will have seen in the papers that the Post Office authorities are trying the motor-car as a test. We sent our van to the General Post Office, and they rather smiled incredulously when we said what it would do. They gave us a list of times and places where we had to be to take the mails, and sometimes we picked up mail bags to the weight of about 11 cwt. or 12 cwt. at tha time. In all kinds of weather for weeks that van has been driven, and has kept much more punctual time than has been done by the horse. I do not think a severer test could have been given us. Having satisfied the Post Office authorities of its utility for short distances, we were asked to test it for longer journeys, and it was used for Staines, Richmond, and all that district, while now they are about trying it for the journey from London to Brighton, to Bedford, and other long distances. Well, we know that with regard to long distances they have no possible chance of competing with us with horses; for we can go at almost any speed—as fast as the law will allow us. In France the motor-car has had a long list of successes, and I may tell you that this Company owns all the leading patents that are in use there. The Panhard Company has arranged to turn out 70 motor-cars a month, and, as you know, it is working under our patents. With regard to the Coventry Motor Company, Mr. Turrell, the manager, has made improvement after improvement during this year, and he expects to perfect by the end of the year, or say the end of January, a motor-car which any lady or gentleman can be trusted with and can easily manage, and that one invention will be a great help to us in the motor-car industry, for it will be on the most simple and marketable lines. Then, mention has been made as to the shares issued at a premium. Those shares were principally issued to the vendors, that is to say, to myself and those gentlemen who were acting with me—inventors and patentees. A large portion of this was never taken by us, although it belonged to us, but was left in the coffers of the Company, and has been spent in the development of the industry. But for that the Company would not have been able to have done what it has. I have a large holding in this Company, and would do almost anything for it, and it was because of my large holding that I was anxious to see that the Company had money with which it might obtain advantages by purchasing other inventions which were offered. It is impossible to say how great the results of this Syndicate's work is going to be. I can only say I have the fullest confidence in it, and every penny I can obtain I shall put into the development of the motor industry. I should mention that we are having negotiations from abroad for light railways to be laid down on our lines, and we have every hope that the negotiations will have a satisfactory result. I now beg to move the adoption of the report and accounts.

Mr. James Bradshaw seconded the motion.

Mr. Gurner, Mr. Spain, and other shareholders put questions upon the accounts, and received explanations from Mr. Van Praagh (the solicitor), after which the motion was put to the meeting, and carried.

Mr. Van Praagh explained at length the consideration which had induced the directors to bring forward the suggested acquisition of the Great Horseless Carriage Company, and the issue of debentures and preference shares for effecting that object. After considerable negotiations, an understanding was arrived at provisionally, but since then certain variations had been suggested, which it was hoped would be satisfactorily arranged. In order to carry out the bargain contemplated it was necessary for the Board to issue the 100,000 shares, the balance of capital remaining, and another 100,000 shares which would be supplied by Mr. Lawson, and issued as preference shares to the shareholders of the Great Horseless Carriage Company in exchange for part of their present holdings. In addition to that the Board would require to issue debentures. Mr. Lawson was willing to come to the rescue, and to give up 100,000 and to take £50,000 out of the issue of £100,000 debentures, to bear interest at the rate of 4 per cent. The shares he would give up, together with those the Company had, would be converted into preference shares, and bear interest at the rate of 5 per cent. As he (Mr. Van Praagh) acted as solicitor to Mr. Lawson, the Syndicate would be represented in this matter by Messrs. Ashurst, Morris, Crisp, and Co., who were represented at that meeting by Mr. Stephenson. He would, therefore, ask that gentleman to read the agreement made between Mr. Lawson and the Syndicate.

The agreement having been read, Mr. Thomas Child, who had taken the chair on its being temporarily vacated by Mr. Lawson (on account of his being concerned in the transaction), formally proposed the resolution approving the agreement, which was carried with one dissentient. A resolution was also agreed to empowering the directors to issue such debentures and preference shares as they might find necessary for the purpose of taking over the Great Horseless Carriage Company's undertaking as proposed.

An extraordinary general meeting was then held for the purpose of making certain alterations in the articles of association; but it was explained that these were largely to meet the requirements of the Stock Exchange Committee. The motion was unanimously agreed to.

New Companies Registered.

[Under this heading we give a full list of new Companies registered which take power to make, deal, or become interested in any manner in automotor vehicles.]

	Capital.
Bradford and District Cycle and Motor-Car Traders' Association, Ld. (Unicorn Passage, Ivegate, Bradford)	£500
E. C. Clarke, Ld. (1, Friargate, Derby)	7,000
Electric Street Car Manufacturing Syndicate, Ld.	25,000
Indian Cycle and General Engineering Co., Ld. (2, Gresham Buildings, Basinghall Street, E.C.)	10,000
Joseph Lucas, Ld. (Great King Street, Birmingham) ..	225,000
Motor-Car Emporium, Ld.	5,000
Power and Traction, Ld. (79, Palace Chambers, Westminster)	10,000
Samuel Weston, Ld. (Barclay's Bank Chambers, Terminus Road, Eastbourne)	52,000
Wheel Manufacturing Co., Ld.	90,000
White and Middleton Gas Engine Co., Ld.	200,000

LAW REPORTS.

The Great Horseless Carriage Company and the British Motor Syndicate.

On November 25th, in the action of Henry Charles Le Hersant, suing on behalf of himself and all other shareholders of the defendant company, plaintiff, *v.* the Great Horseless Carriage Company (Limited), Mr. Warrington, Q.C., asked Mr. Justice Kekewich, sitting in the Chancery Division of the High Court of Justice, to grant an injunction restraining, until the trial of the action or further order, the defendants, their directors, managers, or officials from executing or in any way proceeding with the negotiations for a proposed agreement between the defendants and the British Motor Syndicate (Limited), whereby the assets and undertaking of the defendants were proposed to be transferred to the said Syndicate, and from in any way transferring or parting with to the Syndicate the assets of the defendants.

In stating the case for the plaintiff, Mr. Warrington said that the action was brought to prevent the carrying out of what he ventured to characterise as an outrageous fraud upon the shareholders of the defendant Company on the part of what he understood was practically only one director, viz., Mr. Harry J. Lawson. The articles of the Company no doubt gave power to the directors, and in certain events a single director, amongst other things, to sell the whole of the assets of the Company for shares in another company. The only asset of the Company of value, he understood, was £50,000 cash in the bank, the proceeds of the subscriptions of some 90 persons who had applied for shares to the extent of about £34,000, but had all taken proceedings against the Company and the directors with a view of recovering against the Company the money they had paid for such shares, and against the directors for damages for misrepresentation. The present plaintiff was one of these persons in respect of fully paid-up shares. Lawson, who seemed to have the control of the Company, had, according to the affidavits, a very large claim, which he had settled by taking debentures in a company called the British Motor Syndicate (Limited), and it was this agreement it was proposed to prevent being carried out, as one of the class of cases coming within a well-known rule. As he had said, there had been no meeting of the defendant Company; but Lawson, acting solely in the matter, proposed to assign its assets to the British Motor Syndicate, of which he was one of the directors and held the bulk of the shares, his brother-in-law (Thomas Robinson) being a second director, and a Mr. Child the third. It was to take over the patents of the Horseless undertaking, and the effect of the agreement, if not restrained, would give Lawson the power of receiving up to 750,000 shares, which were of the nominal amount of £1 each, but he (the learned counsel) understood had been issued at £8 each, and in this arrangement also to get control of the defendant Company's assets of £50,000, the Motor Syndicate arrangement being, it was suggested, a mere blind, in effect, to enable Lawson, for his own benefit, to obtain that £50,000.

Without calling on Mr. Warmington, Q.C. (who with Sir Edward Clarke, Q.C., appeared for the defendant Company), Mr. Justice Kekewich refused the application. If he were satisfied that the case was one of fraud he should not, he said, hesitate to act in restraint; but he conceived it had not been made out, even to the extent of constituting a *primâ-facie* case, justifying the course he was asked to take. It might be true that Mr. Lawson both had the control of the Company and a great interest in the Syndicate, and was entitled to receive a large sum under it; but he saw no reason in that for concluding that he would not exercise his powers reasonably and honestly for the benefit of the defendant Company, which, he gathered, was not able to carry out its designs without the aid of some stronger company. As, to his mind, there was not sufficient proof of Mr. Lawson's desire to act other than honestly he declined to interfere at this stage, and refused the motion, the costs to be those of the defendants in any event.

Mr. Warmington said he desired to say the defendants did not admit much of what had been alleged, nor was it true to say that Mr. Lawson was the only director.

Bankruptcy Court.

On November 23rd, in the High Court of Bankruptcy, a receiving order was made against Charles Nigel Stewart, 39, Victoria Street, Westminster.

At a meeting of the New-Mayne Electric Rudder Motor Syndicate, held at Palace Chambers, Westminster, on November 13th, a resolution was passed winding up the Company voluntarily, as it could not, by reason of its liabilities, continue business. Mr. D. F. Basden, of 3 , St. Swithin's Lane, E.C., was appointed liquidator.

On November 18th Mr. Registrar Hope presided at a sitting for the public examination of Sydney Hersco, financial agent, &c., of 14 and 15, Coleman Street, E.C., who failed last August, with total liabilities, £14,996, and assets valued at sufficient to provide a surplus of £2,417. Under examination the debtor said he commenced business as a financial agent at Palmerston Buildings in 1882. Since then he had assisted in the promotion of various public companies. During the last two years he had assisted in the promotion of the Tavernier Motor Syndicate (Limited), the Armstrong-Dove Motor Syndicate (Limited), &c. Lack of capital to work a slate quarry and a fire-clay mining works had contributed to his failure. The examination was adjourned for a cash account to be filed by the debtor.

In the matter of New and Mayne (Limited), Mr. Registrar Hood has sanctioned the recently-approved scheme of arrangement being submitted to the creditors and contributories of the Company. For the purpose of the necessary resolutions, the liquidator, Mr. D. F. Basden, has convened meetings of the creditors and contributories to be held to-day (December 15th), at the Westminster Palace Hotel. It is proposed to incorporate a new Company, under the title of the Engine Patents Development Company (Limited), with a nominal capital of £3,750, divided into 75,000 shares of one shilling each: the new directors to be Mr. Reuben Hunt, Mr. William Shrimpton, and Mr. Anthony G. New. Working capital is to be raised by the issue of "A" debentures not exceeding £10,000, and "B" debentures are to be issued to Mr. M. D. Rucker in part redemption of

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his existing debentures in New and Mayne (Limited), the balance of his debt being satisfied by deferred debenture stock ranking *pari passu* with deferred debenture stock to be issued to all the other creditors of New and Mayne (Limited).

On November 19th, before Mr. Registrar Linklater, William Marshall, mining and electrical engineer, 16, Tokenhouse Yard, E.C., attended for public examination upon accounts showing gross liabilities £15,390, of which £6,701 are unsecured, and assets valued at sufficient to yield a surplus of £54,560. He stated, in reply to the Official Receiver, that from 1869 to 1894 he was in Australia and South America acting as a consulting engineer. He returned to England in August, 1894, with £1,500 capital, and started business as a mining and electrical engineer at Tokenhouse Yard. In the course of that business he financed the inventors of certain electrical patents, and in that way expended between £6,000 and £7,000. Then in May, 1896, he floated the London Electrical Omnibus Company (Limited), with a capital of £250,000, to acquire the plant and patents. As vendor, he was to receive £20,000 in cash and £80,000 in shares. The initial expenses amounted to about £14,000. The public subscription did not come up to expectation, and eventually he returned £13,816 of the cash consideration, and took up the unsubscribed balance of 27,633 shares. He had returned the value of his shares at par in the statement of affairs, but they would not be worth that amount until the omnibuses started running. Witness attributed his appearance at the Court to loss in connection with the City of Mexico Tramways, and his inability to immediately realise his shares in the London Electrical Omnibus Company.

At the conclusion of the examination the Registrar pointed out to the debtor that his accounts showed a surplus because he had returned his Company shares at their face value, and asked whether he wished to amend the accounts.

In reply, the debtor said he would stick to his guns, as he confidently expected to realise the full amount in due course of time.

The debtor was then allowed to pass.

A Motor-Cab Without a Lamp.—Thomas Nugent was summoned for driving a motor-cab without a light on the north side of Clapham Common on the night of the 12th ult. P.C. 400 W said that the defendant was in charge of one motor-cab, and attached to it was another motor-cab. When the cab stopped the electric light flew into the lamps, but the moment the vehicle moved the light went out. The cab was going at a very slow rate. The defendant said he had been sent to Kingston to fetch a cab that had broken down, and the road was so bad that the electricity in his cab became exhausted. Mr. Marsham inflicted a fine of 10*s.* and 2*s.* costs.

A Drunken Motor Cabby.—Leonard Carter, 30, was charged before Mr. Hannay, at Marlborough Street Police Court, on November 16th, with being drunk while in charge of a motor-cab. Constable 390 C deposed that at about 10 o'clock on Monday night he saw the prisoner drive a motor-cab out of Regent Street into Piccadilly Circus. He appeared at first to be going straight across the circus, but suddenly turned round, with the result that he collided with a four-wheeled cab, cutting the horse attached to it on the head and damaging also the motor. Finding that Carter was drunk witness took him into custody. In defence, the prisoner said he did not consider himself drunk when the accident occurred. The traffic caused him to turn and a cab at the same moment turned, causing the collision. Mr. Hannay said the inspector at the station must have thought the accused drunk as he would not have taken the charge. As nothing was known against the prisoner he would only be fined 5*s.* as a caution.

Liverpool Policemanism.—At Liverpool, on the 21st ult., Inspector Breeze summoned James Urmson for using a motor-vehicle principally for the purpose of displaying advertisements on the 16th ult. in Lime Street. Charles Taylor and Levi Nutter were summoned for aiding and abetting. Mr. Cripps prosecuted and Mr. Lynskey appeared to defend. It was stated that on the date mentioned Inspector Breeze saw the vehicle standing opposite 30, Lime Street, the premises occupied by Messrs. Joseph Crosfield and Sons, Soapmakers, Warrington. He asked Urmson what the vehicle was intended for, and the reply was "advertising round the town." Inside the vehicle there were small packets like samples and a quantity of handbills. For the defence, Urmson and the others, as well as Mr. J. F. Jones, Liverpool manager for the firm, were examined. They stated that the vehicle was used entirely for trade purposes—delivering goods ordered by their customers in different parts of the town. With the exception of the lettering on the exterior of the cart there was no other advertising purpose. The bench upon this dismissed the case. The car was drawn up in the police courtyard.

A Policeman Tries to Drive an Electric Cab.—Richard Thompson, 46, an electric cabdriver, of Blackfriars, was charged on December 10th, at Clerkenwell Police-court with being drunk while in charge of his vehicle in Gray's Inn Road. P.C. 120 E said shortly after midnight on the 3rd inst. he saw the defendant driving an electric vehicle along Gray's Inn Road. Thompson was leaning over very much on his cab seat, and nearly drove the vehicle into a refuge in the middle of the roadway. The defendant did not stop when first called upon by the officer, but after driving 200 yards brought the vehicle to a standstill. He refused to get down from his seat, and had to be forcibly taken down by the witness and another constable. The doctor at the station said defendant was drunk. Mr. Edmunds, who appeared for the defence: Did you get on to the cab? Witness: No; the other officer got on the seat of the cab and proceeded to drive. Mr. Edmunds: Did he drive the cab into a wall? Witness: No; he drove it on to the pavement (laughter). Mr. Edmunds: Is it not a fact that your brother officer soon had enough of electric cab driving, and did he not leave the vehicle in the middle of the roadway for anyone to take? Witness: He did leave it in the roadway (laughter). P.C. 444 E. said he attempted to drive the cab, but after colliding with the kerb got down. Mr. Edmunds said the defendant bad an irreproachable character. He had been a cabdriver for 26 years, and during that time had only been once before a magistrate. He was then fined 6*d.* He occasionally suffered internal pains, and when he was stopped by the officers he had a seizure. In consequence of the damage done to the vehicle by the constable who attempted to drive it, the defendant had had to pay £1 2*s.* 6*d.* for repairs. Ultimately the defendant was bound over to be of good behaviour for three months.

The National Traction-Engine Owners' and Users' Association.—The fourth annual meeting of this association was held on the 8th inst. at the Agricultural Hall, Mr. E. B. Chittenden presiding. The annual report, as read by the secretary, Mr. H. R. Summers, stated that the financial support received was still altogether inadequate, though many new members had been enrolled. The committee were of opinion that the association had proved that the present restrictions on road locomotive traffic could be removed by energetic combination. There was no doubt that the use of heavy steam road locomotion was increasing and attracting a large share of public attention. It was, therefore, more than ever necessary that engine-owners should combine together to get whatever improvements were possible. The committee looked forward to some progress being made in the attainment of the association's demands during the next Session of Parliament, if the owners would give their support. On the motion of the chairman, seconded by Mr. Fenton, C.C. (Devon), the report and accounts were adopted, and the general council re-elected. Mr. Griffith Boscawen, M.P., was re-elected president of the association. On the motion of Mr. H. Westley (Cambridge), seconded by Mr. W. Arnold (East Peckham), the following resolution was adopted:—"That this meeting urges Her Majesty's Government to consider the important question of agricultural steam road locomotion and to give facilities for passing into law a Bill to provide uniform regulations and greater legislative freedom for traction-engines."

NOTES OF THE MONTH.

A ROYAL WARRANT has been granted to the Electrical Power Storage Company (Limited) appointing them makers of electrical secondary batteries to Her Majesty.

THE Chelsea Vestry has passed the resolution for the surveyor to obtain full information as to the cost of motor-vans. It is proposed to employ 12 cars for the home district and three for Kensal Town.

IT is stated that the Hon. C. A. Parsons is about to construct at Newcastle a vessel of the torpedo-boat destroyer type, which he estimates will be capable of easily steaming from 36 to 40 knots an hour.

WE learn from the *Beckenham Chronicle* that the local authority has decided to purchase a motor dust-cart. We feel sure that the enterprising officials will find this investment a source of economy to the ratepayers.

GLASGOW has at length adopted the automotor vehicle, and the magistrates have licensed several "Stirling" automotor vehicles to ply for hire. Trials carried out in the presence of the municipal authorities have been very successful.

WE trust that the owners of the motor-car so unwarrantably interfered with by the Liverpool police will take steps to bring the conduct of the policemen concerned to the notice of the Home Secretary, with a view to getting them punished.

A CONTRACT for a number of light locomotives for Egypt has been secured by Messrs. W. G. Bagnall (Limited), Castle Engine Works, Stafford; and the Oldbury Railway Carriage and Wagon Company (Limited), near Birmingham, have also received from the same quarters an order for 200 wagons.

A NEW illustrated weekly paper is to be published at Manchester, with the title of the *Mechanical Engineer*, the price being 6*d*. Mr. William H. Fowler, Wh.Sc., M.I.M.E., A.M.I.C.E., &c., is the editor, and the Scientific Publishing Company, of Hodson's Court, Corporation Street, Manchester, are the proprietors.

A MOTOR-CAR company for Gourock is in process of being floated. In the event of the tramways company and the commissioners failing to arrive at an agreement with reference to the repairing of the rails and roadway at the end of the present lease, which occurs within a few months, the motors are intended to take the places of the ordinary cars between Cardwell Bay and Ashton.

SAYS a recent issue of *Vanity Fair*:—It may not be generally known that the motor-cabs are almost useless in the crowded thoroughfares of the City or anywhere where there is much traffic, because the police—of their own accord or by order of the higher authorities—have a profound distrust of their going faster than a walk or passing any vehicle. As they can be pulled up quicker than the tenderest-mouthed horse, this is absurd. How great is Red Tape, and it shall prevail!

WRITING to *The Times* from Philadelphia, Mr. A. F. Yarrow gives the following particulars of the hours worked at the largest shipyard in America—that of Messrs. Cramp, and in the largest locomotive factory in the world—that of the Baldwin Company. At the former yard, the hours are from 7 a.m. to 12 in the morning, and from 12.45 to 6 p.m. in the evening, whilst on Saturdays work is knocked off at 4.30 in the afternoon. At the Baldwin Works the hours are 7 a.m. to 12 in the morning, and 1 to 6 in the afternoon.

THE contract for the electric lighting of the Dublin Cycle, Tyre, and Motor-Car Exhibition, to be held in January, has been secured by Messrs. Tuck and Co. (Limited). The installation will comprise engines, dynamos, 30 arc lamps, and 1,000 incandescents. The same firm is putting down an installation at the Banagher Distillery, where there will be an engine and dynamo and 300 lamps (incandescents and arcs); and at the Drogheda Steam Laundry they are also putting in engines, dynamos, and boilers for arc and incandescent lighting.

AT the last meeting of the Aberdeen Links and Parks Committee a report was read on negotiations for a motor-car service from the centre of the city to the Duthie Park and the Bathing Station. A letter was read from Messrs. J. and C. Stirling, Hamilton, who run cars from Glasgow to Dumbarton, stating that they would put a service of cars on the routes without asking the Council to purchase them. It was decided to ask them for a specific offer. A drawing by a London firm was submitted of a steam motor-bus to cost £700, but the matter was deferred pending arrangements with Messrs. Stirling.

AN order has been lately issued by the Local Government Board, varying the provisions of Sub-section (4) of Section 28 of the Highways and Locomotives (Amendment) Act, 1878, so that, subject to the conditions specified in the Order, a locomotive may be used on a highway if the driving wheels, instead of being smooth-soled or shod with cross-bars, are shod with wooden blocks. It may not be generally known that in certain parts of Lancashire, local authorities have long since permitted the use of traction-engine wheels shod with wooden blocks, which have been found most suitable for roads paved with granite setts.

ACCORDING to an evening paper, a gentleman conceived the brilliant idea of riding all the way from Oxford Street to Hampstead in a motor-cab; but after the vehicle had proceeded a few hundred yards it slowed and stopped. "The electric power," said the Jehu, "had all gone." So the unsuspecting fare alighted and proceeded on his way. Looking back, he saw that motorious cab merrily plying for hire towards Oxford Street again. Even a horse-cabman, as we must call the class now, could not have dodged the long fare better than that. It is sad to think that the motor-cab should be the cause of so much aberration from the strict path of moral duty.

IT is stated that, in addition to the creation of a large number of additional cab licenses in Leeds, the Hackney Carriages Committee are likely to sanction almost immediately the introduction of motor-cars to ply the streets for public hire. The scheme, it is said, has originated locally. The first public move, however, is directed from London. The chairman of the Hackney Carriages Committee has received from a London company a letter asking for permission to run one motor-cab in the streets, for the benefit, it is understood, of the gentlemen who contemplate the formation of a local company. It is probable that the motor-cab will arrive in Leeds within the next few days.

THE accumulator system at Ostend has been adopted for tramway traction, each car being fitted with 12 cases of nine Laurent-Cély cells each, which have a capacity of 140 ampère hours, and can give a discharge of 50 amperes. Charging takes from three-quarters to two hours. The cars weigh 7½ tons each, batteries excluded, and can accommodate 50 passengers. The motors, of which there are two to each car, are of 18-kilowatt capacity, and were supplied by the Westinghouse Company. They drive the axles through gearing which reduces the axle speed to one-fifth that of the motor spindle. One charge of the battery is sufficient for a run of 44 miles. The tractive force is found to be 17·6 lbs. per ton at starting, and 8·8 lbs. per ton when running on the level at a speed of 11 miles per hour.

NICKEL steel is likely to be largely used in automotor construction, and it is useful to note that the resistance of nickel steel to the attack of water increases with the nickel contents. The least expanding alloys, containing about 36 per cent. of nickel, are sufficiently unassailable, and can be exposed for months to air saturated with moisture without being tainted by rust. With a view of testing the expansion of nickel steel, experiments have been carried out by allowing measuring rods to remain in warm water for some hours, according to the *Iron and Coal Trades Review*. They were not wiped off when taken out, but were exposed for a longer period to hot steam; but the lines traced on the polished surfaces were not altered. The rough surfaces, when exposed to steam, were covered after several days with a continuous, but little adhesive, coat of rust.

A COSTLY experiment in æronautic automobilism with an alleged steerable balloon has recently been carried out in the presence of a large number of officers near Berlin, but proved a complete failure. Both the car and the balloon were entirely of aluminium, and were driven by a benzine motor. They were made in the barracks of the Balloon Detachment in order to keep the matter secret. The balloon rose to a height of about 1,000 feet, and then turned round, but, failing to make any way against the wind, was driven back. It disappeared behind a cloud, and was not seen again till it was found in a field. The car was bent up under the weight of the balloon, and both were badly damaged. The experiments are said to have cost about three million marks, exclusive of the cost of the balloon, which came to grief, and which took four years to construct.

MR. C. D. PHILLIPS has lately astonished the good people of Newport (Mon.) by appearing before them on a motor-cycle, says a local scribe. The motor is started by pedalling the machine forwards, and after about two turns of the pedals it begins to propel the tricycle, leaving the rider nothing to do but to steer. It will mount a gradient of 1 in 10, notwithstanding its weight—150 lbs. Machines of this kind cannot possibly be constructed lighter, as a certain weight is required to reduce the vibration which any vehicle driven by a motor is subject to. The oil reservoir will hold a sufficient quantity to last 50 to 60 miles, whilst the accumulation will even hold out three times as far. In the run from London to Brighton, 12 months ago, the new Beeston was the only British-made motor which reached its destination. The speed may be varied, and in going up-hill the pedals may be worked to assist the motor. The price—70 guineas—does not seem exorbitant when a thoroughly good tricycle will run a purchaser to £30 or £35.

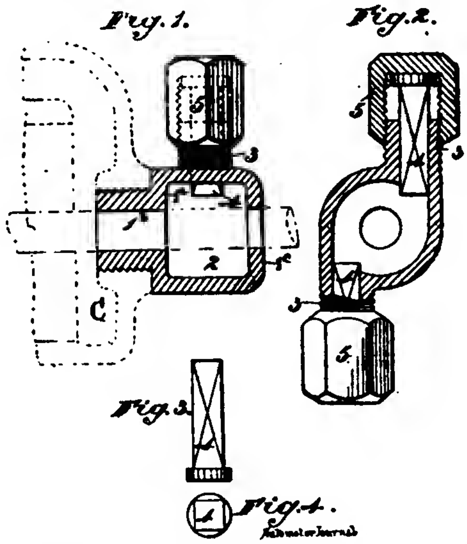
The Post Office and Automobolism.—The announcement that we make elsewhere to the effect that a contract has been entered into between the Postmaster-General and Messrs. Julius Harvey and Co., whereby the latter engages to carry the Redhill mails for a period, is extremely satisfactory, as it shows that the officials are quite alive to the advantages of automobilism for parcels and mail purposes. Messrs. Julius Harvey propose to use a steam van, and we are bound to say that we think their choice a good one. We understand that the negotiations between the parties have been proceeding for some time, and great credit is due to Messrs. Julius Harvey for the tact and pertinacity they have displayed in meeting the departmental objections, and also to the Post Office officials for their commendable departure from official tradition in thus taking up automobilism at such an early stage. If, as we make no doubt, the present experiment succeeds, we shall soon see the present mail coaches superseded by automotor mail vans—a consummation devoutly to be wished.

A NEW STUFFING BOX.

MESSRS. THORNYCROFT have recently patented a novel form of stuffing box, and one which offers considerable advantages for automotor vehicles. The idea is distinctly novel, and we should say eminently practicable. As will be seen on referring to the accompanying drawings, the ordinary gland or stuffing box is dispensed with, but into the hollow chamber in which the shaft works is placed a suitable packing material, preferably white metal shavings or Delaunay Belleville shot packing.

As will be evident from the construction of the stuffing box, the packing material may be pressed more or less tightly according to the extent to which by the screwing up of the cap-nuts the blocks are forced into the interior of the box.

Referring to the drawings, Figs. 1 and 2 show vertical sections, at right angles to each other, of a stuffing box. In this example the following parts are integral, that is to say, the lateral wall, 1, the inner end, 1ᵃ, an external screw-threaded neck, 1ᵇ, adapted to be screwed into the end, C, of cylinder, the outer end, 1ᶜ (which corresponds to the cover in an ordinary stuffing box), and the necks, 3; 2 is the chamber or space to contain packing material.



The inner end and neck, 1ᵃ, 1ᵇ, and the cover part, 1ᶜ, of the wall of the box are bored to fit the rod to be packed. The necks, 3, are externally screw-threaded, and have their axes tangential to the peripbery of the rod; 4, 4, are blocks (one of which is shown separately in Figs. 3 and 4) that fit into the tangential necks, 3, and project into the stuffing box, or in other words into the chamber which contains the packing that surrounds the rod or part packed; 5, 5, are cap-nuts that hold the blocks, 4, in place, and by means of which they can be forced to a greater or less extent into the stuffing box, so as to press the packing therein against the rod.

The packing Messrs. Thornycroft prefer to employ is that known as Wheeler's Fibrous Metallic Packing. This packing contains white metal shavings and fine graphite. The graphite tends to prevent the white metal shavings flowing into a solid mass that would be difficult to remove from the stuffing box.

The Prince of Wales and Automobilism.—After languishing in the cold shade of neglect by the aristocracy the motor-cab has at length emerged into the comfortable warmth of Royal approbation. His Royal Highness the Prince of Wales has done the industry a good turn in his own good-natured way, *i.e.*, by quietly and unostentatiously making a journey in a motor-cab. When proceeding from Marlborough House to the railway station for Sandringham the other day the Prince took one of the ordinary electric cabs plying for hire in the street, and travelled in it with his Equerry by his side. His Royal Highness appeared to enjoy the experience, and I shall not be surprised to hear, says a well-informed correspondent, that the motor-cab has been placed in the list side by side with the hansom cab as his favourite vehicle.

CONTINENTAL NOTES.

The Automobile Club of Paris has 1,150 members.

M. Serpollet has patented a new form of oil-burner, somewhat on the Bunsen principle.

MM. Panhard and Levassor are constructing a 20 H.P. Petrol motor-van for the next Concours des Poids Lourds.

In spite of all protestations and complaints the French Ministry has definitely decided to enforce the tax on motor-vehicles.

M. Fulcrand, an abbot, of Marseilles, is having a steam automotor built; it will have a compound engine and a Longuemann boiler.

We regret to learn the death of M. Roger, a well-known constructor of automotors and inventor of the oil-motor which bears his name. He was only 47 years old.

During his recent stay in Paris Sir David Salomons presented a beautiful snuff-box to M. le Comte de Zuylen. On the lid is a picture representing an electric cab.

Petroleum merchants are having a good time in France, thanks to the spread of automobilism. One merchant has spent no less than 600,000 francs with one house alone.

The Paris Municipal Council has fixed the following prices for electricity:—For lighting, 10 to 12 cents. per hecto-watt hour. For automobilism (we presume charging batteries is meant) the price is 4 cents.

Messrs. De Dion and Bouton, with the view of increasing the popularity of their petroleum motor tricycles, are organising for next year a series of road races for these machines, in connection with which prizes will be put up for competition.

The German Post Office authorities have decided to employ automotor-vehicles. They have ordered two types, one a light vehicle for the collection and delivery of letters, and the other a heavy description for parcels, &c. Both will be four-wheeled vehicles and will have Daimler motors.

M. Mors has brought out a new kind of variable speed gear. We have not yet seen a speed gear which can by any logical process be called "variable." If M. Mors has really made a variable gear he need work no more. We expect, however, that it is a change speed gear that is meant.

It is stated by the *Traccion Ferroviaria* that at the Krupp Works, Esson, locomotive axles are now made of steel alloyed with 15 per cent. of nickel, which gives a resistance of 99 kilos. per square millimetre, or 50 tons per square inch, while with the addition of a little chrome, the steel acquires the almost incredible resistance of 180 kilos. per square millimetre, or 114 tons per square inch.

The following is the new tariff of the Automobile Club:—Breakfast, including wine, 3 francs 50 cents.; dinner, including wine, 4 francs; but on Wednesdays the dinner, including wine, is 5 francs. The charges are moderate enough, and we hope that British Automobile Clubs will charge equally moderate prices.

The official report of the Les Poids Lourds will be sent to all the principal State officers in France, as well as to all officials who are in any connected with transport. In this way much provincial ignorance which mayors, policemen, and other governors of the earth exhibit, not only in France but also in England, will be dispelled. We would suggest that the Home Secretary should procure a number of copies, and present one to every magistrate, J.P., and head constable. It would be a liberal education to them.

The cyclist may not be altogether blest in this country, says the *Daily News*, but it would seem, from remarks made by the lively *Revue Mensuelle* of the Touring Club de France, that he is far better off than his brother across the Channel. The *Revue* says:—"The Paris coachmen in the first fortnight of October killed 18 persons and wounded 112. Not a voice was raised in protest. C'est la Liberté! The cyclists, five times more numerous, caused during the same period five or six accidents. The entire Press rose as one man, while the magistrates emphatically declared that the streets are for the carriages and foot passengers, and for them only; and they proclaimed woe to the cyclists! C'est l'Egalité!"

In the forthcoming motor-car race from Paris to Amsterdam, the following gentlemen have been appointed a commission:—MM. Berlier, Herard, Varennes, Recope, Baron de Zuylen, Comte de Dion, MM. Henri Menier, Andre Lehideux-Vernimen, Ballif, Rives, Comte de Chasseloup-Laubat, MM. Archdeacon, Barbet, Clement, Collin, Pierre Giffard, Jeantaud, L. Lemoine, de Lucensky, Gaston Menier, Paul Meyan, Panchard, Perignon, Peugeot, Pierron, Pozzy, Ravenez, Sir David Salomons, MM. Serpollet, Gastine, Michelin, Echwege, Baron Rognat, and M. Prevost; and in the Marseilles-Nice race to be held in March, 1898, Sir David Salomons, Bart., has been placed on the Committee to represent Great Britain.

According to a table prepared and forwarded to his Government by the United States Consul at Zurich, there are the following lengths of tram line operated by electricity in the various countries of the world:—

	Kilometres.		Kilometres.
Germany	713	Russia	16·5
France	311	Servia	10
Great Britain	142	Sweden and Norway	8
Italy	128	Bosnia	6
Switzerland	88	Roumania	3·5
Spain	53	Portugal	3·5
Belgium	39		

In France the automotor-vehicle is used to convey the sportsmen and sportswomen to and from the scene of operations. In England the idea of riding to a "meet" in a motor-vehicle would be received with absolute horror as being contrary to all rules and precedents made and established and sanctioned by the custom of ages. Many a country squire regards a motor-vehicle as an outrage; but as for using it for hunting! why such an innovation is calculated to shake the foundations of society. However, in France its use for this purpose is extending, and we are told that the fashion has been set by the Duchess d'Uzès, who is an ardent automobilist and sportswoman. Her Grace drives to the hunt or shoot in a Delahaye. Another leader of French society, M. Përier, pursues the chase on a De Dion tricycle.

NOTICES.

Contributions and articles likely to prove of interest to our readers will receive due attention, but in all cases the name and address of the writer must be given, not necessarily for publication.

All matter intended for publication should reach us not later than the 10th of each month, and be addressed to THE EDITOR OF "THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL," 62, *St. Martin's Lane, London, W.C. Stamped envelope must be sent if the manuscript is required to be returned. The Journal is published the middle of each month.*

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The Automotor and Horseless Vehicle Journal.

A RECORD AND REVIEW OF APPLIED AUTOMATIC LOCOMOTION.

DECEMBER 15TH, 1897.

DIARY OF FORTHCOMING EVENTS.

Notices to be included under this heading should reach the Office not later than the 12th of each month.

[*For full programme and proceedings of the Self-Propelled Traffic Association, see p.* 105.]

1898.

Jan.	Exhibition of Locomotion and Engineering, Rifle Barracks, Belle Vue, Bradford.
Jan. 11 ..	Liverpool Cycle and Motor-Car Exhibition, Liverpool.
Jan. 20–29 ..	Midland Cycle and Motor-Car Exhibition, Bingley Hall, Birmingham.
Feb. 3–12 ..	Sheffield Cycle, Motor-Car, and Accessories Exhibition, Drill Hall, Sheffield.
Feb. 14 ..	Yorkshire College Engineering Society—"The Steam Turbine Engine and its Applications," by John D. Bailie (C. A. Parsons and Co., Newcastle).
March 6 and 7	Marseilles and Nice Race (organised by *La France Automobile*).
May 2, 9, 16, 23	Society of Arts Cantor Lectures—"Electric Traction," by Prof. Carus Wilson.
May 24 ..	Self-Propelled Traffic Association (Liverpool Centre) Heavy Vehicle Trials.
June	Motor-Vehicle Exhibition, Paris. Automobile Club of France. Sections—(*a*) Automotor vehicles which have given proof of their practical efficiency; (*b*) Industries connected with automobilism; (*c*) Motors adapted for automotors; (*d*) Vehicles adapted for automotors.
July 5.. ..	Race from Paris to Amsterdam, under the auspices of the Automobile Club of France.
1899	Race from Paris to St. Petersburg, under the auspices of the Automobile Club of France.
1900	Paris International Exhibition — Great Display of Automotor-Vehicles and Allied Trades.

ANSWERS TO CORRESPONDENTS.

A. SERENA.—What you ask for would entail an enormous amount of labour to send you personally. You will find the whole of the particulars you ask for in our 1898 "Automotor Pocket Book of Automotive Formulæ," which will be published about the last week in December.

YORKSHIRE MOTOR-CAR CO.—We have sent your communication on to Messrs. Halstead and Horsburgh.

T. J. MERCER (Sligo).—(A) The JOURNAL shall be sent you as instructed. (B) The address of the manufacturers of the Scotte Motors is Société des Chaudières et Voitures à Vapeur Systême Scotte, 56, Rue de Provence, Paris.

WOODHOUSE (Derby).—The books shall be sent you immediately upon publication. Messrs. Halstead and Horsburgh's address is Whitefield, near Manchester.

RICHARDSON (Leeds).—(A) We should say distinctly not. (B) Before doing anything write Messrs. Julius Harvey and Co., Consulting Engineers, at 11, Queen Victoria Street, London, E.C. They have the matter in hand.

AUTOMOBILISM IN LIVERPOOL.

IN Liverpool the question of automobilism has been taken up with commendable zeal and enterprise—not, we think, from any academic or philanthropic desire to cheapen the cost of transit of the poor man's coals, or his beer, or anything else which is his, but in a practical spirit of enlightened selfishness, which, after all, is perhaps the best way of regarding any question of public convenience. Liverpool and Birkenhead are the natural basins into which flow the vast streams of manufactured products from, to pursue the analogy, the commercial watershed of West Yorkshire and East Lancashire. Into Birkenhead and Liverpool comes also the bulk of the North American produce; and, although produce grown thousands of miles away is brought into Liverpool at what are ridiculously low charges for freight, and finished goods are carried from Liverpool to the ends of the earth at equally ridiculously low charges, complaints are, and have been for years, rife of the heavy costs that the manufacturers in Yorkshire or East Lancashire or their consignees abroad have to incur before the raw produce can reach the one or the finished product be used by the other. If the freight charges on, say, a parcel of cotton-spinning machinery made in Manchester and intended for erection in Japan, or the same charges on a Colorado ox for its transport to Birkenhead and its delivery as dead meat to Manchester, be examined, it will be seen that the heaviest item is railway carriage. In South Lancashire perhaps more than in any other part of the kingdom, the railway interest is all powerful—it has practically a monopoly. Attempts have been made from time to time to introduce competing means of transit, and the Manchester Ship Canal was built partly with this object. Owing to causes which need not here be discussed the Canal has failed utterly in this respect, and at present it is to all intents and purposes a more or less useful adjunct to the L. and N. W. R. Just as on the physics of metals there is an "elastic limit" or point beyond which stress is accompanied by deformation or strain, so in individuals there is a human elastic limit of endurance. Railway, telegraph companies, and other large trading corporations are well aware of this, what we may term law of public stress and strain. To give an example:—The Standard Oil Trust and their agents, the Anglo-American, the houses of Nobel and Rothschild between them fix the price of petroleum. They don't compete because they pursue a policy of enlightened selfishness. Between them they may advance the price of oil by a few cents, or they may lower it by the same amount. The difference may mean thousands or millions of profit, which comes out of the consumer's pocket, and he does not mind a bit. There is, however, a price beyond which he won't go, and the companies dare not attempt to reach this limiting figure, or they would arouse the apathetic selfishness of the public. Really the remedy for dear oil or heavy railway charges lies very largely in the hands of those who pay. Few of us can afford the luxury of an oil well in the back-yard, and still fewer of us own ships or railway shares; but in Liverpool as in Manchester, or indeed in any large city, the formation of automobile carrying companies, requiring but little capital to run them, might well be attempted. As will be seen from the excellent paper read at Liverpool before the Self-Propelled Traffic Association by Mr. Worby Beaumont, an excerpt of which is published in our present issue, that gentleman does not think heavy automotor vehicles, weighing, when loaded, some 14 tons, admissible, chiefly because of the heavy wear on the roads and the steepness of the gradients in and around Liverpool. He is inclined to favour automotor vehicles carrying from five to six tons. We quite agree with Mr. Worby Beaumont that by the adoption of a plate railway, such as suggested by Mr. A. Holt, these objections would vanish or be materially lessened. On the other hand, plate railways would hardly be admissible on the steep gradients that are found leading from the docks to the open country. Indeed, no more difficult site for the development of heavy automotor traffic could be well imagined than Liverpool. The railway companies have had to cut and tunnel extensively, and this opens up the question whether, after all, a light railway would not meet the case. Inasmuch as it would involve tunnelling, we think that if it is decided to have a light railway it would be as well to have an ordinary heavy railway, which, it is safe to say, would be in the Receiver's hands inside of twelve months. A railway of any sort in this district has, as is well known, the option of working with existing companies or winding itself up. Again, take this more practical instance. One steamer discharges in the Alexandra Docks, another in the Toxteth Dock, some six miles apart. What the merchants and shipowners, so ably represented by Messrs. A. Holt and A. Jones, want is the power to send an automotor vehicle to one or the other, and take, say, Smith's consignment of 25 or 50 bales of cotton direct ex wharf to the factory at Warrington, Salford, Manchester, or Oldham. Can it be done? It can, providing that local authorities and those owning these automotor vehicles will arrive at some equable arrangement as to maintenance of roads and bridges. After having witnessed, as we did, the exceedingly onerous French trials at Versailles, we are more than ever convinced that heavy automotor traffic can be advantageously undertaken even in Liverpool; and we speak with some small local knowledge. A heavy railway is out of the question. A light railway would be objected to by the Corporation, as interfering with their tram schemes; moderate automotor vehicles, such as Mr. Worby Beaumont suggests, should be tried first, and their economical limits determined; heavier ones might then be built. Unfortunately there was no discussion on Mr. Beaumont's paper, and the rather pessimistic impression that prevailed to the effect that heavy automotor vehicles are not possible could not be corrected. Seeing how deeply interested Liverpool is in this question, and how, with a capital of less than £10,000 the whole thing could be exhaustively threshed out, it is to be hoped that steps will be taken by those most concerned to test the various views put forth. It is useless, it is stupid, to say, as do the London bus and tram directors, "We are waiting for the 'really satisfactory' motor," because the perfect motor vehicle does not exist, any more than the perfect steamship or the perfect mangle, and probably never will in our time. G. H. L.

THE RISKS OF HORSE DRIVING AND RIDING.

When the poet of old wished to show up the general folly and stupidity of mankind he said: "Some put their trust in chariots and some in horses," thereby implying that in so doing they were relying upon something unstable, uncertain, and unsafe. In those days, when chariots were the only vehicles known and horses or other animals the only sources of tractive power, the user had no choice. He either had *de facto* to put his trust in them or leave them alone. Nowadays there is really little or no excuse for putting any trust in horse-drawn vehicles. Yet such is either the influence of the barbaric instinct or the force of habit that many people prefer to ride or drive horses who might with advantage to themselves and their families prefer the unquestionably safer automotor vehicle. We ourselves, in common with other humble members of the community, are too often forced by circumstances to entrust our lives to the London jehu who drives a bus or cab; we, however, never do so willingly, and could we afford it nothing would ever tempt us to risk an otherwise useful and blameless existence by entrusting it to chariots and horses.

It may certainly be advanced that little risk is entailed when dealing with the poor, overworked, underfed, broken-spirited animals that one is accustomed to see in London and Paris cabs and omnibuses; but one never knows, even these creatures are at times afflicted with a kind of equine hysteria, and under the impulse of a glorious discontent with their unhappy lot they make one last mad rush for freedom and are usually only stopped when they have succeeded in knocking down a lamp post or two or smashing the plate glass of a shop. Far more dangerous is it in the country, where horses are usually better treated, especially when, as is often the case, they are not too much worked and are only too glad to bolt at top speed on the slightest provocation. How many valuable lives have been lost through this cause it would be difficult to say, but every now and again we read of sad and deplorable accidents occurring—all the more sad and deplorable because the risk is so utterly unnecessary. It is not too much to say that were hunting and driving pastimes indulged in by the working classes we should be assured "that legislation was imperatively called for to prevent the loss of life of British working men and women." As it is, these pastimes are indulged in only by the "classes," and so nobody—at least no "popular representative"—cares whether the annual loss of life occasioned by riding or driving high spirited horses is much or little. Leaving this aspect of the question, it is undoubtedly the fact that riding or driving horses is attended with a much greater risk than any other form of locomotion, and it is no doubt the element of danger involved that makes these pastimes such a favourite "sport," and this is enhanced by the absolute uncertainty of what the horse is going to do. Indeed unreliability is, perhaps, more than any other the distinguishing characteristic of the animal. We are led to make these remarks in consequence of the sad and deplorable death of a very distinguished lady—a personal friend of Her Majesty, and one, moreover, greatly esteemed by all classes—we refer to the late Countess of Lathom. It seems that, according to the report published in the daily papers, the Earl and Countess of Lathom had invited a large number of guests for the opening of the shooting season on their Lancashire estates at Ormskirk, and on the morning of the 23rd ult. his lordship and his guests shot over the covers. Several ladies were present in carriages. After luncheon the Countess of Lathom left the party in a phaeton, drawn by two ponies, which she herself drove, her companions in the vehicle being two other ladies. A coachman was in attendance. Not far from the entrance to Lathom Park one of the ponies became restive, and made a sudden plunge, which caused the carriage to swerve to one side of the road, where there runs a somewhat deep brook. The wheels slipped over the bank, and the vehicle toppled into the stream. The Countess of Lathom fell into the water, and the carriage rolled upon her. The other ladies, as well as the coachman, were also thrown out, but escaped the falling vehicle, and suffered little injury save a few bruises and the shock inevitable in such an occurrence. The coachman at once procured assistance in the neighbourhood, and the carriage was lifted out of the brook. Her ladyship was found under it in the water, and it appears that in the fall she must have been kicked by one of the struggling ponies. The body was at once removed to Lathom House, and Dr. Pendlebury, of Ormskirk, was summoned. He expressed the opinion that death was due to concussion of the brain.

That such an accident should occur is always probable. It only requires the slightest cause to make a horse restive, and he then becomes a maddened and unmanageable brute. We can only express the hope that these accidents will become rarer in future. There is no reason whatever why precious lives should be thus risked. The ordinary bicycle is infinitely safer, more reliable, and cheaper in every way than the best horse; while a well-designed automotor vehicle is beyond question the only conveyance suitable for ladies.

*** The General Post Office authorities have within the last two or three days arranged a contract with Messrs. Julius Harvey and Co., of 11, Queen Victoria Street, for the regular conveyance of parcel mails between London and Redhill, to commence on Thursday night, the 16th instant. The van to be employed will be on the "Lifu" steam principle, and will have to carry all the heavy Christmas mails as a start. This contract has been entered into after thorough inspection, &c., by the Secretary and the chief officials of the Post Office.

AUTOMOBILISM AND THE LONDON COUNTY COUNCIL FIRE BRIGADE.

We do not profess to be prophets, but we claim to know something—not much, perhaps—of the subjects upon which we write. In last month's AUTOMOTOR, writing on the Fire Brigade, we said:—

"Speaking generally, it must be said that most of this enormous plant is antiquated and obsolete in design, and generally inefficient: there is not a single steam motor which works at anything more than 150 lbs.—a comparatively low pressure. There is not a single electric pump. Flexible metal section hoses are things utterly unknown to the Fire Brigade, as are water towers and other improved means for dealing with fires. Lastly, *there is not a single automotor fire engine in the first city of the world.* Can it be wondered at that London fires are so frightfully destructive and so costly? Little or no improvement has been made in the plant of the Fire Brigade since the days of the old Metropolitan Board of Works."

We—not being prophets—did not anticipate that such an absolute and positive proof of our contention would be afforded within such a short time, yet, as all the world now knows, London has narrowly escaped destruction by fire simply because we have no means of dealing with large conflagrations. When flame is applied to a combustible in presence of free oxygen total combustion ensues with greater or less rapidity. By various means the combustion may be checked or stopped altogether. If the combustible is of value the scientific method of treatment would be to stop the combustion with as little damage to the unconsumed portion as possible. Now fires in cities have from time immemorial been frequent, costly, and destructive, and it would be a reasonable assumption that at the end of the nineteenth century fire extinction and prevention was a fine art. Yet what are the facts? All the more serious fires which have occurred in London during the last 20 years, including the enormous one on the 19th ult., have been distinguished by the same characteristics; these are:—

(*a*) A small fire has become a large one because there is no such thing in London as scientific fire prevention.
(*b*) The fire has always involved the total destruction of the premises upon which it has occurred.
(*c*) The fire has always extended to adjoining premises.
(*d*) The damage done by the Fire Brigade is a large proportion of the total loss.
(*e*) The operations of the Brigade are mainly confined to preventing the extension of a fire *after* the latter has become, in vulgar parlance, "well alight."

It must, of course, be understood that we make no reflection upon the *personnel* of the Brigade. We quite admit that all firemen are "gallant." We suffer from no lack of brave and gallant men and women in all walks of life. But bravery and gallantry, as all history shows, are of little avail without good organisation and appliances, and it is just these two matters which, in the case of the London Fire Brigade, are so susceptible of improvement. The Fire Brigade has been a kind of spoilt child with the public, and, like all spoilt children, it is impatient of criticism and control, but greedy of applause. If one observes the proceedings at a fire, it must be conceded that, as a rule, the men are fairly well handled; but there is too much theatricality, too much of the polished brass and tinkling cymbal for efficiency. A steam fire-engine drawn by horses dashing up to a fire no doubt tickles the eyes and ears of the groundlings, but it makes the judicious grieve to reflect that this costly and inefficient method of propulsion is yet with us in the land, and that this wretched two-horse show should be trotted out as an up-to-date fire appliance of the first city of the world.

In order to give an idea of the obsolete character of the so-called fire engines used by the London County Council we give the following particulars:—The boilers are of iron of a design that is nearly 50 years old; they carry steam at the comparatively low pressure of 100–120 lbs., and can only by dint of hard firing and careful nursing and stoking maintain it at that. The pumps are of the obsolete single cylinder bucket and plunger type; their maximum-rated (*sic*) capacity is 350 gallons per minute, usually they are doing well if they deliver 200 gallons per minute. This water is discharged through a 1¼-inch nozzle, and is supposed to reach to a height of 160 feet—as a fact 80 feet is nearer the mark. To work this amplified garden squirt no less than 30 I.H.P. and six men are required. These pumps have a *modulus* of about ·30 only; in other words, they are very inefficient. Consequently, in order to throw any stated quantity of water on the scene of a conflagration three times the number of pumps, and therefore three times the plant and appliances, is required than should be necessary. We understand that there is only one fire engine in the London Fire Brigade that can deliver 500 gallons per minute, whereas in many provincial and Continental cities the engines can throw from 1,500 to 1,800 gallons per minute, the average capacity of the London squirts being about 200 gallons per minute. One of the disadvantages attending the use of such small capacity engines is the small size of the projected stream of water and the low pressure. The consequence is that when these garden-squirt streams are projected into a fierce fire the water is flashed into steam, and much of the latter becomes dissociated and actually feeds the flames; in short, in not a few cases the Fire Brigade's efforts increase the conflagration. So long as pure water is used it must be delivered in large volumes at high pressure. This means large, powerful, automobile engines, of not less than 50 E.H.P. It also means the use of water towers—things utterly unknown in London. Naturally enough the glaring inefficiency of the Fire Brigade and the danger of repeating the great fire of 1666, which was not at all improbable, aroused much feeling in the Press. We need not notice the comments made in the lay journals, but the phenomenal ignorance displayed by the *Daily Telegraph* deserves a word. In a leading article on the Fire Brigade it says:—"Motor fire-engines have been suggested after the American model, but these would be almost as much embarrassed by narrow winding lanes as horses." We need hardly say it is just this very property of being able to penetrate where horse-drawn could not that is one of the many advantages of automotor vehicles. This is the unanimous verdict of all competent persons who have ridden in them. Turning to the professional journals we find the Fire Brigade regarded much from our point of view; thus in a recent issue *Engineering* says:—

"But what are the lessons of this enormous conflagration? Those who attended the fire, and have afterwards examined the ruins, can only tell the same tale. The lesson is, that we seem to know but very little about fire protection in London, and that the sooner we take up the matter, the better for all concerned, more particularly if we remember the rate at which the metropolis is growing in extent, the greater costliness of our structures, and their contents. We are not only much too far behind other countries in taking preventative measures, but we are certainly also not ahead of other modernly-equipped cities as regards fire-extinguishing, excepting, perhaps, in the physique and activity of our firemen, our horseflesh and driving, our new fire-stations, some of our engines, the cleanliness and brightness of our brasswork and red paint. Our Fire Brigade can also boast of being able to play to the gallery better than many of their colleagues elsewhere. As regards organisation, general management, and appliances, tactics, and, what is perhaps most serious, the principles on which our fire service is based, we are not only worse than many other cities, but actually the laughing-stock of the foreigner, who we are so apt to despise. There is not the least doubt that

. . . . what was the model brigade of the world in the seventies certainly no longer holds that position. Other nations learnt from us at that time and adopted our methods, improved and developed them, whilst we have practically stood still in everything, excepting numerical strength."

In order to improve the present inefficient, costly, and theatrical service we make a few suggestions:—Amendment of the Metropolitan Building Act; compulsory installation of hydrants; drawing water from the mains and of cisterns containing chemical fluid* on the roofs of warehouses and buildings containing easily inflammable goods; the erection at salient points of electric fire-pumps, these should be either fixed or automobile, in the latter case reels of armoured cable would be required; the replacement of the present fire-engines by automobile engines, and the use of water-towers; and lastly, the reorganisation of the brigade.

REVIEWS OF BOOKS.

"Motor-Cars and the Motor-Car Act, 1896." By WALTER SMYTH. 2nd edition. (Dublin: Hodges, Figgis, and Co) Price 6*d*.

THIS is a little brochure which in four chapters contains all the information that the layman need know of the law of motor-cars. The author is evidently an enthusiast, but is not an engineer, or he would not say that steam has been superseded by its two rivals (why rivals?) electricity and petroleum. He continues: "There is no doubt that in regard to economy petroleum is undoubtedly (*sic*) the cheapest, but there are other desirable qualities to be looked at, such as bulk and safety, and of these electricity has the *advantage*." Whether it be an advantage to have the bulk necessitated by the use of accumulator cells may be questioned. Again, the piston of the Daimler motor is *not* "driven *up* and down" the cylinder by small explosions, &c. In his legal knowledge the author is much better posted, but as there are at least two or three standard works on the subject, it is easy to ascertain what the law is. Chapter IV relates to the law for Ireland, which does not differ substantially, if at all, from that of the United Kingdom. The work is certainly worth its price, and as it can be easily carried in the pocket *its* small bulk is an advantage.

The Engineering Magazine.—The November number of this is to hand, and as usual contains plenty of matter interesting alike to the engineer and business man, especially if the latter is engaged in transportation work. The first article by Mr. H. S. Maxim will be read with more than ordinary interest at the present juncture, it is entitled "The Effects of Trade Unionism upon Skilled Mechanics." Mr. Maxim, as a strong individualist, has little or no sympathy with trades unions. We have always regarded such bodies as useful, but imperfect and crude, and as education advances their power will in the nature of things decrease, simply because no half-dozen educated men could, if they were made of common or garden clay, consent to have their individuality sunk in a dead level of mediocrity—we are too selfish. Mr. Maxim gives many examples of the methods of trades unionism as applied to the lessening of production and the peculiar views entertained by members of unions. One instance is the following. He says:—"I remember that on one occasion several delegates were sent to us by the Amalgamated Society of Engineers with a complaint that we were allowing an unskilled man to work a Brown and Sharpe milling machine. The chief spokesman was a very young man. He said that this machine was of a very high order, and ought by rights to be worked by a man skilled in the art, and not by a mere labourer. We informed him that the man who was operating the machine was indeed a skilled man, that he was able to do the best work done in the place, and that he had worked a milling machine for 30 years, beginning several years before the spokesman himself was born. We asked him if he could do better or quicker work than the man complained of. He said that he did not think he could do it as well. He admitted that the man was able to do the work, but said that technically he was not a skilled mechanic, because he had not served as an apprentice before he was of a certain age. Consequently, no matter what he might do afterwards, or how skilful he might really make himself, he must remain for ever, technically, an unskilled workman, work for lower pay, and be debarred from doing the fine work that he was so well qualified to do. I found that this same feeling existed all over England." Mr. Maxim concludes:—"It appears to me that trade unions oppose, and always have opposed, the use of machinery which enables work to be turned out quickly and cheaply, and I believe there has never been a machine, apparatus, or system introduced into England which has helped to give her the position which she now occupies as a great manufacturing nation, which has not been opposed tooth and nail by the ignorant and unthinking who make up the rank and file of the English trade unions." We would correct Mr. Maxim on one point—he must except the cotton operatives from the last charge.

"Future Supremacy in the Iron Markets of the World," by Mr. J. Stephen Jeans, is, as might be expected from such an authority, a useful contribution. He shows what a leading part the United States are playing in the production of iron. We ourselves remember carrying "pig" to the States; now it is imported. Mr. Jeans shows also that much of the credit for the present position of the United States is due to the American working-man, who is more highly paid, works longer than our own, and who, by his superior intelligence, welcomes every possible improvement in machinery, because it enables him to do more work, and therefore earn more money in a given time. "Modern Wharf Improvements and Harbour (we beg pardon, we should write Harbor) Facilities," is the second of a series of articles which was commenced in the last issue. We commend them to our friends the S.P.T.A. of Liverpool. "Cost-Keeping Methods in Machine Shops" appeals more directly to managers, and is of little general interest. "American Tall Buildings" is a smart criticism of the architectural methods pursued in the States. The author, Mr. S. Capper, is quite content to let our American friends rejoice in their tall buildings. He, as we do, prefers more humble dwellings. "The Enormous Possibilities of Rapid Electric Travel" is also a continuation of a series of articles on this subject. The authors simply revel in estimates and statistics, and we have no doubt but that this contention will be keenly criticised on this side.

"The Economical Governing of Steam-Engines" is a contribution to this important subject by one of our greatest living authorities. Mr. John S. Raworth is, we need hardly say, the recognised successor of Willans, and the present paper is largely an exposition of the now well-known "Willans' Law." We cannot do justice to this article here, and beyond recommending it strongly to engineers we leave it. A paper on "Cement in Construction Work" and one on "Ore-Loading on the Great Lakes" are useful but not particularly informing. "English Railway Stations," by Mr. Whitehead, is an interesting account of the handling of goods in large depôts. It is well to know that the companies kindly store produce in their warehouses rent free for a month. "Civil Engineering" is dealt with by Mr. Graham Harris, C.E., who in a strictly professional manner tells us that in Greater London, with its population of some five and three-quarters or six millions, there has to be disposed of every week a weight of dead humanity equal, roughly speaking, to some 100 tons, or something like 15 tons per day for every day of the week, and "this although Greater London is probably the healthiest city in the world, the average death rate being as low as 19 per 1,000 inhabitants per annum. It is a gruesome thought," continues Mr. Harris, "and a gruesome calculation, but the fact has to be recognised that, to put it in another way, a heap or pile of dead humanity some 3 feet high, 6 feet wide, and more than 250 yards (750 feet) long has to be disposed of in Greater London every seven days." Mr. Jas. Swinburne discourses pleasantly on the electrical engineer, and he tells us—and we quite agree—that it is better to sell paint and varnish than to know much mathematics. Mr. Worby Beaumont deals with "Mechanical Engineering," and we give an excerpt from his paper in another place. Altogether a readable magazine.

* The following fire-extinguishing composition is cheap and effective. Six solutions should be prepared as follows:—

1.	Ammonium chloride	0·44 lb.
	Water	4·4 galls.
2.	Calcined alum	0·77 lb.
	Water	2·2 galls.
3.	Powdered ammonium sulphate	6·6 lbs.
	Water	1·1 galls.
4.	Common salt	4·4 lbs.
	Water	8·8 galls.
5.	Sodium carbonate	0·77 lb.
	Water	1·1 galls.
6.	Soluble glass	9·9 lbs.

The whole of these should be mixed together in the order indicated, and 4·4 galls. of water are then added to the result. This solution is very useful for small fire-extinguishers. By taking 100 or 1,000 or 10,000 times the quantity a larger fire could be dealt with.

The Electrical Review has enjoyed 25 years of existence, and has fittingly celebrated the event by the issue of a double number, in which the progress of electricity is reviewed during that period. In these days of fierce competition between newspapers—competition which in too many instances produces a moral depreciation on the part of proprietors and editors—it is pleasant to know that there are some journals which have always maintained a high journalistic and scientific standard. Such a journal is *The Electrical Review*, and the present high position of the paper in the scientific and technical world is due to two things—ability and probity. *The Electrical Review* has indeed been a kind of literary crucible into which have been put many kinds of frauds and impositions, from primary batteries to medical belts, and refractory indeed has been the matter that could withstand the heat of the editorial fire. In this way it has rendered a great public service. The present number is a most instructive one; it contains articles from the pens of the principal electrical engineers, and the reader is enabled to survey the whole field of electrical science and industry.

The Carriage Monthly Daily is the somewhat confusing title of a very live Transatlantic journal devoted to the carriage industry. It is celebrating its silver anniversary, having been founded in 1872. In consequence of having reached this term of middle life, and having had, as its advertising pages bear copious witness, a prosperous career, it has come out on this special occasion as a thick volume, which is worth preserving for many reasons. In no country has the art of carriage building been so improved as in the United States. American makers taught us how to design structures possessing the maximum of strength and rigidity with the minimum of lightness and section. Wood-working machinery is a distinct American speciality, and it is really marvellous to see how light, and yet how strong, American carriages are. All these and kindred things it is the business of *The Carriage Monthly Daily* to record, and we congratulate our contemporary upon the prosperity it has achieved. The present volume is not only a review of the United States carriage industry, but, as the journal is published at Philadelphia, there is a long series of photographs of the more principal points of interest in that interesting city. The book is a very creditable trade production, and we congratulate Mr. Wade upon it.

CATALOGUES.

MESSRS. ELLIOTT BROS., the well-known manufacturers of mathematical and mechanical apparatus, have recently issued a new price list, which is very well illustrated and got up.

THE Humber Cycle Company send us a well illustrated catalogue of their specialities in cycles and their accessories. The "Humber" is too well known to need any description, but perhaps the best proof of the excellence of Humber cycles is to be found in the rather high prices that the Company is able to command.

WE have also received from the Humber Company their catalogue of automotor vehicles, or more properly automotor bicycles. These are made to be propelled either by light oil motors or by storage cells. For their tandem pacer they claim to have obtained a speed of 40 miles per hour. We rather prefer the look of their motor tricycle, which is driven by a 2¼ H.P. motor. We notice that the Humber Company make a compact, heavy, oil, two-cylinder motor, which seems well adapted for vehicle and launch propulsion.

FROM the Reliance Lubricating Oil Company, of Water Lane, Tower Street, London, E.C., we have received a price list of their various brands of lubricating oil, which, from the tests, &c., seem to us eminently well adapted for automotor purposes. These oils are non-corrosive and do not absorb oxygen, hence they do not "gum" or clog. We notice a well designed tank or drum made by this firm which is well suited for the storage of petrol and other light or heavy oil. We hope no user of petrol will ever store it in a cask. Mentioning casks reminds us that this firm are issuing to their friends and clients a china inkstand shaped like a petroleum barrel; this is mounted on a broad base and forms a useful office utensil.

CORRESPONDENCE.

*** *We do not hold ourselves responsible for opinions expressed by our Correspondents.*

*** *The name and address of the writer (not necessarily for publication)* MUST *in all cases accompany letters intended for insertion or containing queries.*

THE MONOPOLY OF AUTOMOTOR MANUFACTURE.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

SIR,—Several engineers like myself would like to manufacture motor-cars, but, at the same time, do not care to do so with the awful threats and claims made by the British Motor Syndicate as to their master patents. I should like to ask through you what their patents are:—

(1) Do they consider that the combination of a carriage and steering gear with springs and axles to be one of their master patents?
(2) Do they claim the use of all kinds of gear wheels?
(3) Do they claim sprockets and well-known methods of chain driving in combination with an oil motor?
(4) Do they claim combination of a cylinder, piston, crank-shaft, and fly-wheel?
(5) Do they claim the exclusive combination of an inlet valve and exhaust valve?
(6) Do they claim the exclusive right to use benzoline or heavier oils?
(7) Do their master patents cover all systems of carburetting?

If you could kindly enlighten me and several of your readers on these points you would greatly oblige a large body of engineers who would like to take up this new industry.—Yours truly, PETROL.

P.S.—I should also like to know what use Lanchester's Patent Gas-Engine Starter is for motor-cars fitted with oil motors, as I understand they claim a great future for this patent.

[We should advise our correspondent to read carefully Sir David Salomons's paper in which he deals with the question of the validity of patents (*see* AUTOMOTOR, May, 1897). Our own opinion is that probably not more than half a dozen of these so-called "master" patents are valid, and what are valid are of little use, and so far as our own knowledge and experience extend we should say that an intelligent designer could attain the same end by a modified design.—ED.]

ROLLER BEARINGS.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

SIR,—Can you tell me whether the advantages of these bearings are sufficient to justify their substitution for ball bearings on the wheels of my two cars of about 15 to 20 cwt. each.—Yours faithfully, A. C. CRAGG.

Llandudno, *November 25th*, 1897.

[Yes, decidedly so.—ED.]

A GOOD PERFORMANCE.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

SIR,—A run of 450 odd miles in five working days, averaging 9½ hours per day, is not a bad performance for a motor-car, taking into consideration the state of the roads at this season, and that the car in question was not a light carriage but a small "lorry" or drag, carrying a load of nearly half a ton, besides the driver and passenger.

A Glasgow firm, having purchased the car in London, decided to have it sent home by road, and accordingly a start was made for Scotland on the morning of Friday, November 12th, and Grantham reached about 8 o'clock the same evening; the second day's run ended at York, and so far the weather, although cold, had been dry, but on Sunday a perfect downpour compelled the voyagers to seek shelter in Durham at an early hour in the afternoon. Monday morning gave promise of a fine day and a pleasant time, but the promise was not fulfilled, as at about 12 o'clock a blinding snowstorm was encountered, and the inevitable breakdown occurred. This, however, was not serious, merely the slipping off of a driving chain owing to the links having stretched, and half an hour being lost over this, and the country being a difficult one, it was decided to put up for the night at Berwick.

Edinburgh was reached on the following afternoon, and Glasgow at 8 o'clock the same evening, the entire time spent on the road being, as before stated, 47½ hours. The car was driven by Mr. W. M. Hodges, the Manager of the London Motor-Van and Wagon Company (Limited), the builders, the motor being of the well-known Daimler type.—Yours faithfully,

THE LONDON MOTOR-VAN AND WAGON CO. (Ld.),
per W. M. HODGES.

London, *November 22nd*, 1897.

[While congratulating our correspondents upon their performance, we must say that it is no better than what ought to be expected. Automotor vehicles of good design, such as are referred to, are quite out of the experimental stage, and are as reliable as railway locomotives.—ED.]

A VERY SATISFACTORY LETTER.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

SIR,—Perhaps a few notes from Yorkshire may interest you. First as to ourselves. Business keeps constantly improving. We have sold cars each of the last three weeks and the number of enquiries increases. We shall directly have four cars belonging to private gentlemen in Bradford, and one or two other orders promised for the spring.

The pessimism of the Press is giving way to a more reasonable attitude and we look for considerable progress next year. We have plenty of room and shall be pleased to provide free storage and use of tools, &c., to any persons visiting Bradford with autocars. We can allow supply of petrol and charge batteries.

Cars on hire are in great demand; one of ours is now running in Sheffield, taking season-ticket holders free to an exhibition that is open there, the car being hired for the purpose by the exhibition authorities. Our cars have been to Bristol, Brighton, Norwich, Hitchin, Doncaster, Goole, Henley, Sheffield, Derby, York, Leeds, Ingleborough, Wakefield, Chester, Brandon, &c., all lent on hire.

We are also making sales on the hire purchase plan. A stranger car was in Bradford last week, a Daimler, owned by Messrs. Crossfield and Company, the soap makers. Motor-cars and soap seem to go together; three large soap firms, at all events, use cars for advertising.

We are working on a steam wagon and hope to compete at Liverpool in May next. Our motor exhibition has had to be postponed till later in the spring or summer. We could not get the Drill Hall in January.

An Arnold sociable of ours was carrying voters at the Leeds Municipal Election from 9 a.m. to 8 p.m. with only one hour's interval, and, although only built for two persons, was often carrying three and four people, and not one hitch all day with a 10 miles run from and to Bradford before and after the polling time.—Yours truly,

JAS. ED. TUKE.

Yorkshire Motor-Car Co., Ltd., Bradford, *November 23rd*, 1897.

[We congratulate the indefatigable Mr. Tuke on the steady success he is deservedly achieving. It is just this sort of persistent progress that we wish to see.—ED.]

A CLERGYMAN ON MOTORS.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

SIR,—I have pleasure in enclosing 8*s.* 1*d.* for the AUTOMOTOR JOURNAL for 12 months from this date, and "Pocket-Book." I am very much interested in the motor-cars, but I greatly regret there is really no vehicle which at present would be suitable for country-people where there is no electric power. The light oils are objectionable, owing to the smell and dangers attending their use.

Until I can find a vehicle which weighs about 3 cwt., and which will carry two or three people at 10 or 12 miles an hour on the level road, I shall not invest in a motor-car. There is such an amount of trouble connected with those now in use, and no little uncertainty as to their working capabilities, that I must only wait. In the meantime, I shall scan your Journal and hope for progress.—Yours very truly,

A. TAIT, D.D., Archdeacon of Tuam.

[Our reverend correspondent may take it from us that a well-designed oil automotor vehicle can be obtained in which there will be no objectionable features, and which can be easily handled and managed by any intelligent stable boy.—ED.]

MR. MAXIM'S MOTOR.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

SIR,—It was with much interest I read in your last issue the account of Mr. Maxim's new motor and his claims in connection with the same, particularly so as I found I had been working on somewhat similar lines for a tricycle motor. I confess I was considerably disappointed with the arrangement (Mr. Maxim's), as I was looking for a machine that was to strike out on entirely new lines, and I am afraid Mr. Maxim will find he is walking a well-trod path. I saw a diagram of an engine illustrated in one of your contemporaries over a year ago (I believe it was the *Autocar*), which must work on exactly the same cycle as Mr. Maxim's. At the commencement of the stroke the pressure line rose vertically to about 40 lbs. pressure, then moved horizontally for about one-fourth the stroke, then rose again vertically under an explosion to about 100 lbs, and then fell through the ordinary gas-engine expansion curve. I have forgot who the inventor of this engine was, but he will no doubt turn up to claim his rights. Mr. Maxim's method of working his oil-valves by means of mechanically wrought hammers is certainly not a commendable point on a motor-car engine. There will be quite enough hammering action without introducing it artificially. The jolting of the car will not conduce to the steady working of the hammers either. On no point does the motor err on the side of simplicity, and I consider that though it may be a good enough machine to be put into the hands of the expert engineers who are to work the new flying ships, or machines, which are to establish communication with Klondyke, it is not the best engine I have seen to put into the hand of an agricultural labourer.—Yours truly,

J. J.

[Mr. H. S. Maxim will doubtless take note of our correspondent's remarks.—ED.]

The Stanley Cycle Show.—The twenty-first show of cycles, &c., was held during the last few days of November, at the Agricultural Hall, Islington, under the auspices of the Stanley Club. As an exhibition of cycles it was a great success. All the cycling Press has been quite enthusiastic over it. There was also a very good display of tools and machines employed in cycle manufacture. The departure made last year was continued this by including motor-vehicles in the show. But while those vehicles entered were undoubtedly fine pieces of work and well and carefully finished, there was no great improvement noticeable. The Daimler, the Great Horseless Carriage Company, and the Humber Company exhibited their various specialities. The Daimler had seven different kinds of vehicles, all made at the Company's works at Coventry. The only difference between any of them is the car body, the mechanism and framing being alike in all essential features. The Great Horseless Carriage Company had dog-carts, mail phaetons, and wagonettes on view, all, however, fitted with the Daimler motor, also some Bollée voiturettes and De Dion tricycles. The Humber Company exhibited several tandem motor-cycles of the Bollée type and some electrical tricycles. Much ingenuity has been displayed in working out the details of these machines, but it must be confessed that their appearance is not as neat as could be desired. The Burgess Cycle Company showed M. de le Croix's motor-quadricycle, and the Beeston Cycle Company also showed several motor-cycles. It is to be regretted that no motors of purely English design were to be seen, all being of either French or German origin. There was nothing, in fact, calling for extended criticism or description.

President	Sir David Salomons, Bart.
Secretary	Andrew W. Barr, Esq.
President of the Liverpool Centre	The Earl of Derby, K.G., G.C.B.
Hon. Local Secretary	E. Shrapnell Smith, Esq.
Semi-Official Journal of the Association	The Automotor and Horseless Vehicle Journal.

SELF-PROPELLED TRAFFIC ASSOCIATION

(INCORPORATED).

NOTICE IS HEREBY GIVEN, that the Second Ordinary General Meeting of the Self-Propelled Traffic Association (Incorporated), will be held at Cannon Street Hotel, London, E.C., on Monday, the 20th day of December, 1897, at 3 p.m.—

1. To receive the Report of the Council.
2. To receive Accounts and Balance Sheet for the year ending 31st December, 1896.
3. To elect Members to fill the vacancies on the Council.
4. To elect an Auditor.
5. To transact the General Business of the Association.

By order,

Andw. W. Barr, *Secretary.*

30, Moorgate Street, London, E.C.,
9th December, 1897.

Liverpool Centre.—Programme for 1898.

1898.	
January 25 ..	Paper: "Some Points in the Design of Automobile Vehicles intended for Heavy Traffic." Mr. Geo. H. Little, Technical Editor of The Automotor and Horseless Vehicle Journal.
February 8 ..	"An Account of our Trials and Experiments, with the Conclusions drawn therefrom." Mr. D. S Simpson and Mr. W. L. Bodman, Joint Authors
February ..	"Steel Springs." (Date and author in abeyance.)
March ..	"Leather Tyres." (Date and author in abeyance.)
March 29 ..	Paper: "Recent Improvements in Accumulators and in their Application to Traction on Common Roads." Mr. J. T. Niblett.
April 19 ..	Paper: "Arrangements for the May Trials." The Honorary Secretary.
May 24–27 ..	Trials of Motor Vehicles for Heavy Traffic.

Inauguration of the Liverpool Winter Session.

The opening of the Winter Session of the Liverpool Centre was inaugurated on the 26th ult., when Mr. Alfred Jones, the well-known Liverpool shipowner and merchant, gave a luncheon at the Exchange Station Hotel, Liverpool, to a large and representative number of merchants. members, and others interested in automobilism, to meet Mr. Worby Beaumont, M.I.C.E., M.I.M.E., who was in the evening to read a paper before the Association, at the Royal Institution, on "Self-Propelled Vehicles."

At the luncheon Mr. A. L. Jones presided, and the company included Sir Gilbert Carter (formerly Governor of Lagos), Mr. Charles M'Arthur, M.P., Mr. Alfred Holt, Mr. G. H. Cox, Mr. John A. Brodie, Mr. E. R. Calthrop, Mr. Harcourt E. Clare (town clerk), Colonel A. H. Holme, Mr. Thomas H. Barker, Mr. Arthur Musker, Mr. E. Shrapnell Smith, Mr. Lawrence Jones, Alderman J. Webster, Mr. W. J. Davey, Mr. Alex. Sinclair, Mr. W. D. Heyne, Captain Rattray. Captain Graham, Mr. Edward H. Cookson. Mr. W. G. S. Alder, Mr. H. Cottrell, Mr. H. L. Spark, Mr. G. W. Neville, Mr. W. W. Wilson, Mr. W. Denton, Mr. J. P. Davies, &c.

After lunch Mr. A. Jones delivered a brief speech, in the course of which, speaking of Liverpool, he said no city could possibly be worse served so far as the means of locomotion were concerned. It was with a feeling of thankfulness that in London they now saw motor-cars running at rates which would pay, and it behoved them to see that they were introduced in Liverpool as soon as possible. Cheap and good locomotion was a matter of vital importance to the port of Liverpool and the surrounding district. It had been said by Mr. Holt that the Manchester Ship Canal was a great misfortune to Lancashire, and there was no doubt it had been, because it was money needlessly spent If they had had some kind of fair dealing on the part of the railways they should never have had the Manchester Canal, and Liverpool would have had a far greater trade than it had. It was most important that Liverpool men should try and get some improved and cheaper way of working the port. They ought not to be satisfied. Manchester was not satisfied until it got what it did not want. Liverpool surely ought not to be satisfied until it got what it did want. A railway could be made to Manchester which could be run at half the rates charged to-day, and leave a handsome profit. The railway companies were not justified in treating Liverpool as they did, and making it pay for their losses in some other directions. He felt that with those enormous ships they were now building delivering cargo at very much lower rates than formerly, they only wanted improved and cheaper transit out of Liverpool, and they might double the trade they had got to-day. The Dock Board were doing all they could according to their intelligence, but they might do more. When he contrasted Liverpool with other ports he always felt sorry to find there was so much done in other places towards getting trade, while they in Liverpool did so much, should he say, to drive it away, certainly not to keep it or get more. The position of matters in Liverpool was sufficient to justify the existence of the Self-Propelled Traffic Association, which was got up with the idea of trying to find out if anything could be done to put their port upon a proper footing. He sincerely hoped their efforts might have the effect of bringing about a better state of things all round.

Mr. Worby Beaumont said that it was only a year since they had been allowed to experiment on the roads, yet he was able to say that with regard to heavy motors there was a promise. As for light motor-vehicles they were now beyond the experimental stage, and were working successfully and economically in this country and in France. They could do what horses could not do. On long journeys the results were excellent One vehicle had run 18,000 kilometres in 10 days, and was in good condition, and after cleaning, started another long journey the following day. The electric cab is running in this country, and promises to be a commercial success, and was likely to become common in a short time. Motor-vans loading to, say, one ton are a practical success. They are now in the postal service for collecting purposes. He thought the Serpollet* system a good one for heavier work, and though little had been done in this country, experiments had been carried out on the Continent. The Scott and Dion motors for heavy loads showed that horses could be dispensed with to advantage. Traction-engines had grown excessively, and got up to 17 tons. This weight on four wheels damaged the roads, and it was a question whether the authorities would allow

* The Serpollet system is fully described in the present number.—Ed.

this. The horse exerted the greatest power, and was most economical for short distances, say about the docks, as it would require an engine of 20 to 25 H.P. to start a load which two horses could work with comparative ease. It is when the motor can do what the horse can't, that it is most economical. When a great traffic offers, trains become necessary; for the most economical system was that which offered the least resistance, as on steel or iron ways, whether plate-way or otherwise. It was possible to carry goods between Liverpool and Manchester at very considerably less than the railways do. It was a question whether it would not be best to combine the motor-vehicle and the light railway system. It was asked what was the best system. There was no best system; for while the electric system was best for cabs or such vehicles in towns, steam was the best under other conditions.

Mr. M'ARTHUR, in proposing a vote of thanks to Mr. Beaumont and Mr. Jones, said it was due to the latter gentleman that they had the opportunity to meet Mr. Beaumont. Mr. Jones, as was well known, was the pioneer in everything that had for its object the progress of the port of Liverpool, and was also the moving spirit in the Self-Propelled Traffic Association. The question that had been treated by Mr. Beaumont was one of the greatest importance to Liverpool and interior districts. A committee of the Chamber of Commerce had gone into the matter of the charges, but had not yet submitted its report. While it was shown that the system of motor-vehicles was successful for the conveyance of light goods and passengers, yet for heavy traffic there seemed little prospect of the possibility of that success. We have still to look to a prepared roadway like Mr. Holt's, with some form of light railway. The suggestions of Mr. Beaumont were practical.

In the evening at the Royal Institution Mr. Worby Beaumont read his paper, an excerpt of which we print below, before a large and representative audience. Among others present were Mr. A. Holt, who took the chair in the absence of Lord Derby, who was prevented from attending through the exceedingly sad death of Lady Lathom (his sister-in-law), Mr. Alfred L. Jones, J.P. (vice-president), Mr. Henry H. West, Mr. Everard R. Calthrop, Mr. Arthur Musker, Mr. Lawrence Jones (hon. solicitor), Admiral Cleveland, Mr. David MacIver, J.P., Mr. Charles Petrie, C.C., Mr. D. H. Simpson (Manchester), Mr. W. L. Bodman (Manchester), Mr. Reginald Bushell, Mr. J. W. Hughes, Mr. Sandbach Parker, Mr. W. S. Patterson, Mr. Robert Gladstone, Mr. William Crosfield, Mr. Shrapnell Smith, and other well-known residents. Among the visitors were Mr. Henry Mozley (Burnley), Mr. Phillipson (Newcastle-on-Tyne), Mr. Chas. Scotter (London), Mr. G. H. Little (AUTOMOTOR), and others.

Letters of apology and regret were received from the Right Hon. Walter H. Long, M.P. (President of the Board of Agriculture), Mr. Charles M'Arthur, M.P., Sir John T. Brunner, Bart., M.P., Sir Thomas Earle, Bart., Mr. Harcourt E. Clare (town clerk), Colonel Morrison, Mr. William Laird, Mr. J. A. F. Aspinall, and Mr. Thos. H. Ismay.

Mr. W. Worby Beaumont on Self-Propelled Road Vehicles, 1896-97.*

IT has often been said that "a job once begun is half done," and it is a great thing to be able to apply this to motor vehicles begun a year ago, especially as "half done" may be taken as implying a perception of completion. It may certainly be said that the attack which has been made on the problem of mechanical propulsion of common road vehicles has materially lessened its problematic character. Much more is now known of what not to do, that which has been done is better appreciated, and many who thought that to make a motor vehicle only required a vehicle and a motor have found out that the production of a satisfactory self-propelled carriage, van, or wagon presents to the mechanical engineer one of the most difficult problems he ever entered upon. They know now that it is not a problem of mere mechanical compilation, but that a great deal of invention is required, and that this inventive skill must be accompanied by a good deal of practical experience.

It is admitted on all hands that satisfactory road vehicles would give rise to great commercial and beneficial changes in our road and street transport methods, and these have been likened to the adventages conferred by railways over stage coaches and wagons for long distances. The world admits that the conceivable change would be of almost inconceivable benefit in many ways, and yet it would ask or seem to expect that this revolution shall be effected by a stroke of the pen of the engineering genius that has taken sixty years to perfect the steam locomotive. Sixty years will not be wanted to effect a vast change in common road transport, and perfection will never be reached, but in a few years mechanical vehicles will give us cheaper, quicker, more convenient, and a cleaner road transport.

A year ago, when, in an address in Liverpool, I advised those who conduct the great heavy street traffic of Liverpool to stick to their horses for the present, I was accused of throwing cold water on motor-carriage expectations. Well, gentlemen, you have stuck to your horses, and, having excellent reasons for doing so, I am sure you do not regret it. I gave that advice because I could see that some were inclined to think that the coming of the motor-wagon was so near an event that the value of horses would decline quickly. It did not, and it will not, because, although the motor cart or lorry may come quickly, and indeed is now a practical success, it cannot, as a thing which has to be manufactured, come in such numbers as to make a sudden revolution. The number required will be so great that the few who are and who may be the successful designers and builders will be unable to meet the demand for a long time. The displacement of the horse will, therefore, not take place so rapidly as to have much or any effect on its value to its present owners.

What, then, has the year shown us, and more especially what has it done with regard to heavy traffic? That which has been accomplished in this country is of great importance, although it has not made much show yet; and as far as the main facts relating to Continental achievements are concerned, I cannot do better than supplement those which have already been presented to you by the energetic committee and honorary secretary of this very energetic northern branch of the Self-Propelled Traffic Association.

Of the British-made vehicles which have been brought out during the year for the heavier classes of work there are:—

1. The steam four-wheeled dust tip-cart, by the Steam Carriage and Wagon Company, Chiswick.
2. The steam van by the Lancashire Steam Motor Company, of Leyland.
3. The steam van by the Liquid Fuel Engineering Company, Cowes.
4. The four-wheeled steam cart, by Messrs. T. Coulthard and Co., Preston.
5. The mineral spirit motor lorry, by the Anglo-French Motor-Carriage Company, Digbeth, Birmingham.
6. The Serpollet steam lorry of the Light Railways Syndicate, for whom it has been constructed by Messrs. Samuelson and Co., Banbury.

Of the Continental vehicles of different types for the heavier kinds of work, the following may be mentioned as having taken part in the severe trials conducted during six days on several routes from Versailles, under the auspices of the Automobile Club of France, in August last:—

7. The Scotte steam omnibus and motor and trail cars (La Société des Chaudières et Voitures a Vapeur, système Scotte). The Scotte omnibus is designed to carry 12 passengers and 14 cwt. of luggage. The motor-wagon is designed to carry about 3 tons and haul about 7 tons. The motor-car, with its trail car or trailing omnibus, is designed to carry and haul 32 passengers and 1 ton of luggage. The motor of each is a 16 H.P. engine.
8. The Weidknecht steam omnibus, designed to carry 30 passengers, the engine being rated as of 34 I.H.P.
9. The De Dietrich lorry, designed to carry 24 cwt. of goods, and driven by a mineral spirit motor of 6½ H.P.
10. The Panhard et Levasser omnibus, designed to carry 10 passengers and 6 cwt. of luggage, and propelled by a 12 H.P. mineral spirit motor.
11. The De Dion et Bouton steam tractor, hauling a char-à-banc carrying 40 passengers, the tractor being fitted with engines rated at 25 H.P. The similar Dion tractor and omnibus, carrying 16 passengers and 10 cwt. of luggage.
12. The Maison Parisienne wagenette propelled by a 9 H.P. nominal spirit motor, and intended to carry 12 passengers and 7 cwt. of luggage.
13. The Serpollet steam omnibus, designed to carry 16 passengers.

Among the motor-carriages or lighter vehicles for three to six persons are the improved Panhard and Levassor carrieges of different forms, those of Peugeot Freres, those of MM. Bollée, those of MM. Gauthier et Wehrle, and a few others, all of which are spirit

* Excerpt from a paper read before the Liverpool Section of the Self-Propelled Traffic Association.

motor-driven vehicles, while in Great Britain we have the improved form of the Panhard and Levassor Daimler motor-vehicle, as made in Coventry, by the British Motor Syndicate and Great Horseless Carriage Company, by the London Motor-Van and Wagon Company, and by Messrs. J. and C. Stirling, of Hamilton. There is also the steam-carriage, made by Messrs. Toward and Phillipson, of Newcastle, the Serpollet steam Victoria, with petroleum fired boiler, and several others which present more or less improvement in detail. In addition, Messrs. Wilkinson and Co., Wigan, are making a steam van, Mr. Jesse Ellis a 3½-ton steam vehicle, and many others, including Messrs. Clarke and Capell, Messrs. Roots and Venables, Messrs. Petter and Boll are working at this problem.

(All the above-mentioned heavy-traffic vehicles were illustrated by means of lantern views and drawings, and were described in detail by Mr. Beaumont, who at the same time reviewed the performance and the results of trials carried out abroad and at home.)

With regard to the various forms of the motor-carriages of the lighter types, it must be pointed out that, with the exception of the Serpollet vehicles, the whole of the conspicuously successful long-distance and high-speed running has been performed, both on the Continent and in this country, by means of motor-vehicles driven by spirit motor, chiefly of the Daimler type. The objections as to vibration and smell have both been so far removed that the users of the recent vehicles have little to complain of, while they are able to accomplish long distances at high speeds, compared with horse travelling, with certainty.

From the description I have given of a number of the heavy motor-vehicles now made at home and abroad, their character, the great progress made, and the early date at which they may become common will have been obvious. With regard now to some of the salient points concerning the progress and future of mechanically-propelled vehicles for the carriage of goods on common roads, I shall take it as proved that the motor goods van for loads up to 10 to 20 cwt. is now a workable and economical thing to employ, and improvements will only be in detail as continued experience may indicate them. Simplification of some of them and improvements in the motor mechanism and its arrangement will be made, just as improvements in railway locomotives and in sewing machines will be made, but there is no need and, indeed, it is useless to wait for these, for they depend on the growth of experience and lapse of time.

Concerning the heavier vehicles there is more to be said. In order to make a new departure a success we must be prepared to bow to expediency so far as the advantages accruing to that departure may be dependent upon changes in our old methods.

One of the chief objects of the employment of heavy motor-vehicles is to avoid the cost on the one hand of horse haulage and, on the other, the objections which attach to the present traction-engines and their incapacity to perform some of the required services. The traction-engine capable of hauling 20 tons on average roads and out of average situations is a heavy machine and is cumbersome, but under many circumstances it will perform work more cheaply than it can be done by horses. These circumstances are not, however, those of the large proportion of town and suburban transport.

Various circumstances have conspired to make the light traction-engine for general purposes an unprofitable one. Weight has increased with power, until now a road locomotive of 10 nominal H.P. will weigh as much as 17 tons in working condition. Now this is over four tons per wheel, and when we remember what happens with stones in a mortar mill under very much less pressure than this it is not difficult to understand that objections accumulate rapidly to heavy loads per axle, more particularly on macadam roads and in wet weather. Now it has been often proposed to carry as much as 10 tons on large motor wagons or lorries, and this means a vehicle weighing at least 14 tons with its full load, that is to say, 3½ tons per wheel, which means very wide wheels, and in any case considerable wear of roads constantly passed. For many reasons it appears desirable the notion of carrying 10 tons per vehicle as an ordinary practice should be given up, and that much more moderate loads should form the ordinary maximum unit. When 10 tons is absolutely necessary as a load, the weight per wheel should be decreased by increasing the number of axles, so as to bring the load down to what may be called the limit of economy of motor-vehicle dead weight, considered with reference to the limit of common road endurance under continuous traffic. The maximum limit of load for common road motor-vehicles may be on economical grounds sooner reached than for horses, because the power of four or six horses for starting heavy loads and for getting them out of awkward places is so great as compared with the power of that size and weight of motor which is for ordinary roads and travelling sufficient for propulsion not only at higher speeds but for almost any length of haul. This proposition would appear to involve a paradox, but a little consideration of practical conditions and limitations will show that the necessity for limiting the weight of load to be carried per vehicle makes the proposition a true one.

The Paris-Versailles trials last August certainly showed that very considerable weights could be carried and hauled up even steep inclines by vehicles such as the Scotte tractors and trains which I have shown and described, the tractor vehicles being much less in weight than anything in the nature of the traction-engines to which we are accustomed.

The tractor vehicles, however, exceed in weight the limit allowed by the 1896 Act, and they were, moreover, loaded much nearer to their ultimate strength, both as to vehicle and propelling machinery, than would be judicious for continuous work. Limited then as we are in this country by that Act, and taking into consideration the limits as to power and road endurance, we are forced to the conclusion that weights considerably less than 10 tons per motor vehicle are advisable, or that a form of vehicle with six or eight wheels all dirigible must be designed.

In moving a vote of thanks to Mr. Worby Beaumont, the chairman, Mr. A. Holt, M.I.C.E., the founder and managing director of that fine fleet of steamers known as the "Blue Funnel Line," said he joined the Association to further investigation, and he was very willing to do anything in his power to the end in view, viz., to secure the style of vehicle wanted for Liverpool work. After years of study he maintained that the plateway system alone would meet their requirements for the Liverpool to Manchester trade. He had too often said that some mechanical feat was impossible of achievement to say such a thing again; nevertheless, although he devoutly hoped he might be wrong, he feared it would be many years before a vehicle for really heavy work was able to conduct their traffic under all conditions. The adhesion of the wheels would not, he felt sure, be sufficient on a greasy, dirty day, upon an incline; they must devise some means other than merely rotating the wheels.

The Volume of Trade passing through Liverpool.

Recently Mr. Shrapnell Smith, the Hon. Sec. of the Liverpool Branch of the S.P.T.A., addressed a letter to the Mersey Docks and Harbour Board asking for statistics of the trade done in Liverpool. In reply the Board furnished the following:—

Statement showing certain Particulars as regards the volume of Foreign Trade passing through the Board's Docks at Liverpool and Birkenhead during each of the three years ending the 1st July, 1896.

Imports.

Year.	Goods paying rates by weight or by measurement, &c., the weight of which it has been possible to estimate.	Goods paying rates per package of the weight of which no estimate can be formed.
	Tons.	Packages.
1894	5,452,000	3,162,000
1895	5,417,000	3,939,000
1896	5,546,000	3,535,000

Exports.

Year.	Goods paying rates by weight or by measurement, &c., the weight of which it has been possible to estimate.	Goods paying rates per package of the weight of which no estimate can be formed.
	Tons.	Packages.
1894	2,705,000	3,038,000
1895	2,909,000	2,991,000
1896	3,054,000	3,305,000

DESCRIPTION & TRIALS OF THE SERPOLLET LIGHT LOCOMOTIVE.*

FOR some time past a light Serpollet locomotive has been employed on the Cecil Line carrying mails, &c., and has given every satisfaction to the Compagnie de Chemin Fer du Nord. We may mention that this automotor was selected because the amount of traffic in the district did not warrant the employment of the regular train. Some details of the technical arrangements will no doubt be of interest to readers of the AUTOMOTOR.

This Postal Automobile comprises a platform, 2·40 m. by 2·78 m., upon which stands the Serpollet generator, tank, valves, hand feed-pump, &c. There is next to this a compartment for passengers, &c., 3·07 m. by 2·50 m. It can carry 10 passengers, the total weight (loaded) being 17·65 tons The weight on the driving axle is 10·8 tons, and the tractive effort 2,182 lbs. The diameter of the wheels is 3 feet 1½ inches.

The boiler which produces the steam, and which is the distinguishing feature of this system, is illustrated in Fig. 1. As will be seen, it is vertical, and consists of 44 tubes, placed in groups of four; the eight lower tubes are of a circular section, as are also the four higher ones. The 32 intermediate tubes are of U section, and are arranged in eight groups. The tubes are about 12 mm. thick, and when pressed to the U or kidney shape the internal tubulure is about 3 mm. wide. After being arranged in groups they are joined up "in series" by means of screwed unions, much in the same way as is adopted in the Belleville boiler. Before being passed for service each tube has to stand a test pressure of 1,500 lbs. per square inch. There is thus a large factor of safety. The dimensions of the boiler are:—Height, 1·14 m.; breadth, ·68 m.; and width, 1·77 m. The heating surface is 11·32 sq. m. and the grate area 46 square decimetres; the weight of the boiler is 2,880 kilos.

Two suction and feed pumps, worked by the motor-axle, inject water from a tank of 650 litres in capacity, placed behind the driving-axle, into the lower part of the boiler, where heating and evaporation take place; the steam thus produced being superheated in the middle groups and attaining in the higher part a temperature of 350° C., passes into the distribution valves of the motor.

At the outset this ingenious system of instantaneous evaporation was subjected to various criticisms; the engineers feared on one hand the sudden re-cooling of the boiler, on the other the force of the fire.

The improvements carried out in this system have caused difficulties and inconveniences to disappear. A pyrometer, the dial of which is under the eyes of the driver, indicates the real state of the superheat, and by this means he can accordingly regulate his fire and speed, and the use of a small extra feed which works during stoppages causes an incessant circulation in the tubes of a certain quantity of water, which is a protection to the boiler from the heat of the fire. The cylinders are placed longitudinally and in the middle of the framing of the vehicle; they are of 18 cm. diameter by 15 cm. stroke. As will be seen from the accompanying illustration, Fig. 2, motion is transmitted to the driving-axle by pinions, and the first motion shaft also works a feed pump. On the driving-axle is the compensating gear. In contradistinction to ordinary water-space or water-tube boilers, boilers of the "instantaneous generation" type frequently contain no water whatever. Speed, therefore, is regulated, not by liberating more or less steam from a reservoir of pressure but by direct control of the amount of water admitted into the boiler. When a stoppage is necessary, the feed is stopped and the boiler may be devoid of either water or steam. In order to start, half-a-dozen strokes of the hand feed-pump are sufficient to inject enough water to provide a working pressure when the automatic pump continues the supply and the speed is regulated by the "pass-valve." This valve is interposed between the pumps and the boiler, and allows the water delivered by the pumps to pass either:—

(*a*) Entirely to the boiler, for maximum pressure;
(*b*) Partly to the boiler and partly back to the feed-tank, for intermediate pressures;
(*c*) Entirely to the feed-tank, for cessation of motion.

The speed is, therefore, capable of regulation to a nicety by merely turning a small hand-wheel. After extended trial, this screw-valve is now being replaced by a balance-valve, having the spring attached to a slide on the lever-arm which regulates the pressure on the valve. Between the boiler and the engines, on the main steam-pipe, an ordinary stop-valve has been introduced. This new arrangement permits of the pressure being varied according to the requirements of the route for, by moving the slide along the lever of the balance-valve, the feed-water returned to the tank whenever the pressure corresponding with the position of the slide tends to be exceeded. The approximate pressure required is thus maintained in the boiler. The stop-valve is used to shut off steam during stoppages and reduced speeds, or to avoid using the brake, exactly as in a locomotive. So far the performance of this Post Office automobile and mail wagon has been most satisfactory. The speed, of course, varies with the gradients. On a gradient of 13 mm. the speed is 37·5 kilometres per hour, but on the level as much as 70 kilometres has been attained; the consumption of small coal is about 2·25 kilos. per kilometre.

FIG. 1.—SERPOLLET BOILER.

In Paris some trials have, during the past year, been made with the Serpollet carriages, in order to determine the speed, power, coal and water consumption. We give the results here as there is no reason why this system should not be adopted in many English towns. The trials were made on a course from the Place de la République to the Place du Chateau-Rouge (above the Barbès Boulevard), which is almost a continuous ascent; the distance between these two places is about 2,600 metres, and the altitude difference about 30 metres, which gives a slope on an average of $\frac{30{,}000}{2{,}600} = 11{\cdot}5$ mm. per metre.

From these experiments made by the omnibus company, one can estimate about 13·5 kilos. as the resistance per ton of these carriages at the stopping places. On a slope of 11·5 mm. this resistance becomes equal to $13{\cdot}5 + 11{\cdot}5 = 25$ kilos. per ton. The weight of these carriages, properly laden, is a little over 16 tons; their average resistance in motion on the considered course is about $16 \times 25 = 400$ kilos.

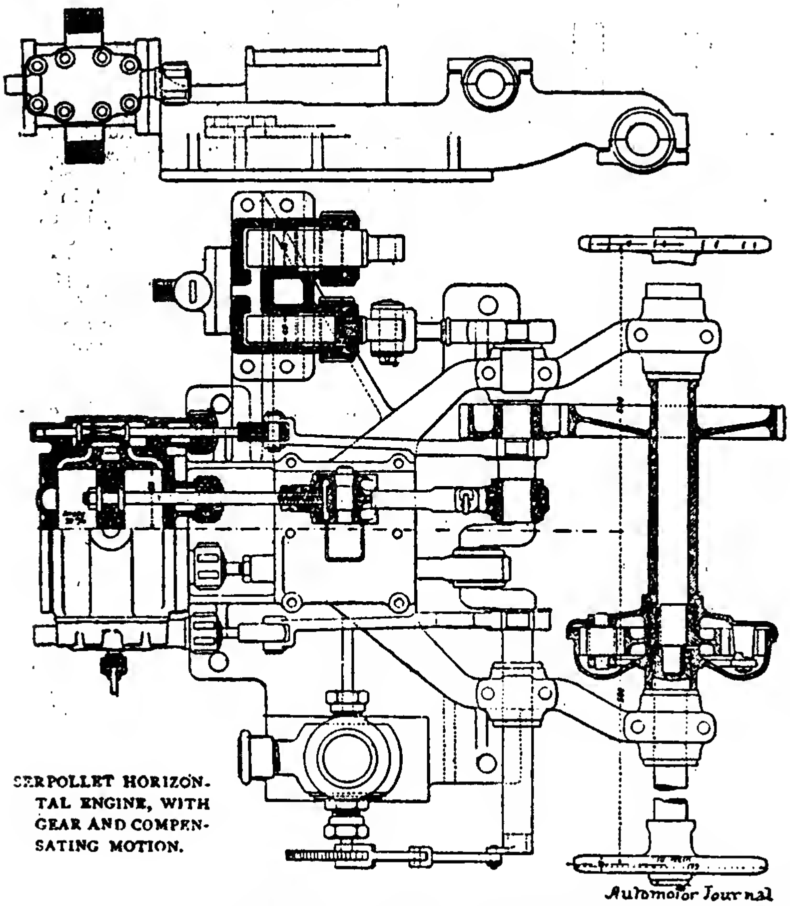
* This article is published at the request of numerous subscribers.—ED.

On the other hand, the average speed (deducting stoppages) is from 10 to 12 kilometres per hour, otherwise about 3 m. per second ; the effective work done by the motor is thus :—

$$400 \text{ kilos.} \times 3 \text{ m.} = 1{,}200 \text{ kilogrammetres, or } \frac{1{,}200}{75} = 16 \text{ H.P.}$$

On one car the quantity of water was measured for three separate cut-offs of the stroke, viz., at 31, 50, and 66 per cent. The consumption of water is easily ascertained by reading the gauge on the feed tank. It was in the three cases 27, 30, and 33 litres for the journey. The consumption of water per effective H.P. is then in the three cases :—

$$\frac{27}{16} = 1{\cdot}69 \text{ litre.}$$
$$\frac{30}{16} = 1{\cdot}87 \text{ litre.}$$
$$\frac{33}{16} = 2{\cdot}06 \text{ litre.}$$



SERPOLLET HORIZONTAL ENGINE, WITH GEAR AND COMPENSATING MOTION.

Automotor Journal

Each time the journey was made in 17 or 18 minutes, in which the stoppages took up about three or four minutes; the real time, therefore, occupied was exactly 15 minutes; the consumpt per H.P. hour would be thus :—

$1{\cdot}69 \times 4 = 6{\cdot}76$ kilos. for the journey at 31 % cut off.
$1{\cdot}87 \times 4 = 7{\cdot}48$ kilos. for the journey at 50 % cut off.
$2{\cdot}06 \times 4 = 8{\cdot}24$ kilos. for the journey at 66 % cut off.

The temperature of the steam was the same in all three cases, from 230° C. to 240° C., and the superheat on an average about 70° C.

Two experiments carried out on the following day, on two other carriages, gave the following results :—

First journey at 31 % cut off—

Average pressure of the boiler	6 kilos.
Temperature of the steam	350° C.
Superheat of the steam	190° C.
Consumpt of water	24 litres.
Consumpt per H.P. hour	6 litres.

Second journey at 50 % cut off—

Average pressure of the boiler	7 kilos.
Temperature of the steam	210° C.
Superheat of the steam	40° C.
Consumpt of water	50 litres.
Consumpt per H.P. hour	12·5 litres.

These are remarkable results for engines of such a small power, working with the customary expansion of only two volumes and without condensation ; it is evidently due to the use of superheat.

The temperature of the feed water in these experiments was, on an average, from 50° C. to 60° C.

If the mean consumpt per kilometre is found, it will be seen that in the first experiments it has been raised to :—

$$\frac{27}{2{\cdot}6} = 10{\cdot}4 \text{ kilos.}$$
$$\frac{30}{2{\cdot}6} = 11{\cdot}5 \text{ kilos.}$$
$$\frac{33}{2{\cdot}6} = 12{\cdot}7 \text{ kilos.}$$

If on an average slope of 11 mm., the resistance of the carriage is only 15·5 kilos. − 11·5 kilos. = 4 kilos. per ton, in place of 26 kilos., the consumpt would be only $\frac{4}{26}$ of the preceding figures, or respectively 1·6 kilos., 1·8 kilos., and 2 kilos.

The average consumpt for the whole journey would be :—

$$\frac{10{\cdot}4 + 1{\cdot}6}{2} = 6 \text{ kilos. for the journey at 31 \% cut off.}$$
$$\frac{11{\cdot}5 + 1{\cdot}8}{2} = 6{\cdot}7 \text{ kilos. for the journey at 50 \% cut off.}$$
$$\frac{12{\cdot}7 + 2}{2} = 7{\cdot}2 \text{ kilos. for the journey at 66 \% cut off.}$$

In the last two experiments this consumpt falls to 5·3 kilos. for the first, and rises to one litre for the second.

Other experiments made on the whole journey from Porte Clignancourt to the Bastille, distance 11·2 kilometres, give the following results :—

Journey at 50 % cut off—

Average pressure in the generator, 7 kilos.
Consumpt of water, 92 litres, or, per kilometre, $\frac{92}{11{\cdot}2} = 8{\cdot}2$ litres.

The temperature was not taken as the carriage was not provided with a pyrometer.

A second experiment on another engine going over the same course gave a kilometric outlay of 12·5 litres.

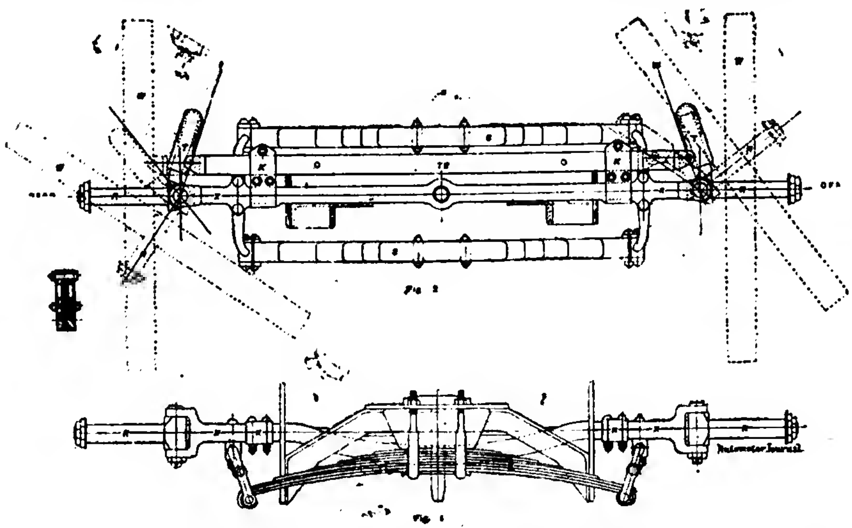
Lastly, if the steam is not all superheated, or if the fire has not been lighted early enough, or during the journey if the engine-driver lets the fire get low, or injects too great a quantity of water into the boiler, the consumption will be raised to 20 litres and more per kilometre. But usually the engine-driver maintains a temperature of about 250° C. of steam, which after a little practice is very easy to do; the consumpt per kilometre is only 6·5 litres. This figure for the consumption of steam can be compared with carriages on the electric tramway, worked on the trolley system or by accumulators.

In the trolley system the average energy absorbed by a kilometre carriage for an automobile to seat 50 is a 3 H.P., corresponding to an outlay of steam of about 16 kilos.

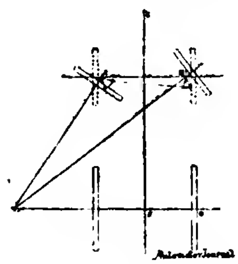
For carriages worked by accumulators the energy is equal to a 3 H.P., corresponding to an outlay of steam of 24 to 25 kilos.

DAVIS'S STEERING GEAR.

NOT a little ingenuity, misplaced and otherwise, has been exhibited by various inventors of late years in designing steering gears for automotor vehicles. But it cannot be said that the principles underlying the matter are as well understood as is desirable. In ordinary four-wheeled vehicles in which the axle of the fore wheels rotates upon a pin placed in the longitudinal axis, it is necessary, in order to maintain a straight course, that the two wheel axles shall be parallel; and in order to go in a curved path that the two axles form the ends of radii of the common centre of curvature. In practice, especially for heavy vehicles on rough roads, this means erratic steering, and a straight course can only be maintained by aid of a long pole or shafts projecting in front of the vehicle and which not infrequently forms an effective but unnecessary battering ram. There are few things more unwelcome or unpleasant when one is,



say, driving out to dinner through a crowded thoroughfare than to have the pole of a bus projected through the back of the vehicle and prodding one in the ribs. It is at such times that one longs for the suppression of all horse-drawn vehicles. Another objection to the accepted mode of steering is that it practically gives the vehicle but three points of support, and this not infrequently leads to a capsize through want of stability. If instead of using a rotating fore axle a rigid transverse axle be employed and means be given so as to permit the wheels at the ends to rotate in a vertical plane, not only is the steering much simpler but the weight is better distributed. In this case, how-



ever, the two wheels must make some angle with each other, and this angle will vary as the ratio of the beam or distance between the two fore wheels and the radius of the curve. In fact, each wheel is tangential to its own radius. This is clearly seen by a reference to the accompanying figures. Mr. Davis has ingeniously worked out the mechanical details of these principles in the steering gear shown in Figs. 1 and 2, in which Fig. 1 is an elevation of the improved gear, and Fig. 2 a plan of the same looking on the top side of the springs and axle. In Fig. 1, X, X is the axletree, having forked ends, to which are attached the jointed arms, R, R, on which the wheels, W, W, when in motion turn. With these arms are combined, in one forging, the tiller heads, T, T, fitted with sleeve pieces coupled to the ends of the movable tiller bar, T, B, which is carried in the clip guides, K, K, fixed at both ends of the axletree, X, X, the springs, S, S, supporting the fore body of the car being located on either side of the axletree and carried by it as shown. Motion may be given to the bar, T, B, by any kind of hand gear preferred by the carriage builder. Fig. 3 is a diagrammatic plan of a four-wheeled vehicle with the trailing axle, D, D, fixed, the two steering wheels being pivoted on the ends of the leading axle at A and B, as previously shown in Figs. 1 and 2.

Royal Agricultural Society Motor-Car Competition.—In connection with the Birmingham Show to be held in June next, the Royal Agricultural Society offer a first prize of £100, and a second of £50, for self-moving vehicles for light loads, and prizes of equal amount for similar vehicles for heavy loads. Light load vehicles will include such as would take the place of light spring carts for carrying loads up to one ton, exclusive of the weight of the vehicle; the heavy load class will be for vehicles capable of carrying three tons, exclusive of their own weight. The competitions are for vehicles carrying their loads, not drawing them. In the case of equal merit in either class the prize money will be divided, or in case of insufficient merit any prize may be withheld. All vehicles are to be propelled exclusively by mechanical means, and, in the case of oil-engines, any such oil may be used as is allowed by the regulations as to petroleum made and circulated by the Home Secretary under Section 5 of the Locomotives on Highways Act, 1896. The design is left to the manufacturer, but he must conform to the Act. Trials will be made of the competing vehicles carrying a declared weight for an ordinary load over a distance not less than 25 miles out and 25 miles return. During the run the consumption of fuel, water, &c., will be carefully noted. The maximum speed to be in accordance with the regulations of the Local Government Board. Such further trials will be made as the judges may consider necessary to test the efficiency of the vehicles ascending or descending hills or otherwise. The points to which the special attention of the judges will be called are:—Due regard to the convenience of the public; ease of handling, with special reference to stopping, starting, and steering; economy in working, including attendance; price; simplicity; strength of design; weight of vehicle; in the case of oil engines, density and high flashing point of the oil used. The trials will take place early in June, 1898, in a locality to be subsequently fixed. Shedding accommodation will be provided by the Society, free of charge, for the trials and for the exhibition of the competing vehicles in the Society's showyard at Four Oaks Park, Birmingham, from June 18th to 24th, 1898; but each competitor must himself arrange for the staff and appliances necessary for showing his vehicle at work in the showyard, and for its delivery to the showyard. The entries for these prizes must be made on or before Friday, April 1st, 1898, and must be accompanied by a deposit of £10 for each entry. Such deposit will be forfeited if the machine is not submitted for competition at the time appointed for the trials, and is not exhibited at the Birmingham meeting.

Motor-Cars for Northumberland.—For some time there has been an agitation to obtain a short railway between Cramlington and Newsham, Northumberland, which has been very much opposed, and now, apparently, abandoned. The Northumbrians, however, are not to be beaten, and with the aid of Mr. John Philipson, J.P., of the well-known firm of Atkinson and Philipson, of Newcastle-on-Tyne, the requirements of the neighbourhood are likely to be satisfied during the forthcoming year by the introduction of steam motor-cars built by this firm and Messrs. Toward jointly. Recently the qualities of their No. 4 steam motor-car were tested, with the most satisfactory results. The roads were very bad, but there was no difficulty in getting a regular speed of about 12 miles an hour without the least vibration. The car, which is of a wagonette shape, carries six persons, the seat in front carrying two. The fuel is coke, and during a drive of 12 miles only about 6 or 7 lbs. were burned. We understand that very shortly contracts can be arranged for the supply of these motor-cars.

THE FAURE-KING TRACTION CELL.

This cell is being so largely used for automotor vehicles that the following tests made by Mr. E. Wilson will be of interest. Speaking on Mr. L. Epstein's valuable paper * at the Institution of Electrical Engineers, Mr. Wilson said about six months ago he had carried out a series of experiments upon traction type cells in the Siemens' Laboratory, King's College, for the purpose of a small work entitled "Electrical Traction." Those experiments were given in full in the book, and he had extracted the results in the table below, which

—	Number of Test. 5	6	7
	Discharge.	Charge.	Discharge.
Volts, initial without current	—	—	2·18
Volts, initial with current ..	2·04	2·135	2·02
Volts, final with current ..	1·85	2·6	1·85
Ampères, constant at ..	15	17·8	14·9
Total time of discharge ..	5 h. 20 m.	5 h. 30 m.	5 h. 15 m.
Ampère-hours	80	97·9	78·2
Watt-hours	157	228	155
Quantity efficiency	82	—	89·7
Work efficiency	68·8	—	76·1

refer to an Electrical Power Storage Company's Faure-King traction type 5-plate cell. The cell was fully charged when delivered. The two positive plates measured each 7¼ inches by 8 inches, and had a thickness of ¼ inch, not including the perforated envelope in which they are placed. They weighed, with lug, when just taken out of the acid, 7 lbs. 7 ozs. The total weight of the cell in ebonite box and acid was 21 lbs. 2 ozs. The special gravity of the acid in the fully-charged cell was 1·275. Tests Nos. 5 and 7 in the table showed for a net drop of about 0·2 volt, with current passing, a work efficiency of about 72 per cent. It was to be clearly understood that these tests had been made upon new cells, and that therefore no conclusions could be drawn as to the life of such plates; and further, tests made upon isolated cells like these might not represent the average results which would be obtained from many. It was interesting to see what weight of these storage cells would fulfil the conditions put down by Mr. Epstein. Taking his lower rate of discharge at 2,208 watts for five hours, the watt hours would be 11,040.

The Faure-King type cell just referred to, when working under the conditions given in the table, gave 156 watt hours. Therefore, $\frac{156}{21} = 7{\cdot}43$ was the work in watt hours per lb. of total weight of cell. Dividing this into 11,040 should give the total weight of a battery of these cells to fulfil the conditions put down $\frac{11{,}040}{7{\cdot}43} = 1{,}490$ lbs., as against Mr. Epstein's 1,000. This made no allowance for diminished capacity after continued working, if such existed in this cell. The number of such cells would be $\frac{1{,}490}{21} = 71$, and since 2·6 volts were required for the fully charging of the cell at the rate given in the table, the total charging volts would be 2·6 × 71 = 185, if the cells be kept in series. The number (71 cells) just given could be considerably reduced if the capacity be increased, and still give currents convenient to deal with in motor and controlling apparatus. This was important, since the weight of an equivalent battery, so far as work is concerned, would come smaller. Taking the 9-plate instead of the 5-plate Faure-King cell, it was capable of discharging 150 ampère hours at 30 ampères, the time, as before, being five hours. The weight was 35 lbs., complete with acid, as against 21 lbs. in the 5-plate cell. From these figures the watt hours per lb. $= \frac{300}{35} = 8{\cdot}57$, as against 7·43; also $\frac{11{,}040}{8{\cdot}57} = 1{,}290$ lbs., as against Mr. Epstein's 1,000. The number of such cells would be $\frac{1{,}290}{35} = 37$, and, allowing 2·6 each, the voltage would be 96 if the cells be charged in series. Under these conditions, then, 1,000, as given by Mr. Epstein, seemed low, but he might have assumed different conditions of working. It was premature to discuss which type of cell will eventually survive for traction purposes. The cell of the future must be capable of being over-discharged without serious injury.

* Published in this number.—Ed.

PROCEEDINGS OF TECHNICAL SOCIETIES.

Mechanical Propulsion on Canals *—(*continued*).

Propulsion by Screws.—In America in 1871 competition was invited for introducing upon the canals in the State of New York some other method of haulage than by animal power.

The first designs presented were intended to overcome the wave, which it was thought a speed of three miles an hour would cause; but this difficulty, as had already been shown some years before by Pole's experiments, was more apparent than real at that speed, because a wave of sufficient height to be detrimental is caused rather by the speed exceeding three miles an hour than by the actual nature of the machinery used for propulsion. Boats carrying light freight and passengers, and running at six miles an hour, do cause injury to the banks.

The principal changes made since that time have been connected with the improvement of some of the details of the boats, which have resulted in the present canal steamers, and also in the use of these steamers for conveying through the canal one, three, or five ordinary canal boats fully laden. The steamer usually pushes one boat in front of it, and tows two other boats behind it, which are kept together in the same way as the coupled horse boats at present in use. In addition to its fuel the steamer carries 180 tons of cargo; the canal boats carry 250 tons each. In the coupled horse boats, one boat is directly behind the other, their bow and stern being in actual contact. They are coupled by ropes running from the stern of the forward boat, through blocks on each side of the rear boat, and returning to a steering wheel on the forward boat. The ropes are not connected with the rudder of the rear boat, which is left to swing freely, and the boats are steered by using the whole rear boat as a rudder. The standard steam canal boats are 18 feet wide and 90 feet long. The engine commonly in use was designed by Gordon W. Hall, and is generally known as the Hall engine; another engine designed by the Pound Manufacturing Company has been placed upon a number of boats. Both these engines are simple condensing engines, with cylinders of 12 to 14 inches diameter and 16 inches stroke. They have adjustable cut-off gear, feed-water heaters, and surface-condensers. The feed and air pumps are worked by a single beam, which is usually actuated by an eccentric on the crank shaft, but sometimes by the cross-head. The arrangement for securing circulation of the water for the surface-condenser is peculiar: by the motion of the boat and of the screw the circulating water is forced up, without pumping, through the opening in the bottom of the condenser, and out at the stern. In a modified form this plan is adopted in some of the torpedo boats and destroyers in the navies of this and other countries.

Aire and Calder Navigation.—The method of propulsion in use on the Erie Canal is not unlike that which up till lately was in vogue on the Aire and Calder Navigation, and has proved so successful. Here a steam tug in the rear propelled in front of it a train of 11 boats, each carrying about 40 tons. The boats are 20 feet long, 16 feet wide, and 7½ feet deep. A tender or dummy boat was attached to the front of the train, in order to make a stem, because the vessels of the train themselves are not strictly boats, but merely iron boxes for stowing cargo in. It was supposed that by having the tug behind the train, instead of in front, greater control could be exercised over the boats in steering them. The author has been informed, however, that this plan has been discontinued, and that at the present time the tug is placed in front of the train. The boats are threaded together by means of wire rope controlled by two cylinders, which are self-acting and are under the charge of the steersman. By lengthening or shortening the ropes on each side of the train it can be guided in any curve, while the several vessels composing it are left to rise and fall separately according to any little variation of

* Abstract of paper read by Mr. Leslie Robinson at the Institution of Mechanical Engineers.

head-line; the train is not bound rigidly in any way. Side-buffers are attached to the ends of each boat, which have a tendency to bring them back again into a straight line in the event of any slight disorganisation caused by wind and water; the train and its direction are under the full control of the steersman. This plan Mr. Bartholomew considers could not be introduced on many of the canals in England, unless the locks were made longer; but he would prefer inclined planes for getting from one level to another. The locks on the Aire and Calder Navigation are long enough to admit one of these trains at a time, so that after having been made up they do not need to be uncoupled until they arrive at their destination. The cost of conveying mineral traffic by these boat trains is low; it will be dealt with subsequently.

Leeds and Liverpool Canal.—Tugs propelled by screws are in use also upon the Leeds and Liverpool Canal, of which the cross-section is at present small, and is now being enlarged at considerable expense. Some years ago Mr. William Wilkinson, of Wigan, suggested utilising ordinary barges as tugs, by putting in small engines to drive a screw propeller as large as could be made available without too high a percentage of positive slip; and he proposed, further, to make each tug carry a paying cargo. In conjunction with Mr. Charles White, the engineer of the canal, he fitted up one of the barges with engines. When tried, it was found that it was able to tow two others at a speed of two miles an hour; in parts of the canal where the depth is greater the speed rose to 2¾ miles an hour; and under similar conditions, with only one barge in tow, as high a speed as 3½ miles an hour has been attained, but then a rolling wave was set up which caused injury to the banks, thereby confirming Dr. Pole's observations upon the Ashby-de-la-Zouch Canal. The results proved so satisfactory that some 40 more barges have since been fitted up for the same canal by Mr. Wilkinson's firm. The form of propeller adopted was arrived at by an exhaustive series of experiments, and its best results are obtained in shallow water.

Engines.—In conjunction with the Leeds and Liverpool Canal Company experiments have also been made by Mr. Wilkinson, with the object of finding out the best form of engines to use in the barges. The following eight kinds have been tried:—(1) Simple diagonal with two cylinders, and (2) compound ditto jet-condensing, and (3) compound ditto surface-condensing; (4) compound with four cylinders, two high pressure and two low, surface-condensing; and (5) ditto jet-condensing; (6) compound inverted vertical two-cylinder tandem, high pressure over low, surface-condensing; (7) compound with two cylinders side by side, non-condensing; and (8) compound diagonal with four cylinders, two high pressure and two low, non-condensing, with 140 lbs. steam, and cranks at right angles. The two last, Nos. 7 and 8, give the best results. With No. 8, which is now the standard engine on the canal, the author is informed that the following performance is obtained. The tug, 62 feet long by 13 feet wide and with 3¼ feet draught, carries 28 to 30 tons of cargo besides her machinery and fuel, and tows two barges 62 feet long by 14 feet wide, each carrying 36 to 40 tons, from Liverpool to Leeds, a distance of 128 miles with 97 locks, on a consumption of 43 lbs. of good gas coke per mile, locks included: which is equal to 0·39 lbs. of coke per ton-mile, assuming the boats to be fully loaded. Including loading and discharging, the double trip of 256 miles total is made in six days. It is stated by Sir William Bailey that these steamers have conduced much to the punctuality and regularity of working on the canal, and that in comparison with horse towage they have accelerated the speed some 40 per cent.

Upon some of the canals in the Netherlands small screw boats are fitted with petroleum motors, constructed by Van Rennes of Utrecht, which drive the screws through belting.

On the Bourgogne Canal a trial is being made of a small screw driven electrically, and fixed in the rudder of the boat. A large steel box carrying the motor and screw is attached to the stock of the rudder; the box displaces a volume of water more than equal to its own weight, and is thus capable of floating alone upon the canal. It has a total length from front to back of 8 feet 2 inches, a height of about 5 feet 10 inches, and a width of about 1 foot 5 inches. This width is continued only for a distance of about 5 feet 10 inches backwards from the front end; after that it is cut away to allow of a freer run aft. The motor is fixed in the box upon a foundation plate secured to the bottom, and its shaft is connected direct to the screw. The entire box, containing motor and screw, weighs about 15¾ cwts., and floats with a draught of from 4 feet 1¼ inches to 4 feet 3¾ inches.

Hauling upon a Submerged Chain or Wire Rope.—A favourite means of traction, especially in France and Belgium, consists in hauling upon a chain or wire rope, fixed at each end, and laid along the bed of a canal or canalised river; but it is only on the most frequented canals that it can be advantageously applied, and only in a certain number of reaches of great length. It is extensively used in the tunnels upon the canals in the North of France. To render it remunerative there must be a considerable amount of traffic, and the tolls should be somewhat lower than those for towing by horses; also the reaches should be long enough for the trains of boats to regain the time lost in locks. According to M. Derôme, with chain haulage on a much frequented canal the average speed of a train of four boats cannot practically exceed 2¼ miles per hour. That of a boat drawn by horses is usually 1¼ mile per hour. Haulage is superior to tugs only when there is any current to contend against; its advantage diminishes as the velocity of the opposing current decreases.

Hauling on a submerged chain is done by means of two grooved drums, one behind the other in the line of the chain with their axes parallel to each other and about 10 feet apart, round each of which the chain is generally wound about four half turns, making four turns round the pair. As far as the preservation of the chain is concerned, the plan is defective. If the grooves in the drums are not absolutely equal in diameter the chain cannot help slipping, and abnormal strains then arise in the intermediate lengths, often exceeding the tractive force on the stretch ahead upon which the boat is hauling itself. The chain, moreover, is bent as many as eight times during its four half turns round the drums; when working in sandy or muddy water the alternate bending and straightening is highly detrimental to its durability. The necessity for one boat throwing the chain off when meeting another is also a great objection, as this is not easy to do, and causes a considerable loss of time. It has, however, been got over to a certain extent in M. de Bovet's magnetic tow boat "Ampère," now in use on the lower Seine, where the chain passes over only one pulley, which is magnetised, and thus causes it to adhere. The wetting of the chain even by soapy water does not cause a loss of more than 10 per cent. of the tractive power. Up to the present this boat has been successful; the chain is used only for going up the river; on the downward journey the boat is propelled by an ordinary screw. In order to avoid having to throw the chain off when meeting another boat, it has been proposed to use two chains, which, however, would necessitate widening the bottom of the canal in order to prevent them from getting entangled, and even then the danger would still exist in curves. In 1860 some experiments were made on the Grand Canal in Ireland with chain haulage, but it was found impracticable. Although it has been so successful on the Continent, its advantages have not been sufficiently great to lead to its adoption in this country.

Upon the Rhine a wire rope is used instead of a chain ("Proceedings, 1869," p. 240). The rope is laid in the bed of the channel, and is taken up over a wheel at the bows, passed round a clip drum, and then dropped astern. Some experiments with a wire rope were made by Sir Leader Williams on the Bridgewater Canal; but where there is much traffic in the opposite direction, and many bends in the canal, the wire-rope plan is found to be practically unworkable. Cable towing was also tried upon the Erie Canal in the United States. The first cable of 34 miles length was laid down in 1872, and in 1879 there were over 80 miles of it; but it was abandoned after ten years' trial.

Electric Haulage.—Electric haulage on a chain has lately been started upon the Bourgogne Canal, and has given complete satisfaction up to the present time. It was designed by M. Galliot, Ingénieur des Ponts et Chaussées, under the direction of M. Fontaine, chief engineer of the Bourgogne Canal, and was approved by the Minister of Public Works on February 8th, 1893; the work was immediately begun, and was finished on July 15th following. The reach of canal upon which the system has been applied is 3¾ miles long, and includes a little over two miles through a tunnel; the width of waterway is about 23 feet in the open and about 20 feet in the tunnel, while the depth varies from 7 feet 4½ inches to 7 feet 10½ inches. From 1867 to 1883 barges were towed by a steam tug hauling on a submerged chain; the plan worked well, but was dear, the cost of maintenance being high. In 1888, the old tug boats being no longer serviceable, it was decided to utilise the waterfall at the canal locks for driving turbines to generate electricity, and to work this reach electrically. The ground having been surveyed, it was decided to make a fall of 23 feet at Pouilly at the Seine end, and another of 26¼ feet at Escommes at the Saône end. The available water power at Pouilly is 20·7 H.P., and at Escommes 11·8 H.P., making a total of 32½ H.P. Two dynamos are used, which are shunt-wound Gramme machines, connected in series: that at Pouilly is constructed to supply a normal current of 30 ampères at 370 volts, and the other at Escommes furnishes 30 ampères at 280 volts. A conducting wire running along the canal bank joins two opposite poles of the machines; and from each of the two remaining poles a separate wire runs along the same bank parallel to the first wire and below it; by means of the two lower wires the current is conveyed to the motor. When the turbines are running at their normal speed, the total electromotive force is 370 + 280 = 650 volts; the resulting current does not generally reach 30 ampères, but varies between 12 and 25 ampères according to the cargo towed; for a current of 25 ampères the loss of power is 180 volts. The motor is capable of absorbing a maximum of 18½ H.P.; it is rarely, however, that such a high power is required. The mode of connection by the wires presents the advantage that the length of conductor traversed by the current remains always the same, on whatever part of its journey the tug boat may be. The switchboard on the tug has a rheostat of 180 ohms for admitting the current gradually to the motor. The governor regulating the admission of water to the turbines is worked electrically; it allows a variation in voltage of only 10 per cent. when a tug is starting, and normally a variation of only 2½ per cent. A battery of accumulators is connected in parallel with the conducting wire, and works simultaneously with the dynamos; the connection is continuous, so that the accumulators act as equalisers. The battery working alone is sufficient for two journeys in each direction; it is placed in the collar of the resident engineer's house. The accumulators have been found, however, to be of but little use; and M. Galliot states that, if the work were to be done over again, he should dispense with them, and should also use series-wound dynamos, instead of shunt-wound as at present. The total length of circuit traversed by the current being about 7½ miles, the resistance is 3·9 ohms. In ordinary working at 600 volts with a current of 20 ampères the efficiency is 87 per cent. The three wires of the line are so arranged as to occupy in section the corners of an isosceles triangle 3·9 inches high, the two lower wires being those along which the current travels to and from the motor. For keeping the wires in their required position, insulators of a special form are used. The line so constituted forms an open circuit; to close the circuit, it is only necessary to place the two lower wires in contact with the poles of the motor, which is done by means of two trolleys carried by the boat. As on American tramways, the trolleys are composed of two long jointed arms, each terminating in a small roller, which travels along the conductor on the bank of the canal, and conveys the current to the motor leads that run through the arms. At the end of the arms of the trolleys the conductors are connected to the switchboard, and thence to the poles of the motor. The latter is a series-wound Gramme machine, which on a brake trial at 900 revs. per minute, with 30 ampères and 550 volts, gave 19 brake H.P.; the mechanical efficiency was 85 per cent. The motor receives a greater or less supply of power in proportion to the trains it has to tow; it works well with different cargoes in tow, and is remarkably free from sparking. It is connected to the chain drum by means of belting; the pulley of the motor is 11·8 inches diameter, and the fly-wheel on the chain drum 5 feet 10¼ inches, or six times the pulley. The boat is geared for two nominal speeds of 1·79 and 3·13 miles per hour; the actual speed of course varies largely with the weight of cargo towed. The tug is 49 feet 2¼ inches long, 10 feet 6 inches wide, and 3 feet 11¼ inches deep, with a draught of 1 foot 5¾ inches. Fore and aft she is covered with fluted sheet-iron; and a length of 26 feet 3 inches amidships carries a cabin of thin sheet-iron to protect the machinery from the weather. In order to prevent the chain from bespattering the boat, it is entirely enclosed in a U-shaped trough, which is covered by a half-round lid of thin sheet-iron. The chain enters and leaves the boat through two holes similar to those on river steam-tugs. There are two rudders, one at each end, and each connected to a wheel placed at the opposite end, so that the boat can be steered from the forward end both up stream and down stream. In the tunnel the boat is lighted by electricity. The total cost of the arrangement was about £5,400, including £400 for the accumulators and £200 spent on unsuccessful trials, which latter of course could now be avoided. With the advantage of present experience the electric haulage at Pouilly could now be carried out for about £4,800, exclusive of the accumulators which are of little use: so that the cost per mile would be about £4,800 ÷ 3·75 = £1,280. The saving in cost over the old steam-tugs is considerable. During a period of six months the cost of transport over the length of 3¾ miles was 0·68*d*. per ton by electric haulage, as against 0·99*d*. by the old method, or a saving of a little over 30 per cent. The time taken is also slightly less.

Running Rope.—A third plan of towing, by means of an endless running rope working along the canal bank, was tried in France for some considerable time by M. Maurice Lévy on the St. Maur Canal, and also on the St. Maurice Canal near Charenton, where nearly every difficulty likely to occur in practice seems to have been encountered. From experiments made both in France and in Prussia it has been found that this plan is practicable, and that it will probably prove satisfactory in respect of economy. To start such a plan means of course a heavy outlay upon machinery; and to make it successful the traffic must be frequent. The boats can be attached to the rope in a simple and ingenious way at any point along the route; and the difficulty of getting the attaching rope past the pulleys has been successfully overcome. One great difficulty which had to be surmounted was the rotation of the endless rope; this was overcome, and in 1891 the plan had been working perfectly for two years without an accident. The rope used was of steel wire, having a tensile strength of upwards of 50 tons. The supporting pulleys were placed as intervals of 230 to 262 feet apart. The two stationary engines driving the rope were each of 50 H.P. and about 15 miles apart, so that each worked a circuit corresponding with a length of about 7½ miles. The cost of traction by this plan on the St. Maurice Canal came to 0·039*d*. per ton-mile, including interest and redemption of machinery. This would point to the conclusion that, where the first outlay is warranted by the amount and nature of the traffic, the plan is not so expensive as might at first sight be expected.

On the Marne and Aisne Canal a method of traction has been in operation since the beginning of 1896, for a description of which the author is indebted to M. Bourguin, engineer-in-chief at Reims, under whose supervision the work has been executed. Since this plan has been got to work, the above experimental towage on the St. Maur and St. Maurice Canals has been discontinued. The present is the first really practical application of this plan, which is the invention of M. Maurice Lévy, to the traction of boats; and it is the only one of its kind at present at work. The total length of canal worked in this manner is only 1·37 mile, of which 1·18 mile is in tunnel, leaving in the open 0·10 mile at one end and 0·09 mile at the other. The tunnel of the Mont de Billy has so narrow a towing path that only horses accustomed to the work could get along it. As the supply of such horses was insufficient for the traffic, some other method of haulage had to be adopted; and towing by an endless running rope, which was then successfully working experimentally on the St. Maur and St. Maurice Canals, was decided upon. The work having been authorised in March, 1893, was begun in June, 1894, and finished 12 months later. Experiments were then made upon the new plan, and such improvements and alterations as seemed necessary were carried out. At the end of January, 1896, nearly the whole of the traffic was conveyed by the rope, in order that any minor difficulties which might be experienced in the daily working of the rope might be observed and removed. On May 1st, 1896, rope haulage was rendered compulsory, and has been in use successfully up to the present time. In order to get over the great difficulty of the tow line winding round the running rope, owing to the rotation of the latter, the boats are attached to the rope in the following manner. Where the attachment is to be made, a serving of twine, mixed with resin and pitch, is wound round the running rope for a length of about 7 inches, forming a protecting pad; a cast-steel collar in halves is then bolted tight upon the rope, bearing hard upon the serving of twine. Against the front face of the collar bears a cast-steel saddle, which has a short coupling rope passing round it and attached to it. One end of the coupling rope terminates in a pear-shaped bulb; and the other end, which is of the same length, has a piece of rope spliced to it, with a gap or eye left for a short distance between the two splices, just long enough to allow the pear-shaped bulb to be pushed through when the rope is slack; but the gap closes tight up directly tension is put on the rope, and prevents the bulb from pulling out of it. For disengaging, all that has to be done is to slacken the rope, and the bulb can at once be pulled out of the eye. The end of the rope containing the eye terminates in a loop, to which the tow line proper is fastened. The tow lines, which are provided by the management, last a considerable time, for apart from the pull upon them in towing there is nothing to wear them out. The coupling rope round the saddle, however, wears out quickly, in consequence of its passing over the pulleys carrying and guiding the running rope. At the present time the running rope is in good condition, and apparently will last four or five years. The pulleys are much worn by the passage of the collars and saddles, and will require renewing about every two years. The servings of twine wear out rapidly, and have to be replaced every fortnight. The saddles on the rope have also to be renewed every few months, because, being pressed tightly against the horizontal guide-pulleys, they get out of shape and constantly break. The traffic is worked in two convoys of eight boats each way per day. For a convoy of eight boats towed against the current, which is slight, 20 H.P. is required, the speed of the running rope being about three-quarters of a mile per hour. At the end remote from the works a telephone is provided, so that notice can be given to the engine house when a convoy is despatched, and also any other instructions can be sent.

(To be continued.)

NEW INVENTIONS.

Claiming particularly to apply directly or indirectly to Motor Vehicles, &c.

Compiled for "THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL" by HERBERT HADDAN and Co., Registered Patent Agents, of 18, Buckingham Street, Strand, W.C., London.

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Patents Applied For.

Abbreviations: Impts., Improvements in; Relg., Relating to.

1897.			
Nov.	2.	25,371.	A. G. ROBINSON and E. ROBINSON. Impts. relg. driving of cycles, motor-cars, &c.
,,	3.	25,524.	T. J. RYLAND and E. BIRD. Impts. driving gear.
,,	5.	25,668.	J. H. MORRIS. Impts. relg. driving of motor-cars, &c.
,,	5.	25,747.	R. HARRISON. Impts. relg. motor-cars and appliances connected therewith.
,,	9.	26,006.	J. H. KIRK and J. W. JEFFS. Impts. joining motor-car frames.
,,	9.	26,060.	ANGLO-FRENCH MOTOR-CARRIAGE CO. (LTD.) (E. Gascoigne and T. Meacock). Impts. mechanically-propelled vehicles.
,,	9.	26,062.	G. IDEN. Impts. driving gear.
,,	11.	26,281.	J. V. PUGH. Impts. joints for frames.
,,	12.	26,411.	G. HENSHAW. Impts. relg. electric cars.
,,	13.	26,495.	R. Y. MCINTOSH. Impts. self-propelled vehicles.
,,	17.	26,898.	G. IDEN. Impts. spirit or oil motors.
,,	17.	26,918.	J. HOPKINSON. Impts. electrically-driven vehicles.
,,	19.	27,059.	A. CRAIG and W. PHILLIPS. Impts. relg. motor-vehicles.
,,	19.	27,117.	J. E. LAIRDET. Locomotion and guidance of vehicles.
,,	19.	27,133.	J. D. PRENTICE. Impts. springs for vehicles,
,,	19.	27,146.	W. H. WAKFER. Impts. connected with driving gear.
,,	19.	27,151.	A. CRAIG and W. PHILLIPS. Impts. differential driving gear.
,,	20.	27,212.	R. HAGEN. Impts. motor-vehicles.
,,	24.	27,573.	J. E. THORNTON and J. P. LEA. Impts. variable driving gear.
,,	25.	27,709.	H. CROUAN. Impts. autocars.
,,	25.	27,734.	L. LEEMHOFF. Improved engine and motor-carriage.
,,	26.	27,812.	R. M. MCDONALD, Impts. electrically-propelled vehicles.
,,	26.	27,868.	J. L. DIDIER. Impts. change speed gear.
,,	29.	28,046.	W. C. WOOD. Impts. driving and propelling gear.
,,	30.	28,205.	H. P. MAXIM. Impts. running gear and frames. (Date claimed, May 3, 1897.)
,,	30.	28,262.	H. H. LAKE. Impts. motor-vehicles (Old's Motor-Vehicle Co).
,,	30.	28,281.	W. H. WAUD. Impts. in machinery for engines and motors.

Specifications Published.

28,648. Motors. Stephen Marius Balzer, 370, Gerard Avenue, New York, and William Henderson Humphrey, of Norfolk, Connecticut, both in the United States of America. December 15th, 1896.

In Fig. 1, 12 is a shaft which has a crank-pin, 14, shown carried by arms, 14ª, in well known manner, but, of course, the crank-shaft, 12, can be made in any desired manner, and may be carried in any suitable supports. The casing shown consists of a central shell, 15, which surrounds the crank, 14, and on the sides of this shell are bolted or otherwise fastened shells, 16, 17, which have tubular extensions or bearings, 16ª, 17ª, which receive and rotate upon the shaft, 12. Of course the central shell and one of the side shells could be made in a single structure, and the extensions or bearings, 16ª, 17ª, can be fitted with ball bearings to reduce friction on the shaft, 12. This casing or shell (its central portion, 15), carries suitably arranged cylinders, 18, which are secured thereto by screw threads or otherwise, and open into the interior of the casing (*see* Fig. 2), these cylinders being closed at their outer ends and aligned with the crank, 14. 19 is the piston within the cylinder, and 20 the piston-rod, which may be connected therewith by a ball-and-socket joint, 21, or otherwise, to allow independent movement between the piston and its rod (*see* Fig. 2). As there are a pleurality of piston-rods, 20, all working on the same crank-pin, 14, we provide each rod with a foot or extension, 22, the under surface of which is curved to correspond with the periphery of the pin, 14. The width of the feet, 22, of the rods, 20, is such as to leave a space between them so that said rods can have necessary oscillatory movements on the pin, 14. The feet, 22, of the piston-rods, 20, are held upon the pin, 14, so that the rods, 20, can effect a pulling action on the pin, 14, by rings, 23, which surround the feet, 22. The feet, 22, are held from movement along the pin, 14, by the crank-arms, 14ª (*see* Fig. 2). To adjust the rings, 23, in position around the pin, 14, and feet, 22, said rings are made in sections, and these rings are held together, and spaced apart, by studs, screws, or bolts, 24. To form a firm structure the sections of the rings, 23, overlap or are dovetailed together, and the bolts or screws pass through these joints. By preference, the studs, 24, are hollow, and screws or screw-bolts, 24ª, pass through them and

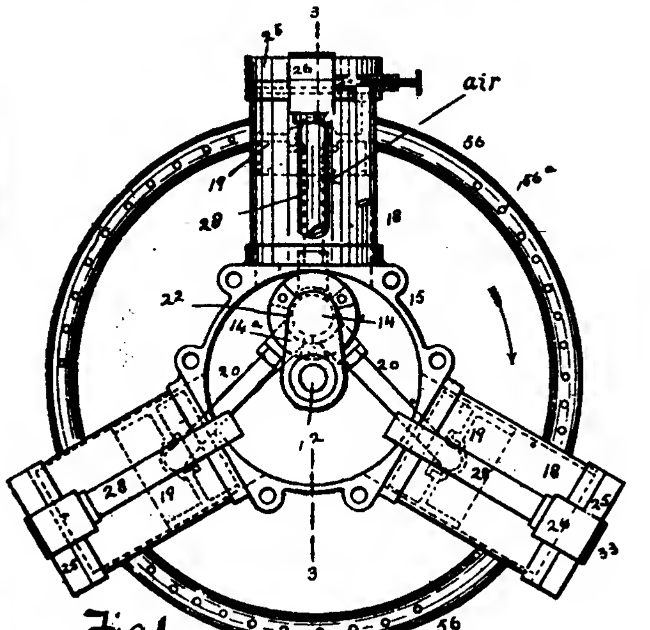


Fig 1.

28.648.

through the sections of the rings, 23, as shown in Fig. 2. In order to take up wear that may occur between the outer surfaces of the feet, 22, and the inner surfaces of the rings, 23, the outer surfaces of the feet, 22, are inclined outwardly, as in Fig. 2, so that as wear occurs the rings, 23, may be adjusted nearer the rods, 20.

The improved motor or engine is designed to be operated by hydrocarbon oil or vapour and air, but could be used with any other suitable propulsive medium. The outer end of each cylinder, 18, is provided with a plate or cover, 25, suitably connected therewith, and on one side of each plate is an enlargement, casting or housing, 26, having a chamber or channel, 27, into which projects an air pipe, 28. These pipes, at the opposite ends, pass into the chamber, 15ª, of the shell or casing, 15, 16, 17, and serve to draw air therefrom to supply the cylinders, 18, through the chambers or channels, 27. The portion, 12ª, of the shaft, 12, is hollow throughout, to admit air to the chamber, 15ª, and as air thus enters the casing, 15, 16, 17, it serves to cool the latter, and the contained mechanism. But it is evident that air could be admitted to chamber, 15ª, otherwise, say, for instance, by apertures in the side of the casing. But by the means shown the danger of dust, &c., entering the casing is reduced. It is also obvious that the pipes, 28, could take in air without receiving it from the chamber, 15ª.

The chamber or channel, 27, communicates with the cylinder, 18, by a channel, 29, in the plate or cover, 25, and a valve, 30, regulates communication between said chambers. The valve stem, 31, is shown passing through the plate or cover, 25, and provided with a spring, 32, suitably arranged, which normally holds the valve, 30, to its seat. The valve, 30, is operated by suction, as hereinafter explained, to admit air and oil or vapour to the cylinder, 18. 33 is a plug which closes the opening that admits the valve, 30, to its seat.

The valve, 30, regulates the admission of vapour or oil to the cylinder, 18, as well as air, and for this purpose a pipe, 34, leads to the valve-seat, and is fastened in the plate or cover, 25 (*see* Fig. 2), its delivery end being in line with the valve, 30, as shown in dotted lines in Fig. 2.

As the casing, 15, 16, 17, rotates, means are provided for supplying oil or vapour to the pipe, 34, through the portion, 12^b, of the shaft, 12, which for this purpose is hollow, its inner end being plugged, or in other words, the portion, 12^b, of the shaft has a bore to receive oil or vapour. For convenience of manufacture a hollow shaft or tube is used, the inner end of the portion, 12^b, being plugged. 12^c is a hole in the shaft leading to its bore, 12^d, and the bearing, 16^a, of the casing, 15, 16, 17, is provided with a chamber, 16^b, into which the hole. 12^c, opens. The chamber, 16^b, communicates with a channel, 34^a, in the bearing, 16^a, which channel connects with the pipe, 34. The pipe, 34, for this purpose passes into the casing, 16, as in Fig. 2. 35, 36 are suitable bushings in the bearing or extension, 16^a, through which the shaft, 12, passes, the bushing, 35, having an annular cavity, 35^a, and an aperture, 35^b, leading from the cavity, 35^a, to the chamber, 16^b. The bushings hold packing in place to keep oil properly in position, a cap, 37, on the bearing, 16^a, serving to keep said bushings and packing in place. Oil or vapour may be supplied to the bore, 12^d, of the shaft, 12, in any suitable manner.

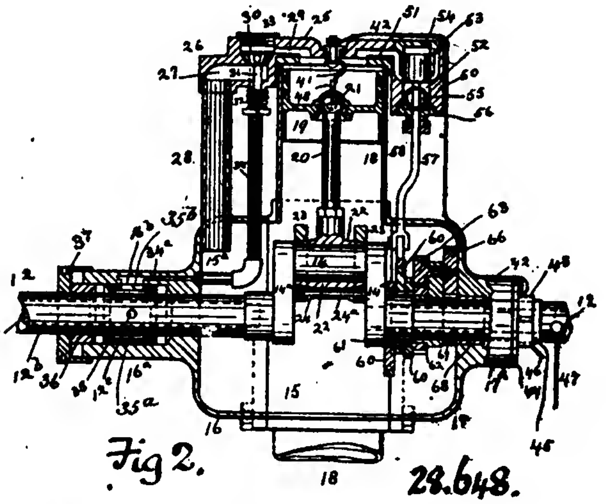


Fig 2.

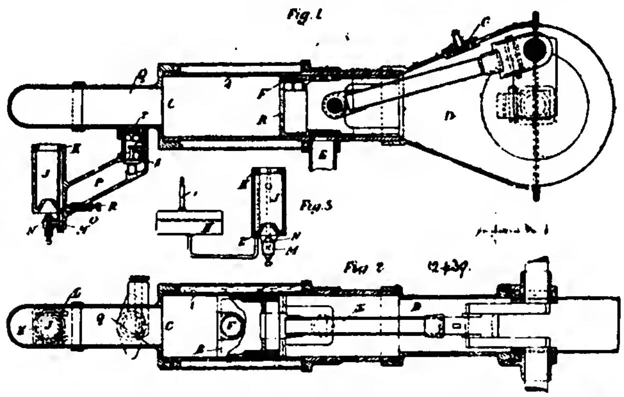
In the operation of this motor each cylinder makes two revolutions around shaft, 12, for each charge of propulsive material, and during the greater part of these two revolutions the valve, 53, keeps the port, 51, closed, and only opens at one instant to allow the escape of the exhausted charge. Or in other words, when the piston, 19, first moves towards the crank it draws in a charge of oil or vapour and air (this takes place during the first half revolution of the motor), the piston next recedes (during the other half revolution) and thus compresses the charge of oil or vapour and air. During the next half revolution of the motor the charge is exploded and expanded to give motion to the parts. While the motor is thus making one and one-half rotations the valve, 53, remains closed, but as soon as the piston starts to move back to the outer end of the cylinder, during the fourth half-revolution, the valve, 53, operates quickly to open the exhaust port and permit the expanded charge to escape. To cause these valves to thus operate at the proper time, the eccentrics, 60, are made independently rotative and cause them to rotate just one-half as fast as the cylinders, or, in other words, the cylinders make two rotations or revolutions around shaft, 12, to one rotation of the eccentrics, 60. As there are three cylinders, 18, we have shown three eccentrics, 60, one for each cylinder, and these eccentrics are connected together and rotated as follows:—61 is a sleeve mounted to rotate on the shaft, 12, which sleeve passes through the eccentrics and is keyed or otherwise secured to them. The eccentrics, 60, are located in proper position relatively to each other to cause the valves, 53, to operate at the proper time. The sleeve, 61, carries a pinion or spur teeth, 62, with which a pinion, 63, meshes. The spindle, 64, of the pinion, 63, is journaled in bearings on an arm, 65, that is secured to and projects from the shaft, 12, said spindle also carrying a pinion, 66, which meshes with spur teeth or a gear, 67, carried by the casing, 17. The teeth, 67, are shown carried by a tube, 68, which is socketted in and secured to the part, 17, of the casing or shell. By these means as the casing rotates, the eccentrics, 60, will be rotated together, through the gearing above mentioned, and the relation of the gearing is such that the eccentrics will be given but one complete revolution to two revolutions of the casing. The eccentrics, 60, have straps which are connected with the stems or rods, 57, to actuate the valves, 53. The relation of the parts is such that a cylinder, 18, can make three half turns before one eccentric, 60, will act to operate the valve, 53, because, as the eccentrics rotate but half as fast as the cylinders, they will be kept from operating the corresponding valve, 53, until such time as the exploded charge is to be exhausted.

12,489. Improvements in Oil-engines. Dugald Clerk, London. March 8th, 1897.

This invention relates to that type of engine in which an explosive mixture of air and oil-vapour or gas is formed, and ignited to give the required impulse or impulses, and where the necessary oil-vapour or gas is produced as required from liquid petroleum.

Fig. 1 is a vertical section through the engine, Fig. 2 is a horizontal section, and Fig. 3 is a detail view.

The engine has a single cylinder, A, and piston, B, as shown on Figs. 1 and 2, the back portion, C, of the cylinder acts as the motor end, while the front portion opens out into an enclosed crank-chamber, D. The motor impulses take place every revolution behind



the piston, B, while the air in front is compressed into the crank-chamber, D, to a few pounds above atmosphere. The piston, B, over-runs an exhaust port, E, at or about the end of its stroke, when the pressure at the motor end falls to atmosphere, and at this time the compressed air in the crank-chamber blows open a non-return lift valve, F (preferably placed in the piston, as shown), so that the air from the crank-chamber, D, flows into the motor end, C, of the cylinder, and scavenges out the burnt gases through the exhaust port, E.

An air suction valve, G, is arranged in the crank-chamber, D, so that on every back stroke of the piston air is drawn in.

To produce the oil-vapour as required for supplying the engine there is a small reservoir of oil, H, as shown in detail, Fig. 3 (the ordinary lamp oils of high flashing points in use in this country being preferably employed) with its surface kept under a constant air pressure of from 10 to 30 lbs. by means of an ordinary air pump such as I.

There is a vapour lamp, J, of a somewhat similar construction to that known as the "Wells," as illustrated. It consists of a metal coil, K, having the end, L, communicating with the oil reservoir, H, while the other end, M, leads to the nozzle burner, N, fixed centrally underneath the coil.

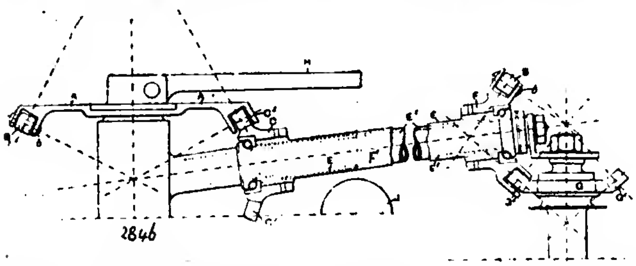
In the lamp, J, shown on the drawings, the coil, K, for convenience of making and cleaning is formed by drilling straight holes leading one into the other. The lamp, J, is put into action by a preliminary heating before oil is admitted from the reservoir, H. When the oil is admitted up past L, the hot coil at once vaporises it, and a jet of vapour at high velocity issues from the burner, N. This jet is lit, and passing through the coil, K, keeps up the production of vapour as long as the lamp is kept burning. On the side of the nozzle burner, N, is fixed a small bye-pass pipe, O, which leads to a small chamber, P. This chamber is of sufficient size to hold one charge of vapour (for one impulse of the engine) at a pressure in excess of atmospheric pressure, and has on its end two small valves, S and T, opening into the combustion and ignition tube space, Q, of the engine herein referred to and controlled by the governor. The bye-pass pipe, O, allows the chamber to fill up with oil-vapour at a similar pressure to that in the nozzle burner, and it is evident that as this supply is drawn off to feed the engine the bye-pass will at once fill it up again. The size of opening from either end of the bye-pass may be arranged with an adjusting device, such as R.

On the end of the motor cylinder, A, is an extension, O (preferably tubular) of the combustion or compression space, and the Bunsen lamp flame impinges on this tube so that it forms a combined combustion chamber and ignition tube. The oil-vapour from the chamber, P, is admitted at the termination of exhaust and scavenging into this tube, Q, but as sufficient air is not present, no ignition takes place; however, on the back stroke of the piston air is forced into the tube, Q, and mixing with the vapour at the hot end, explosion takes place, and thus a motor impulse is provided. By so arranging the length of the tube and the extent and position of heating, the explosions may be accurately timed.

2,846. Improvements in Bevel Gearing. William Edwin Heys, Manchester. February 2nd, 1897.

This invention relates to gearing for the transmission of rotary motion.

As represented by the drawing, the crank axis carries wheel, A, in substitution for the ordinary teeth of which are arranged small friction rollers, B, free to turn upon the fixed axes, *b*. The axes of these rollers are not radial, parallel with the plane of the wheel, but in the surface of the cone to which the wheels are constructed as indicated. The rollers themselves are cylindrical, with one or with both ends rounded so as to prevent friction between them and the walls of the recess or cavity within which they are mounted. The



wheel, A, gears with a pinion, C, which has the ordinary or any suitable special form of smooth fixed teeth, C[1]. This pinion is screwed or otherwise fixed on the end of a ferrule or sleeve, E, which is mounted and capable of rotation, with or without ball bearings, upon the rod or tube, E[1], which may form part of the framing of the machine. The opposite end of this ferrule or sleeve has similarly fixed upon it the wheel, F, furnished as A, with friction rollers in substitution for teeth, near to the hub of the driving or back wheel, upon which is fixed the pinion, G, having fixed teeth, G[1], similar to those of the pinion, C, gearing with the wheel, G.

12,601. Motor Carriages. John Johnston, 2, Bush Street East, Pembroke Dock, Pembroke. June 9th, 1896.

This invention consists of improvements relating to motor carriages, the object being to provide more efficient and reliable means for steering than exists with the vehicles at present in use.

In the application of the invention to a motor carriage having two back wheels, such wheels are mounted upon separate axles coupled together by compensating gear, arranged in the ordinary manner to permit one wheel to over-run the other, and thus enable the vehicle to be turned round a sharp corner. Upon each of the back axles is mounted a brake wheel and a friction block adjacent to each wheel upon the short arm of a brake lever. At the extremity of the long arm of each brake lever is formed a hole or aperture to admit a steering rod which is connected with a hand or foot operating lever in any ordinary manner. Upon the steering rod are attached two collars adjacent to the brake levers, a spring between each of the levers and the adjacent collar or projection from the steering rod. Steering is effected by the application of the friction block to one or the other of the brake wheels; the adjacent wheel of the vehicle being thus retarded, the opposite one over-runs it, and causes the vehicle to swing round.

When the carriage is in motion the front wheels can be caused to swing or slew round in either direction by the operation of the steering gear, by pivoting them forward, of the centre of the axle, but the slewing is effected against the resistance of springs, such resistance always tending to return the wheels to their central or normal position. The motion of the carriage is thus maintained in a straight line direction until forcibly turned aside by the operation of the steering gear, and such steering can be readily effected without producing a jerky or unsteady motion of the vehicle.

In the construction of steering gear for a motor carriage having but one front wheel, the spring or springs is or are arranged upon the central steering head in such a manner that when the steering head is turning a torsional force is imposed upon the spring, thus setting up a resistance tending to return the head to its central position.

12,894. Framings of Autocars, &c. Wolseley Sheep Shearing Machine Company (Limited), Sydney Works, Alma Street, Birmingham, and Herbert Austin, of the same address. June 6th, 1896.

According to this invention the two side frames of the body of an autocar or self-propelled road vehicle are formed, as seen in side elevation, each of upper and lower longitudinal members joined together at their ends by pillars which, preferably, incline somewhat towards one another upwards, and of diagonal members or braces which join the upper corners with the middle of the lower longitudinal member; and the socket piece or mounting which forms the joint between such diagonal members and the lower longitudinal member is conveniently formed at its upper end as an eye, or otherwise, to carry the axle. A rail or guard may extend above the top of the upper longitudinal member, being conveniently formed with a longitudinal portion and downward portions which are fixed at their lower ends to the corners of the frame and are joined by curves at their upper ends into the ends of the longitudinal portion.

The portions of the framing which extend forwards of the frames above described vary according to the character of the vehicle and method of steering the same.

1,972. Carbonic Acid Engines or Motors. Adolphe Delsemme, No. 32, Avenue Rogier, Liege, Belgium. January 25th, 1897.

This invention has for its object a carbonic acid engine or motor, and it consists in connecting the motor cylinder or cylinders to a reservoir formed of metal, suitable for containing the carbonic acid under pressure in a liquid state, and into which enters an electric conductor, the ends of which are connected to the two poles of a dynamo, or other source of electricity, in such a manner that when an electric current passes through the conducting wire, there results a heating of the carbonic acid which in the form of gas at high tension enters the motor cylinder or cylinders for acting upon the piston or pistons.

A dynamo is provided which, when the car is in motion, is driven by one of the car wheels, from which motion is communicated to the dynamo through bevel gearing, or through any other suitable medium.

A small battery of accumulators is connected to the dynamo, and which stores sufficient electricity to furnish the current necessary for starting the vehicle.

A receptacle contains the liquid carbonic acid. The said receptacle is surrounded with insulating material, and into it enters the conducting wire, which conveys from the dynamo the current which heats the carbonic acid. This receptacle communicates with the motor cylinders by a pipe furnished with a suitable valve conveniently connected to levers, by means of which the driver of the car can regulate the supply of carbonic acid gas to the cylinders.

Pipes form communications between the receptacle and heat and pressure gauges situated near the driver for the purpose of indicating to him the degree of heating and pressure of the carbonic acid. Make and break devices arranged in the circuit of the conducting wires enable the driver to control the passage of the current to the receiver.

THE AUTOMOTOR

AND

HORSELESS VEHICLE JOURNAL

A RECORD AND REVIEW OF APPLIED AUTOMATIC LOCOMOTION.

Circulates amongst Makers and Users of Motor-Cars, Cycles, etc., in the United Kingdom, the Colonies and the Continent.

VOL. II. No. 16. JANUARY 15TH, 1898. PRICE SIXPENCE.

CONTENTS.

IN AID OF AUTOMOBILISM.

IT is, as a rule, an unwise thing to prefer a request unless a favourable reply can be assured. Most people interested in the development of automobilism will, we think, agree with us in the opinion that in asking the Liverpool City Council for a grant in aid of the forthcoming trials next May, the Self-Propelled Traffic Association (Liverpool Centre) took a rather ill-advised action, and exposed itself to a needless snub. From the Liverpool papers we learn that at a recent meeting of the Corporation a letter was read from Mr. E. Shrapnell Smith, hon. organising secretary of the Self-Propelled Traffic Association, asking the City Council to grant £200 towards the expense of the trials of motor vehicles for heavy traffic to be held in Liverpool in May next. The Finance Committee decided to decline the application, a grant by the Council being *ultra vires*. That this result should have been reached was only to be expected by anyone knowing the Liverpool Corporation, which, like most similar bodies, is composed of well-to-do, well-intentioned, but not very liberal-minded persons. Can any good thing come out of a body that objects to the Nude in Art, and which entertains a truly moral and provincial view of the awful depravity associated with what some of its members unctuously term the Continental Sunday? From the report quoted we learn that the request was refused because it was *ultra vires*. *Ultra vires* is, as Shallow would say—"Yea, indeed, a good phrase," but, we would observe, quite out of place in this connection. Why should a request for public funds in aid of a public object be *ultra vires?* It is, of course, too much to expect that a real British municipality, such as Liverpool, can so far rise superior to its narrow-minded provincialism as to encourage automobilism. This would be indirectly encouraging travelling on Sundays! Liverpool rejoices in many (and much needed) means for the "elevation of the masses." Thus it owns a very fine and large organ, and pays an organist an inordinately large salary to perform on it. On each Sunday a selection of what is called "Sacred Music" is ground out on the aforesaid organ, and the well-dressed people of the middle and lower middle classes have their "religious feelings" comfortably excited by doses of the "Lost Chord," "Nazareth," and things of that kind, which, it is needless to remark, would not be tolerated in a first-class London concert hall. This means of spending a "pleasant Sunday afternoon" costs about £1,500 per year to the ratepayers. We say nothing more than this, that *if* any practical benefit result the money is well spent. This expenditure of public money on what is a scheme of exceedingly doubtful utility is—such is municipal logic—*not ultra vires*. A grant of a few hundred pounds, which would enable a problem in applied science to be solved, and which solution would be of incalculable benefit to Liverpool, in that it would lessen the burden of that terrible incubus known as "Port Charges and Town Dues," and which gives Liverpool such a bad name with shippers all over the world is, however—such, again, is municipal logic—distinctly *ultra vires*.

It is, we think, to be regretted that the S.P.T.A. ever preferred this request. The reply was so obvious. It is difficult to obtain exact, or even approximate, figures stating what the employment of horses in cabs, omnibuses, trams, carts, &c., costs a municipality in street cleaning—in getting rid of the excremental matter, in wear of roadway, and lastly, but by no means of small import, the mental irritation caused to citizens through the clatter of innumerable horses' feet on granite pavements. The sum must, however—and this is certain—be a very large one: and if a public body is not justified in spending money upon even experimental means for abating a growing nuisance, upon what object, in the name of common sense, is it justified in spending money? To refuse the request of the S.P.T.A. because it was *ultra vires* shows that the Finance Committee uses words like Mrs. Malaprop. But to refuse the request at all was an exceedingly illiberal and undignified proceeding. Contrast the behaviour of the Liverpool Corporation with that of Continental municipalities. In the encouragement of automobilism—which we cannot repeat too often means cheap internal transport—the French municipalities are surprisingly liberal. Paris, Marseilles, Bordeaux, Dieppe, Rouen, have found it to be distinctly *not ultra vires* to vote large sums in furthering the cause of automobilism. We now see the authorities of Amsterdam making preparations for the Automobile Congress that is to take place next year, while all the large towns lying *en route* between Paris and St. Petersburg will cheerfully vote money for the same purpose. Yet Liverpool will not grant a small sum of £200 to further a project from which she has everything to expect. Did a member of the Royal Family express a wish to visit Liverpool the same committee would spend thousands of the ratepayers' money. This would *not* be *ultra vires*, but a request for a small sum to aid in the solution of a practical problem in automobilism is churlishly refused because it is *ultra vires*. We can only say, in the words of the immortal "Chicken," "Why it's mean."

THE SERPOLLET BURNER.

M. SERPOLLET has recently patented a new form of liquid fuel burner which we illustrate herewith, and which possesses some features of interest. In this burner petroleum vapour or gas is injected under pressure in a Bunsen burner, and is there burnt,

FIG. 2.

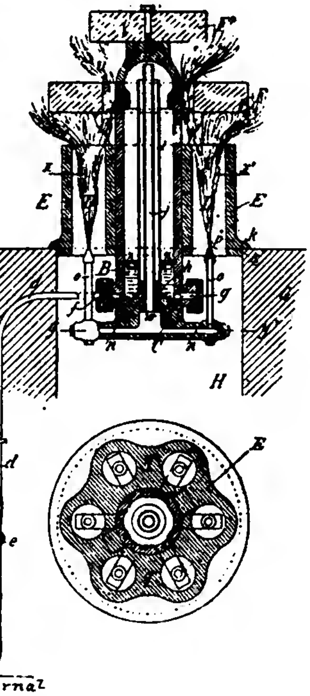


FIG. 1.

mixed with the heated air which is sucked in, and heated by contact with the hot metal of the frame. Referring to the drawings, *A* is the reservoir of petroleum under pressure, the upper part of the chamber being in communication with a pressure gauge, *b*; the arrangement being almost exactly similar to that adopted by Wells and other makers in their petroleum lamps. A pipe, *d* (*see* Fig. 1), conveys the petroleum to the burner, *B*, the quantity of oil passing being regulated by the gauge and valve, *E*. The oil passing into the central chamber is heated, and the vapour generated passes down the central tube through *W* (Figs. 1 and 2), to the burners, *o*, *o*, whence it issues as gas, and the flames, *D*, playing upon the refractory walls, *E*, and the heating surfaces, *F*, *F*[1], causes the latter to become highly heated, and not only is the radiation very intense, but these thick refractory walls, &c., act as reservoirs of heat so that in

FIG. 3.

the event of the supply being temporarily shut off the furnace will remain hot for a long time, and on again turning on the oil it is immediately gasified as described. The air is admitted below the burner through *H*. Fig. 3 shows a different arrangement, the oil as before passes into a central chamber, *B*, and is vaporised and issues as gas at *o*, the jet playing downwards through the passages, *D*, and heating all the central portion; air is admitted through the pipe, *H*. It will be gathered by those familiar with petroleum burners that M. Serpollet has not introduced any specially novel features, and we should not like to say that his burner presents any material point of practical superiority over those which have been previously described by us. We would remind our readers that the most suitable forms of petroleum burners are fully described and illustrated in our AUTOMOTOR POCKET-BOOK for 1898.

A HALTING VESTRY.

WE had thought that Shoreditch, by the establishment of its dust destructor and excellent electric-lighting arrangement, had earned for itself the reputation of being an up-to-date and progressive community. In the matters mentioned it certainly leads the way. We are sorry to have to modify our opinion somewhat, but the Vestry has not exhibited the same foresight and intelligence in dealing with automobilism as it did in dealing with the disposal of the refuse question. From a recent issue of the *Hackney Express* we learn that some enlightened member of the Vestry had proposed, and very properly too, to employ motor disinfecting vans. The Public Health Committee, as instructed by the Vestry, had considered this question, and had received a report from the medical officer of health as to the cost of electric motor-cars adapted for the purpose of conveying goods to and from the Vestry's disinfecting station. The amount to be laid out would be at least £400, but the cost would be somewhat less if the bodies of the old vans could be utilised. Dr. Bryett pointed out that motor-cars are at present a novelty. Whenever they stop in the streets, small crowds, mostly of children, collect round them, and in the case of a car used for conveying infected articles, there would be a very considerable amount of risk of infection. The committee were therefore of opinion that it is not advisable to try the experiment of using motors for this purpose, and they recommended accordingly.

The committee further reported that the average sum annually paid for horse hire during the past four years was £83 18*s*. 6*d*., and they estimated the cost of maintaining a horse belonging to the vestry at £53 10*s*. As the estimated saving to the vestry would be upwards of £30 per annum, the committee recommended that an extra horse be purchased for the use of the Public Health Department at a cost not exceeding 30 guineas, and a set of harness at an estimated cost of £8.

We would beg the Vestry not to be misled by the report of this medical officer. This person cannot possibly be an authority on motor-vans. The price he mentions is far too high, while the reasons he adduces against the use of a motor-van are shallow and jejune. Whenever a fever patient is being conveyed from a house, in the easily recognised hospital vehicle, there is always a crowd of small boys. So there is when a fire-engine makes its appearance. The committee is, we think, justified in rejecting this report as being inaccurate and, no doubt unintentionally, misleading. It seems also obvious from the figures relating to the cost of horses that neither the committee nor the person responsible for the estimate understands the "law of economy" which governs these things, and which we expounded in our October number. We would recommend a perusal of this with advantage to all vestrymen and their officials.

THE COACHMAKERS' COMPANY AND A CHANCE FOR THE MOTOR-CAR.

OUR always interesting, frequently well informed, but, like its prototype, the *Daily Chronicle*, too hysterical contemporary, *London*, as befits its position as an organ of municipalisation, keeps, as does its exemplar, a watchful and somewhat suspicious eye upon the old City Companies. Whether the latter appreciate the attention is, of course, quite another matter. In a recent issue our contemporary, under the heading "A Chance for the Motor-Car," in the course of a not altogether undeserved eulogy of the Coachmakers' Company, makes the following (to us) extraordinary statement :—

"The Coachmakers' Company have given the fullest encouragement to the motor-car. One would not have been surprised to find a Company, with members representing some of the largest firms in the country, looking askance upon the newcomer lest their own business be interfered with. But, no. With that keen business foresight which recognises that progress lies along the line of new inventions, they have welcomed the motor-car, and gone out of their way to give it encouragement. Last year, for instance, they offered a first prize of £20, and another of £10, for the best designs of a motor-carriage. So poor were the exhibits that the prizes could not reasonably be awarded. The limitations imposed may have had something to do with the shortcomings of the designs sent in. Anyhow, this year a wider field has been opened. Instead of limiting the competitions to coachmakers only, they are free to 'British subjects generally resident in the United Kingdom of Great Britain or Ireland.' This is certainly wide enough, and ought to bring in some of the many outsiders who feel keenly that the motor-car, or cab, or carriage, is yet far from being a sightly or convenient mode of transit."

The Coachmakers' Company has certainly displayed a broad-minded appreciation of the automotor vehicle, which we gladly acknowledge; but careful and well-thought-out designs of new machines are hardly to be obtained by such inducements as prizes of £10 or £20. A well-known coachbuilder so clearly recognised this that not long ago he offered, through the AUTOMOTOR, £100 for a suitable design. Even allowing, for the moment, that out of the callow minds of apprentices and improvers a fairly good design can be evolved, is it yet to be expected that such young men can produce the design of a wholly new type of vehicle, propelled in a wholly different way, and involving mechanical knowledge, or rather a knowledge of engineering principles and mechanics, that a locomotive engineer has to have, but which no coachbuilder, so far as we are aware, either has or pretends to have? The competition, in so far as it related to motor-vehicles, was distinctly premature. What, too, we may ask, were the qualifications (we speak as an engineer) of those who would decide on these designs? The question of merit in the design of a motor-vehicle can only be answered by those who have a pretty extensive knowledge of automobilism. An ordinary cart or carriage is not a self-moving vehicle, even when running down hill; and while we should unhesitatingly defer to the opinion of a coachbuilder on coaches, we should not accept it as necessarily possessing any value as regards automobile vehicles. We are afraid, however, that *London* lives in the same benighted ignorance as do so many of the London papers on things relating to automobilism, whether this relates to aeronautics, submarine boats, torpedoes, or automobile vehicles. We have occasion elsewhere to draw attention to this lamentable display of want of common knowledge on the part of the lay Press. Referring to the latter part of the quotation from our contemporary, it will be seen that *London* imagines that the Coachmakers' Company is again offering prizes for designs for motor-vehicles. *London* rejoices that this will bring comfort to those who "feel keenly," &c. We are sorry to disappoint any respectable person who "feels keenly," as does our contemporary, that the motor-carriage is not yet a convenient mode of transit, but truth compels us to say that our contemporary is misinformed. The Coachmakers' Company officially inform us that they "are *not* offering any prizes for motor-car designs in the coming year (1898)," as we pointed out some months back; and we think wisely, too, for reasons we have stated. It will thus be seen that the whole bottom is knocked out of our contemporary's article entitled "A Chance for the Motor-Car."

MUNICIPALITIES AND AUTOMOBILISM.

WE are glad to observe an increasing interest taken by municipal bodies in automobilism. It is at length very generally recognised that by the adoption of automobile vehicles a great saving in the rates can be effected. Indeed, so heavy are those in many districts that any increase is out of the question. One of the heaviest charges is that incurred in keeping the roads and streets clean, in carting away the sweepings, &c. So long as horses are employed to the unreasoning extent that they are, the streets in large towns can only be maintained in a healthy state by employing a large army of sweepers, whose business is to collect the fæcal matter as fast as it is deposited; then comes in the question of the disposal of this. Farmers sometimes will take it, at other times they will not have it as a gift; it then has to be carted or barged away. Those who have to deal with these municipal matters know that this question of street cleansing is a most costly and unsatisfactory one. If horse traffic could be prohibited in, say, the precincts of the City of London, the cost of keeping the streets clean would be less than one-fifth of what it is at present. Another vexatious item of cost is the large number of horses that a municipal body has either to maintain itself or else through a contractor.

Automobilism offers the very best remedy for these things, and the more advanced and enlightened municipal bodies are recognising this. Thus Chiswick set an example which Leicester has followed, and now, as will be seen from our advertising columns, Wolverhampton follows suit, and is anxious to obtain a motor-van. We congratulate the Corporation on their foresight, and we have but little doubt that they will find this experiment a complete success. From the outline specification, which, by the way, is well drawn up by the borough engineer, Mr. J. W. Bradley, C.E., it is evident that the Corporation mean to have a first-class vehicle. Here is an excellent opportunity for engineers to show what they can do. This is the germ of what will be a gigantic industry. If automotor vehicles are employed for no other purposes but for that of scavenging there will be work sufficient for a score of firms. Before leaving the subject we would ask how it is that the London County Council is so deficient in municipal enterprise. It does not possess a single automobile vehicle. It is as backward as the City Corporation.

ROOTS AND VENABLES' OIL-MOTORS AND MECHANISM FOR VEHICLES.

THIS firm have been consistently working for many years past at the improvement of the oil-engine, and have succeeded in greatly increasing the mechanical efficiency and simplifying the mechanical details of the oil-motor using "heavy" oil and working on the Beau de Rochas cycle. The following is a description of their latest model, intended for road vehicles, and embodies their most recent improvements:—

The crank-pit is enclosed and is air-tight, and is made in two portions bolted together, each carrying a bearing. The movement of the piston producing suction and compression within the crank-pit is utilised to deliver air (suction and delivery valves being fitted for this purpose) to a chamber bolted or screwed to the side of the crank-pit. This chamber forms the air-pressure reservoir, so that the pressure in the delivery pipe shall be equable and steady. The delivery pipe conveys the air to the end of the oil-feeder, and the groove cut in the oil-feed spindle to supply the burner delivers its oil to the blast of air. The oil is conveyed, together with the air, in a pipe which, after passing once round the vaporiser, reaches the ignition tube. The counter-shaft operating the exhaust valve is driven by a chain and chain-wheels at half the speed of the crank-shaft. This half speed shaft may convey the power of the motor; it has fitted between its bearings a governor weight in one casting connected by a link to a sleeve within the groove on which works one arm of a lever, the other end of which lever moves a small slide which, as the speed becomes excessive slides in front of a block upon the exhaust-valve spindle, the pin through which block of hardened steel operates the oil-feed spindle lever. The end of the exhaust-valve spindle telescopes within the cylindrical slide that carries the roller running on the face of the cam which is keyed upon the valve counter-shaft. The vaporiser of the patentee's usual construction is surrounded by a cover, through a slot in the floor of which the starting burner is placed for starting. The air for the combustion in the cylinder passes by a pipe through the floor plate of the cover, and has a filter of some textile fabric or wire gauze fitted at its end. The additional air pipe is fed from the same filter. In a twin-cylinder engine one set of chain and chain-wheels are used, and one governor and sleeve which operates one slide for holding open the exhaust valves, and thus stopping the feed of oil, the two cranks being placed in the one crank-pit with a bearing between them.

Referring to the drawings, Fig. 1 is a sectional elevation of the single-cylinder motor for vehicles, &c.; Fig. 2 is a part sectional plan of the same; Fig. 3 is a part sectional plan of a similar but twin-cylinder motor; Fig. 4 shows a fly-wheel of this motor with a water-cooling coil attached.

In a motor for driving the front wheel of cycles and vehicles, the motor bearing is preferably formed by and passes through the axle of the wheel. A steel tube is screwed or otherwise secured into the bearing boss on the casting forming the crank-pit of the motor; within this, a close-bearing fit, the crank-shaft turns, on the outside of this tube, on ball bearings, the vehicle or cycle driving-wheel turns. The motor is on one side of the fly-wheel preferably placed vertically and the fly-wheel is on the other side. On the fly-wheel side of the shaft a chain-wheel is fixed, driving by chain a chain-wheel of double the size fixed on the shaft, at the top of the motor. The motor may form one arm or prong of the fork, the other arm is formed of a single-steel or double-steel tube. The top counter shaft running at half-speed drives the valve gear. The valves may be of the ordinary mushroom type, working in the usual manner. A rotating valve may feed the petroleum oil or spirit. In the small cycle-motor a fixed quantity is measured by the pocket in the plug and is swept through into the cylinder by the suction. When the speed is excessive the supply is cut off by ceasing to turn the plug valve by means of the governor. On a second short spindle, parallel with the former, is fitted a chain-wheel which drives the pneumatic or vehicle wheel through a chain-wheel fixed to the hub. Upon both spindles are fixed two toothed wheels. The one or the other pair of wheels is brought into gear to change the speed as desired by shifting the spindle or a sleeve upon it sideways—the chain-wheel to permit of it being fixed on a feather. Springs may be fitted to the chain-wheel to take the first shock of gearing.

Referring to Figs. 1, 2, and 3, A is the cylinder, B the piston, C the crank-shaft, D the crank-pit chamber, D_1 the air cushion chamber, E the cylinder cover, F the cylinder jacket, G the admission valve, H the exhaust valve. H^1 is the slide operating the valve, H^2 the exhaust valve cam, I the cam shaft. H^3 is the oil-feed lever having its fulcrum at H^4. The lever, H^3, is operated by the pin fixed on the block fitted on the spindle of the exhaust valve, H. J is the oil-feed spindle of the patentee's usual construction with two grooves—the one for supplying the cylinder with oil, the other groove feeds the automatic burner, as described in the Specification No. 14,756 of 1896. The shaft, I, is driven at half speed by means of the two chain-wheels, I^1 I^2, it operates the valve, H, and the oil-feeder, J, by means of the cam, H^2. K is the governor weight, pivoted by means of a pin through the shaft, so that a degree of oscillation upon its pin is permitted. K^1 is the link connecting K to the sleeve K^2. The sleeve, K^2, operates the forked lever, K^3. The lever, K^3, slides the sliding piece, K^4, in the guide, K^5, and places it behind the block, K^6, on the exhaust valve spindle, which prevents the closing of the exhaust valve, H. As the lever, H^3, is operated by means of a pin, K^7, fixed on the block, K^6 (the end of the exhaust valve spindle telescopes within the roller slide, H^1), the prevention of the full stroke of the valve, H, prevents also the full stroke of the oil-feed spindle, J, so that the groove, J^1, which normally supplies oil to form the explosive mixture in the cylinder, no longer supplies oil, the stroke of the spindle being too short for the groove, J^1, to enter the oil, but nevertheless a small quantity of oil is fed to the vaporiser sufficient to keep the vaporiser channels moist with oil awaiting the first working stroke following the cutting-out of the governor. A small quantity clings to the spindle in its movement, which gives the slight excess above the usual feed per stroke which is so necessary for that working stroke following the cut-out. The groove, J^2, supplies oil for the automatic burner, Z^1, within the vaporiser, Z, by means of the pipe, J^3, the air-blast of which is supplied by

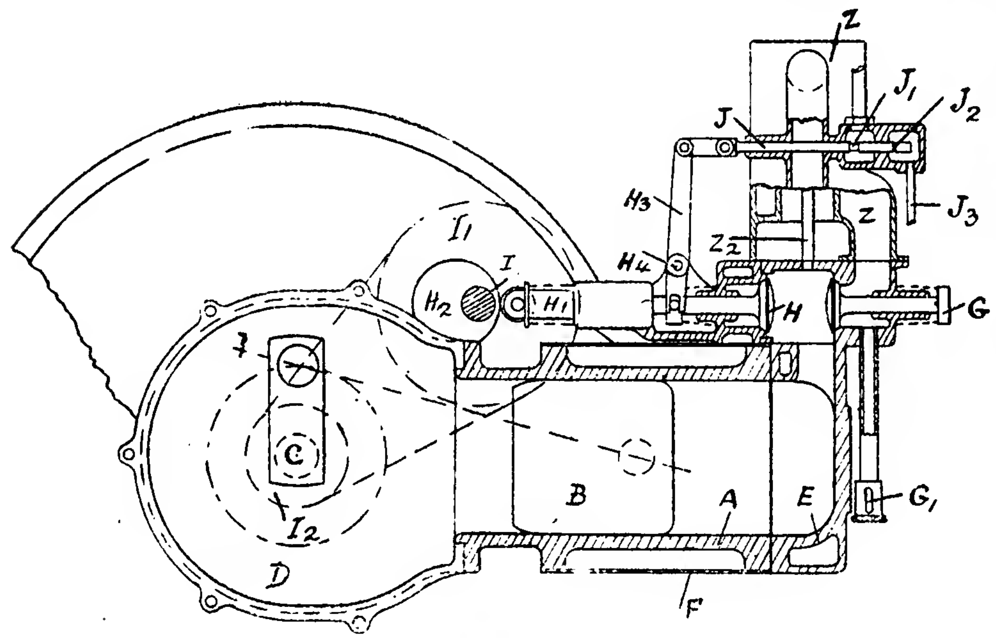


FIG. 1.

the pipe, J^4, in the manner set forth in the Specification No 14,756 of 1896.

In the twin-cylinder engine shown in plan, Fig. 3, a similar arrangement of parts is shown as in the single-cylinder engine in Fig. 2, one chain and pair of chain-wheels are used to drive the counter-shaft to which are keyed the two cams, H^2 H^2. The whole valve-gear comes between the two bearings of the counter-shaft, I, as in the single-cylinder engine and the two exhaust valves, H, are fitted to and operate in one casting. Two burner nozzles, Z^1 Z^1, are fitted to play upon the ignition tubes, Z^2 Z^2, within the vaporiser, Z. This vaporiser (having two separate oil-feeders) is divided into two distinct channels, so that the air for the cylinder, A, is always drawn through its own half of the vaporiser, and the same with the other cylinder. From the entrance of the air at Z^3 (not shown) to its passage through the valve, G, as section, Fig. 1, it is retained in a separate channel throughout to the air for the other cylinder. The two crank-pit chambers have one bearing between them fitted to the dividing wall, each chamber is air-tight from the other and delivers air from the

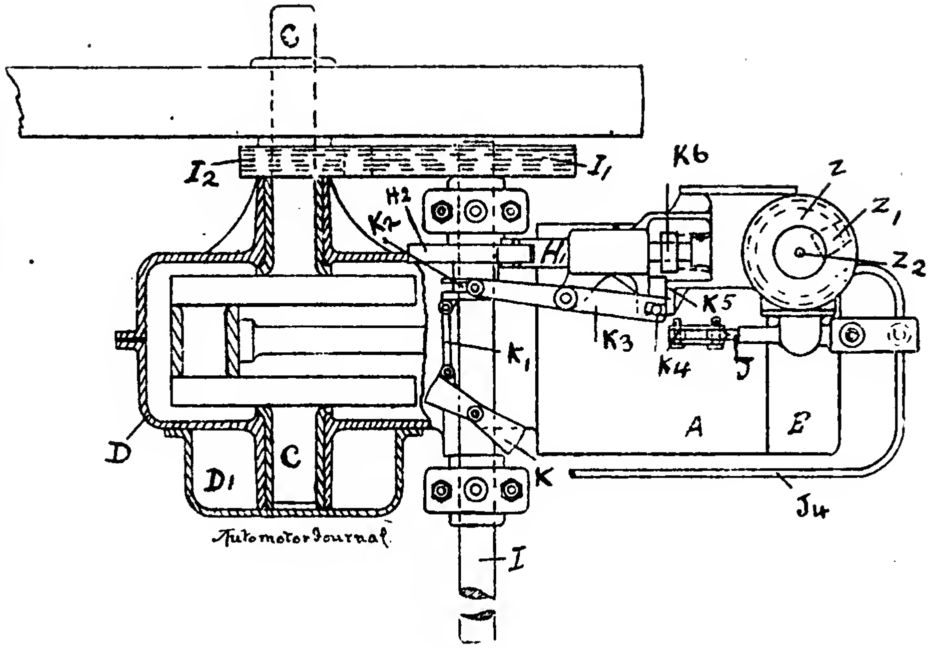


FIG. 2.

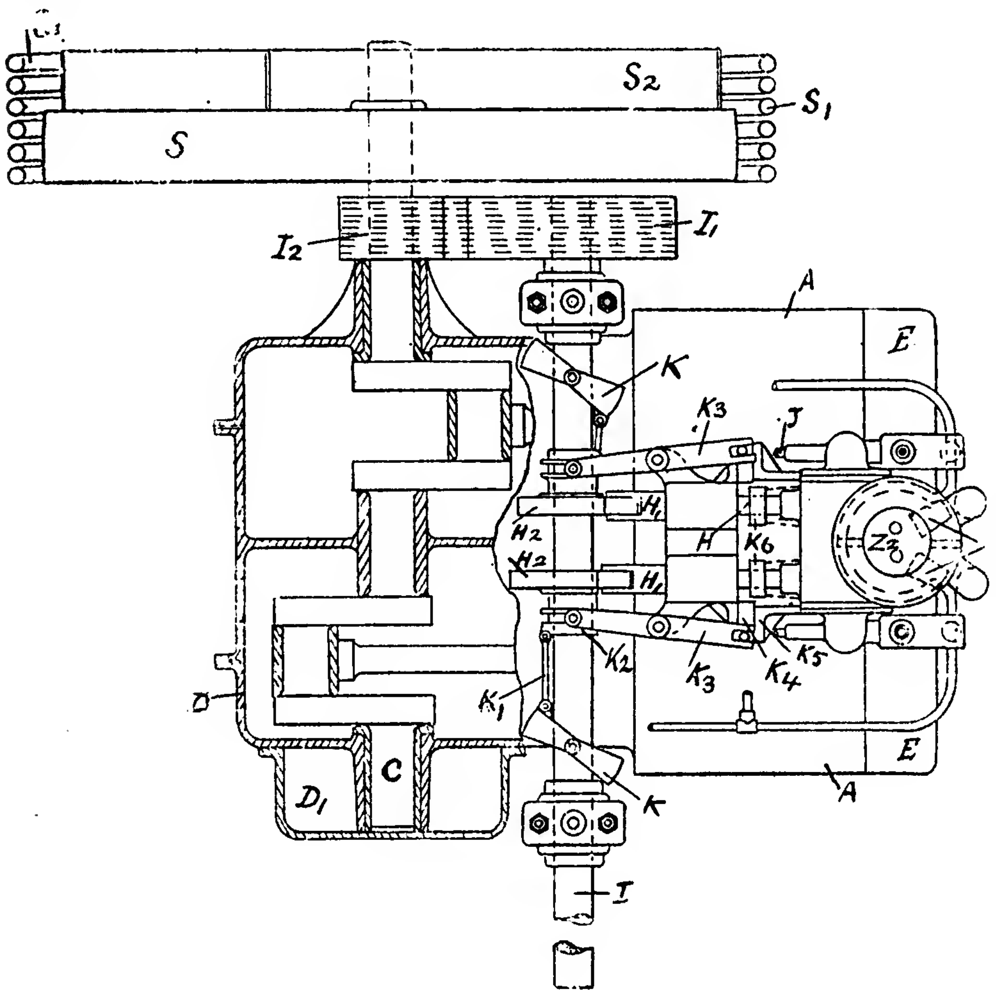


FIG 3.

chamber, D_1, for the air-blast supply of the automatic burners playing upon the two tubes, Z^2 Z^2, within the vaporiser.

Wire-gauze filters may be applied to the ends of the two air inlets, Fig. 1, the air inlet for the vaporiser not shown, and G^1 the additional air inlet.

Referring to Fig. 4, the motor is placed on one side of the driving-wheel, which is preferably the front and steering-wheel, and the fly-wheel and driving-chain on the other. A is the cylinder, B the piston, C the crank-shaft, D the closed crank-pit casing or chamber, E the cylinder cover, F^1 are ribs cast in the usual manner on the cylinder to cool it by radiation, but it must be understood the ribs are shown as an alternative, as the water-jacket is more reliable.

The tubes, XX, form one side of the usual front wheel fork of a bicycle or tricycle, while the cylinder and crank-pit casing form the other side of the fork; the head of the fork and the handles are not shown. X^1 is the front wheel of the motocycle, bicycle, or tricycle, although the motor may be equally well applied to the back wheel of a bicycle or the axle of a tricycle.

The wheel I^1 having twice the teeth of the wheel I^2, the countershaft, I, which operates the valves and transmits the power, rotates at half the speed of the crank-shaft. The crank-pit, D, is in one casting, having the closing plate, D_2, to form

K 4

an air-tight cover. The crank-pin then works in oil, as it does in the horizontal motor shown in Figs. 1, 2, and 3. The crank-shaft, C, has its bearing in the steel tube, C^1, which extends through the wheel from the crank to the chain-wheel, I_1. The bearing of the casting, D, screws over it at one end, and at the other is held by the nuts at the foot of the fork. The cones of the ball-bearings of the hub of the wheel, X_1, fit over the steel tube, C^1.

In Fig. 3 is shown the method of cooling the jacket water. S is the fly-wheel of the motor, the coil of piping, S^1, surrounds it, the water is pumped in at the one end of the coil and forced right

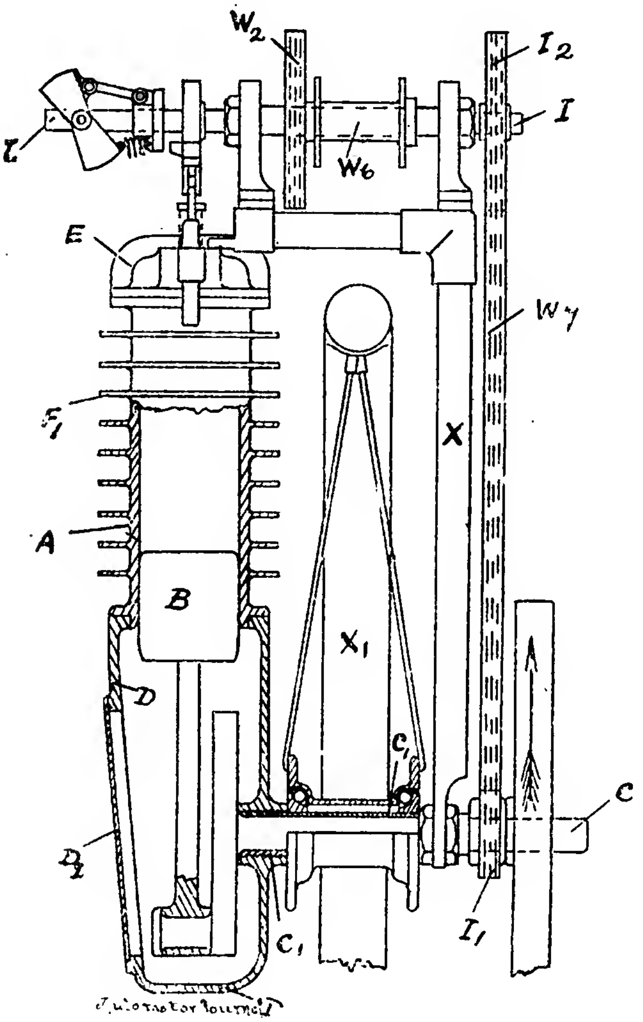


Fig. 4.

round and out the other end into the water tank, if one be used, or if the coil be of sufficient length no water tank will be necessary, and the water can return to the jacket cooled. Sixteen claims are made. The specification is numbered 23,604 of 1896, and is dated August 23rd, 1897.

Another Progressive Municipality.—At Southampton recently Mr. Alderman Lemon moved: "That the Team Labour Committee be requested to invite designs and tenders for motor-vehicles for the collection of house refuse." He asserted that electric motors were cheaper than horse traction. He intended to insert an advertisement for tenders, so as to obtain information. The motion was duly seconded, and after the, of course, necessary amount of opposition from those sitting on the fence, was carried. We congratulate the good people of Southampton on the progressive spirit thus manifested, and trust they will obtain their heart's desire in the shape of a motor dust-cart.

THE ELECTRICAL CAB IN LEEDS.

One of the new electrical cabs, of the kind now running in London, was tried in Leeds a few days since. Some time ago the London Electrical Cab Company (Limited) applied to the Hackney Carriage Committee of the Corporation for permission to run 50 of the new vehicles in the city. Having regard to the interests of the public, as well as the local cab proprietors, the committee decided that before licensing any motor-cabs one should be brought to the city on trial. This vehicle arrived on Monday night, January 3rd, and was tried on the following day. It was a novelty to most people, and whenever it pulled up a crowd soon gathered around it. Those who had an opportunity of riding in it expressed their entire satisfaction, more especially at the manner in which it can be manœuvred amongst other vehicular traffic. It has been built for the comparatively smooth thoroughfares of London, and jolted a little over the rougher pavement of Leeds. The promoters of the new conveyance state, however, that should the Hackney Carriage Committee decide to license any of the electrical cabs, the springs shall be arranged so that in passing over the worst paved streets there shall be little or no vibration. The carriage in question is built on the lines of the brougham, and has been fully described in our columns. Provisional arrangements have already been made for supplying electricity to such cabs as may be licensed to ply in Leeds. The Yorkshire House-to-House Electricity Company have agreed to supply power at the usual rate, viz., 1½*d.* per unit, if sufficient cabs are licensed.

A number of gentlemen made trips in the cab, Mr. W. C. Bersey, the engineer of the Company, acting as driver. Perhaps the severest test the vehicle was put to was ascending the stiff gradient in Cookridge Street, which was managed with the greatest ease. Those more particularly concerned in the trial took lunch together in the Queen's Hotel, Mr. Leonard W. Holmes (Messrs. J. H. Holmes and Co., electrical engineers, Newcastle), presiding. Amongst those present were Councillor Bettison (chairman of the Hackney Carriage Committee), Mr. J. W. Addyman, Mr. Bersey, and Mr. Carney (Hackney Carriage Inspector). Councillor Bettison gave "Success to the electrical cab." He said that he had ridden in the vehicle, and felt sure that it would prove a success. The manner in which it threaded its way through the traffic was quite surprising. He was satisfied that the people of Leeds would appreciate the action of his committee in doing something to secure electrical cabs for the city. He could not say that a large number of licenses would be granted to motor-cabs at present, but the committee did not intend to stand in the way of the enterprise. Of late there had been considerable agitation with regard to hackney carriages in Leeds. He thought, however, that when local cab proprietors saw that the new vehicles were being well patronised, they would change their opinion with regard to them. One of the oldest cab proprietors in the city, after examining the new cab, had advised him to endeavour to persuade his committee to license a dozen electrical cabs straight away. In conclusion, Mr. Bettison said he was certain his committee would consider any application that might be made for licenses.

The Amenities of the Cycling Press.—*Punch* has often told us what a "cycling cad" is, and has often, too, reflected the wild joys of the "scorcher" in terrifying if not injuring the harmless pedestrian. It would seem, however, that in the motor-car the "scorcher" has found a Nemesis which was not altogether expected, and the cycling Press is indignant because the scorcher is scorched at times. This is the refined way in which cycling journalism, as exemplified by the *Cyclers' News*, pours out its vials of wrath:—"*A Motor-car Hog.*—A new form of danger is threatened to road riders, and that is reckless riders of motor-cars. A couple of London cracks relate how they met a motor-car road hog along the Brighton road at Christmas, and who all but ran them down in a narrow part of the road near Crawley. In the two cracks, however, the hog had someone to reckon with; and, keeping behind the car, the two riders made the driver pull up and apologise when he arrived into the village of Crawley. Had one or the other actually been run down and hurt, it might have fared a good deal worse still with that driver." We can only say that it is difficult to judge which is the greater offender, the driver of the motor-vehicle or the scribe. The former may be safely left to the police, but as for the latter—but there, we have often remarked that good manners are not taught in Board Schools.

DOINGS OF PUBLIC COMPANIES.

AT the annual meeting of Campbells, Limited (Glasgow), on the 30th ult., the report, recommending a dividend of 10 per cent., was adopted. In answer to a shareholder, the chairman (Mr. A. I. Fortescue, of Kingcausie) said the directors were closely following the development of motor-cars, and were determined to keep abreast in the matter.

AT the annual meeting of the Girling Cycle and Motor-Car Company (Brighton) last month, it was resolved to pay a dividend of 3 per cent. for the past year on the ordinary shares. The directors explain the small dividend by stating it is owing to a wet and windy spring, ridiculous articles in the daily Press, and the large amount paid for duties, legal expenses, &c., owing to the reformation of the present Company.

London Electric Omnibus Company.

THE RESULT OF EIGHTEEN MONTHS' WORK—A COMMITTEE OF CONSULTATION APPOINTED.

THE ordinary general meeting of shareholders of the London Electric Omnibus Company was held on the 31st ult., Major S. Flood Page (Chairman of the Company) presiding.

The CHAIRMAN said:—I am very glad that the time has come at last when it is my duty to discuss with you the affairs of this Company. We have postponed the meeting as long as we possibly could, even to the limit of the legal date, because we had hoped that when we met we should be able to tell you that we had succeeded in making an alliance with a company for the building of the omnibuses, and with another company for the manufacture of the accumulators. I am glad to be able to say, with reference to the Syndicate called the Electric Street-Car Manufacturing Syndicate, that that Syndicate has now come into existence, and that I have been summoned to a meeting of the Board down in Wolverhampton on Wednesday next, for the purpose of allotting the shares which have been applied for. Now, you are aware that we have been under great difficulties, owing to our not having proper premises. It states in the report that, the amount of capital at the disposal of the directors not being sufficient to enable them to commit the Company to the expenditure necessary either for the purchase or lease of suitable premises, they have had to contract for the several portions of the omnibuses with various firms in different parts of the kingdom, the engineer then putting the parts together in London under great difficulties. We came to the conclusion, very shortly after we set to work to build the first omnibus, that it was a most difficult matter to contract for the manufacture of the various parts and put them together in London. This was instanced in the contracts required for the manufacture of the motors. We could not get any of the different contractors in the various parts of the country to agree to anything like a penal clause. We made a contract for the delivery of motors at the end of four months, and, not getting them, we were compelled to cancel the contract and start again. We, therefore, came to the conclusion that it was absolutely necessary to make some other arrangements. At the statutory meeting I said that we were not going to launch into factories, as we had not money enough. I also told you that this was a pioneer Company, and that we must of necessity move slowly. No doubt we are all disappointed that more progress has not been made. At the commencement we all believed that we should be able to make more rapid progress than we have been able to do; and yet real progress has been made. The first step is the solving of the manufacturing question, which has been the most difficult thing to contend with. As you will see by the report, the directors during several months have been negotiating for and assisting in the formation of the Electric Street-Car Manufacturing Syndicate, which was registered on the 3rd of this month, and a contract has been made between this Company and the Syndicate, in which, among other things that have been going on, it was proposed that I should accept a seat on the board of the Syndicate, and Mr. Thomas Parker, of Wolverhampton, should accept a seat on the board of this Company. The appointment of Mr. Parker to this board will materially strengthen it, as that gentleman has had a large experience of the manufacture of electric appliances. Now, how do we stand? We are the only Company in England—I am not quite sure whether we are not the only Company in Europe—that has got electric omnibuses to run along the streets without rails. We have at this present moment one omnibus which holds 26 passengers, and we have a report from our engineer, Mr. Radcliffe Ward, in which he tells us that it must be noted that the technical difficulties in successfully producing and working such a vehicle are far greater than those for small vehicles carrying a few passengers. Nevertheless, this car is under the most perfect control, and can turn in a small space, and steers with perfect ease in the most crowded traffic.

Then we have another 10-passenger omnibus, which was licensed by the police yesterday, and I may say that the 26-passenger omnibus will certainly be licensed in the present or next week. In addition to that, we have partly built another 26-passenger omnibus at Shrewsbury, and arrangements have been made with the Electric Street-Car Manufacturing Syndicate for the building of another omnibus for this Company. In the course of a very short time I hope we shall, at any rate, have one 26, one 10, and one 16 passenger omnibus running about the streets of London, in order to show what can be done in electrical traction in omnibuses. I am sorry Mr. Spagnoletti is not able to be present at our meeting; but he has written to me a letter with reference to the Sola accumulator, which he says is the best accumulator in the world. What I maintain is that in this Sola accumulator we have an accumulator admirably adapted for our purpose, and one which will give us an enormous advantage when we come to have it regularly at work in the streets. It has never failed, and, of course, you know something about the value of accumulators. I was in hopes of getting over the manufacture of the accumulator, but certain claims have been made. I have no hesitation in saying that when these claims can be adjusted—they ought to be adjusted—we shall be able to show we have got a valuable property in that accumulator. We have heard a good deal about this being a very big Company, but it is a very small Company. It never could be in a position seriously to compete with the London General Omnibus Company, we having only a capital of £50,000. (A Voice: "It ought to be £150,000.") Of that £50,000, £48,756 has been called, of which £20,000 was paid to the vendor. Now as to the future. We state in the report that all that is required is that the shareholders should work together, that a comparatively small amount of money should be provided for the immediate purposes of the business, and that there should be some alteration in the details of the Company. There is no reason for panic, least of all for winding up the Company, as has been suggested If the vendor and his associates had paid the money due on their partly-paid shares the Company would have had ample funds for immediate requirements. We also want to carry the shareholders with us. We believe that if we act in unity the foundation has been laid for a real good business; but I am quite sure that if we act in discord somebody else will inherit the work we have been doing during the last 18 months. It is for you to determine whether you choose to keep it in your hands or to leave someone else to reap the benefit. We would suggest that you appoint a committee to consult with the board on the position and requirements of the Company, and if you agree to that I have very little doubt that we shall be able to put this concern in a stronger position, and one that will give great promise for permanent success. I beg to move:—"That the report and accounts for the period extending from the registration of the Company on May 18th, 1896, to November 30th, 1897, be and are hereby received and adopted."

Mr. HENRY FOX seconded the motion.

Mr. CURTIUS was proceeding to refer to the prospectus of the Company when he was interrupted by the Chairman, who said that as legal proceedings were pending with reference to the prospectus, he was advised by the solicitors that such a matter could not be discussed. Mr. Curtius, continuing, said that in that case there was no use making any comments at all. He proceeded to say, however, that in 1888 a syndicate was formed for thoroughly testing Mr. Radcliffe Ward's system of electric traction, and that, after years of successful investigation and experimental work, it had been decided to form a company, with adequate working capital, to introduce the system into London and elsewhere. That appeared in the prospectus, he said, and he asked how far had they gone in that direction? He would also ask why the directors dared to go to allotment on the capital they did?

Mr. CONDICT also complained of the directors proceeding to allotment on so small a capital, and expressed the opinion that it was not the business of this Company to manufacture accumulators. He also objected to Mr. Parker being on the board of this Company when he was associated so directly with a business which he held was antagonistic to their own. He suggested that the omnibuses which had been spoken of by the Chairman should be at once put

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upon the streets of London, say from Victoria Station to Piccadilly Circus, the fare to be 6*d*. per journey. He also thought that some time should be given to those in arrear of calls, permitting them to pay up in monthly instalments. If they did not avail themselves of that privilege the shares might then be offered to the remaining shareholders. (Applause.)

After some further discussion, the CHAIRMAN, in reply, said with reference to the question of whether the shareholders who had not paid up their calls should be sued, that was a matter which the committee, which it was proposed to appoint, would decide upon. No cash of the Company had been paid into the new Company to make the Sola accumulator; it was simply a transfer of so many fully-paid shares. With regard to Mr. Parker's appointment on the board, he might say that on any question in which a director was personally interested he refrained from voting.

The resolution was then put to the meeting and agreed to.

The CHAIRMAN said he had now to move that the following shareholders be appointed to consult with the directors on the position and requirements of the Company, namely, Colonel Turnbull, Mr. Hayden, Mr. Serymgeour, and Mr. Condict, and that these gentlemen, along with the board, be requested to report to the shareholders at a special meeting to be convened within sixty days.

This resolution was unanimously agreed to, Messrs. Percy Mason and Co. were reappointed auditors, and a vote of thanks to the chairman, on the motion of Mr. Condict, brought the proceedings to a close.

Britannia Motor-Carriage Company.

THE second ordinary general meeting of the Britannia Motor-Carriage Company (Limited) was held on December 15th last, at the Britannia Motor Mills, Woodstock Road, W., under the presidency of the Hon. J. H. H. Berkeley (the chairman of the Company).

The CHAIRMAN, in moving the adoption of the report and accounts, said that under ordinary circumstances he should at once go through every item in the accounts and explain them; but the shareholders would see that the auditors had appended to the accounts what was called a qualified certificate, and he thought it best to commence by referring to their report of the 6th inst., which was alluded to in their certificate. He and his colleagues and the solicitor to the Company were of opinion that the auditors had in their report taken an entirely erroneous view of their functions and duties, and in several of the statements which they had made they had gone entirely beyond their province. In support of this opinion he quoted the opinions expressed by Lord Justice Lindley and Lord Justice Lopes to the effect that it was no part of an auditor's duty to give advice to either directors or shareholders as to what they ought to do, and that his business was to ascertain and state the true financial position of the Company at the time of the audit. Again, an auditor was not bound to be a detective, or to approach his work with suspicion or with a foregone conclusion that there was something wrong. The chairman proceeded to read the report of the auditors (Messrs. Carnaby, Harrower, Barham, and Co.), in which they pointed out that while the balance-sheet was a correct abstract of the accounts as appearing in the Company's books, its accuracy, as disclosing the true position of the Company at September 30th, 1897, was in their opinion subject to the clearing up of various matters. These had reference to the sale of patents, the absence of various vouchers and documents, and several other matters of which the chairman gave categorical explanations. He remarked that for every payment made by the Company there was originally in the office a receipt, but at the present moment several of those receipts were missing. It was not possible for him to tell the shareholders who had abstracted them from the office of the Company, but they had been wilfully abstracted, possibly for the purpose of injuring the Company. He believed the shareholders would concur with the directors in thinking that if the auditors had approached their work free from suspicion, and without having apparently arrived at a foregone conclusion that there was something wrong, they would have believed the representations made to them by the directors, in whom the shareholders had hitherto placed their confidence. Practically every entry in the books of the Company had been made by the auditors, and the accounts now submitted were made up and prepared by them, so that they should have had no doubt as to the accuracy of the balance sheet. Perhaps the shareholders would agree with him in thinking that it would have been better for the auditors to have confined themselves strictly to their own duties, instead of apparently desiring to arrogate to themselves the duties appertaining to directors and solicitors. The chairman then referred to the accounts in detail, and pointed out that the profit and loss account showed a considerable excess of expenditure over income. At the date when the accounts were closed the Company had not reached a point when it was in a position to complete the delivery of motor-carriages, consequently while the expenditure was necessarily heavy during the period covered by the accounts, there was practically no income. Shortly after the Company went to allotment negotiations were entered into for the sale of the British patents and colonial rights, and the outcome of these negotiations was that they sold the British patents and colonial rights to the British Motor Syndicate for £16,000, but they obtained, as part of the contract of sale, a perpetual free license to manufacture, sell, and use the Britannia Motor in Great Britain, Ireland, and the colonies. As part of the contract they had also placed with them orders from the British Motor Syndicate to supply them with motor-carriages to the extent of £10,000 per annum for three years, on which they were entitled to charge 35 per cent. over the actual cost price of the motor-carriages. They did not at first propose to manufacture themselves, but intended to get the motors and carriages built for them. They, however, found this most difficult; indeed, it was almost impracticable at the time, and at last they were compelled to face the fact that if they were to get the motors made satisfactorily they should have at first to make them themselves. They endeavoured to get suitable premises for their purposes in or near London on lease, but although the managing directors and the engineer visited dozens of places, they could not get one on lease, and as the premises in which they were now assembled were offered to them, they secured them on terms which were most advantageous to the Company. They were most commodious and most suitable premises, and they were now well fitted with machinery, tools, and necessary appliances. Only those who had been continually at the business, as the directors had been, could form any idea of the immense difficulties which had had to be overcome in starting an entirely new industry, in equipping the works, in getting ready the various patterns and designs, and in making the tools. Everything had been done there excepting the bodies of the carriages and the tyres. These tyres had been the cause of much trouble and anxiety to the directors, and he was not sure that they had got the most suitable ones for their purpose. Some motor-carriages were finished, and others would be completed shortly. Practically, their greatest difficulties had been overcome. But it was no use disguising from the shareholders the fact that the Company had not too much working capital left; and, although they might go on satisfactorily, it would, in the opinion of the directors, be advisable for the Company to be strengthened in some way. Consequently, they had had for some time under their consideration in what way this could be best done. At the meeting held on November 5th he informed the shareholders that there were pending, and were almost completed, negotiations for a deal by which he believed members would be very considerably benefitted. He was not able then to give particulars of the proposed deal, but he had sincerely hoped that he should have been able that day to say it had been completed. The shareholders had to thank those persons who, while pretending they had been animated by a virtuous desire to protect the interests of members, had, since the last meeting, been using the most persistent endeavours to throw discredit on the Company and all connected with it, that the deal had not yet been completed. It was hardly to be wondered at that those who were negotiating with the directors had not shown too much anxiety to complete. Draft agreements, however, had been exchanged; they had had several meetings, and there was at present only one point on which they were not in accord, and that, he believed, could be got over. Shortly, the proposals were as follows:—(1) That the Britannia Motor-Carriage Company should sell the whole of its undertaking and assets to another company; (2) that holders of shares on which 15*s*. had been paid should receive for the shares they at present held 2*s*. 6*d*. in cash per share, and one share credited with 17*s*. 6*d*. paid up in a company to be called the Britannia Electric Motor-Cab and Omnibus Company (Limited), with a nominal capital of £120,000, and a working capital of £30,000 for each share at present held; (3) that holders of fully paid-up shares should receive 2*s*. 6*d*. cash per share, and one share in the company already referred to for every share at present held. The proposed arrangements appeared to the directors to be to the advantage of every member. Practically, they amounted to this: that, if the agreements were completed, members who had subscribed for their shares would get a cash bonus of 16½ per cent. on the amount they had paid up within some 15 months of the original allotment of the Britannia Motor-Carriage Company, and get credit for another 16½ per cent., while they would obtain exactly the same holding in the new Company as they had at present in the Britannia Motor-Carriage Company, but their present liability of 5*s.* per share would be reduced to 2*s.* 6*d.* per share. The holders of fully-paid shares would get a bonus of 12½ per cent. on the nominal value of their scrip, retaining an interest equal to their former holding in the new Company. It rested entirely with the shareholders whether the directors should go on as they were at present, or whether they should endeavour to get some such scheme carried through. Of course, they could not come to a definite decision that day, but if there appeared a desire among the shareholders that the scheme should be carried through, then the directors would in due course summon an extraordinary general meeting, and submit formal resolutions to give effect to it.

Mr. BRYANT seconded the motion.

The AUDITOR (Mr. Carnaby Harrower) said that when his firm took up the audit they had to complete the postings in the books and to hunt about for vouchers, &c. The chairman had admitted that there was considerable confusion when they took the matter up, and in his (the auditor's) opinion his firm had only done their duty to the shareholders.

Mr. TIBBETTS moved, as an amendment, that the accounts be received but not adopted, in order to give the auditors an opportunity of investigating certain matters which, he said, had not been altogether answered to their satisfaction.

Mr. SIMPSON seconded the amendment.

The CHAIRMAN remarked that Mr. Tibbetts had only the previous week had five fully-paid shares transferred from the name of another member of the Company into his own name.

Mr. TIBBETTS said he had had the shares transferred into his name for the specific purpose of attending that meeting, in order to represent several shareholders.

After some discussion the amendment was rejected, and the report and accounts were adopted, with eight dissentients.

Messrs. Carnaby, Harrower, Barham, and Co. (the present auditors) were proposed for re-election, but an amendment in favour of the appointment of Messrs. Hardy, Hislop, Cleveland, and Channon was carried.

A vote of thanks to the chairman closed the proceedings.

In reference to the appointment of Messrs. Hardy, Hislop, and Co. at the above meeting, a letter from that firm appears in the current number of *The Accountant*, in which the following passages occur:—

"In the first place, our names were proposed at the meeting without any reference whatever to us on the subject, the first intimation we received of our appointment being through the medium of the financial papers, several of which contained a full report of the meeting.

"Secondly, we have not up to the present received any official notification of our appointment, and when we do we have yet to decide whether or not we shall act.

"Supposing, however, that we should accept the appointment, the shareholders may rest assured that the whole of their interests will be as strictly and as conscientiously looked after as they have been by the late auditors."

Great Horseless Carriage Company.

AN extraordinary general meeting of the shareholders of this Company was held on December 22nd last, at the Motor Mills, Coventry, Mr. H. J. Lawson presiding, for the purpose of considering the resolution for the reconstruction of the Company, full particulars of which scheme we publish hereunder.

The CHAIRMAN thought it would be a waste of time to talk about the success of the motor-car and the future of the motor traffic. He believed the present state of public opinion was very different to what it was 12 months ago; the power of motors, their speed, and the economy with which they worked were generally acknowledged. At the same time he would call their attention to two or three things which placed that matter beyond controversy. The traffic of our streets was slower and more expensive than it might be, and he could prove that to the satisfaction of anyone who disputed it. He could take them from that spot to any given spot within 20 miles quicker than a railway train could. If they wished to go from one place to another they had to walk to the railway station and when they arrived at their destination they had to walk or take a cab to their houses. With a motor-car they could go from door to door. Objections to motor-cars had been raised, and such questions had been asked as "Will it do for all sorts of roads?" "Will it go any distance and any length of time?" There was a car in that building which had been the longest journey possible in this country. It had been driven from Land's End to John o' Groats and back, a distance of 2,000 miles. It acted perfectly and kept time. Every part of it was made in those works and the Daimler Company's works. Motors had also climbed hills, and a car built in these premises had been driven up the Malvern Hills. He had received a letter from a Mr. Stirling, in Scotland, giving a long list of journeys made by motor-cars for passenger traffic. They had cars to carry eight people, which were built there. One of the greatest complaints against the board of that Company was with respect to the enormous amount of money being spent on perfecting the electric cab. But the £10,000 or £12,000 they had spent on the electric cab had produced the London electric cab.

It was the first time in the history of the world that these cabs had been put upon the streets to take traffic, which these cabs had done, to the satisfaction of everyone. They had the sole right to build these cabs, and they had received orders for 75 London electric cabs from a company a week or two ago. All the cabs the Company wanted were supplied from these works, or else they had to consent to the order being given elsewhere. Fifty cabs were being built under their patents and license by another firm, because they were not ready to do that work. (A Voice: "Then you ought to have been.") He had received letters from people who were using their vans in London, and all of them were satisfied. They started six months behind the Daimler Company, and as it was only 13 months since they started, the shareholders could hardly expect much more. They had now more orders than they could turn out, and the Daimler Company was booked up for all next year. They had 260 cars in hand. Time would also be wasted in talking about the value of their licenses and patents, and the monopoly it gave them. (Hear, hear.) The monopoly was theirs. (Hear, hear.) It would be time to talk about that when competition was severe. At the present time no one else was turning out motor-cars every week. There were one or two solitary makers who had succeeded in making cabs, but they would be pleased to run their cabs against any other make in the world. Having plenty of money and plenty of work the shareholders might say, What was the use of a scheme and a reconstruction? He would refer them to the two circulars—one from the directors and the other from the shareholders' committee. The one from the directors stated that they could do no more than they had done.

They had had a great deal of opposition, a great deal of mismanagement, to complain about, and a great deal to fight against that they ought not to have had. Instead of going over that, which would do no good to their shares or to the Company, he would turn at once to the committee's scheme. Since the committee had been sitting, clearing up the obstacles which he had to fight against, they had had a new manager, and they had been turning out and selling cars as hard as they could. Notwithstanding the enormous expense they had been earning a profit. Before the committee sat, their expenses amounted to nearly £1,000 a week, and the results were most unsatisfactory. The board consisted of men who knew nothing about the motor-car business, and some of the directors held the view that every floor of these works ought to be fitted with machinery, and started on full power making motor-cars. Against that view he and two other gentlemen were opposed, because they knew that their capital—the £40,000 they had in the bank—would have to be spent. By his determination that money had been saved. They wanted to make one pattern of motor which would suit the million and come within reach of their pockets, one which would not cost £300 or £400, but which would be simple to repair if anything went wrong. They were having built a suitable thing to sell to the crowd in quantities at about half the price that the motor-car of to-day costs. Since the committee had been sitting they had actually been making a small profit. Their expenses were reduced to about £250 a week, and their works were built and ready to receive heavy machinery. When the premises were fitted with machinery they would be able to turn out two or three dozen cars a week. The Daimler Company were turning out more cars than any other company in Europe. Their great object was to make their own motors, which were now supplied them by the Daimler Company. They should be obliged to be good customers to the Daimler Company, because that Company had all their wheels and frames, &c., from the Great Horseless Carriage Company. The shareholder who had a £10 share in the Great Horseless Carriage Company got four preference shares in the British Motor Syndicate, the parent Company, which owned all the patents—with the possibility of having to pay in the course of time 3*s.* They would have to pay 6*d.* a share down, and the further sum when they were called up. Why was it in the interests of the British Motor Syndicate or this Company that the shareholders should have to pay 3*s.* and take the four preference shares in the Syndicate?

Speaking for the British Motor Syndicate, he could assure them they hoped they would not take the preference shares. They would let them off. He would take the preference shares, and pay the 3*s.* This parent Company had a right to form as many companies and grant as many licenses as would be required. That Company had to pay the Great Horseless Carriage Company £12,000 a year in dividends. The British Motor Syndicate had great pressure put upon them before they consented to give them that for 3*s.* The reason it was done was purely on moral grounds. Some of the shareholders imagined that they had some hold on the parent Company; they also held some interest in the patents. The Company which would take the place of the Great Horseless Carriage Company had the advantage of paying a dividend on a much smaller sum than this Company would do if they went on the present lines. They would only have to pay 6*d.* immediately, and they would have 10 shares which would be much more marketable than one £10 share. It would be a superior sort of an investment compared with what they had now. It was only as an improvement that they should consider it, because they could go on on the present lines and with £40,000 in the bank, only they would not have such a good investment, and it would be much longer before they would get a realisable security. With regard to the money spent on experimenting, he did not think it had been wasted, as it had taught them a great deal. He hoped the shareholders would remember that they were speaking to their customers as well as to the public, and he hoped they would not foul their own nest and do harm to their own shares and the Company.

Mr. MACK proposed the following resolutions:—

"(1) That it is desirable to reorganise the affairs of the Company, and, accordingly, that this Company be wound up voluntarily, and that John Baker, of Chiswell House, Finsbury Pavement, chartered accountant, be, and he is hereby, appointed liquidator for the purpose of such winding up. (2) That the draft agreement marked 'A' submitted to this meeting be, and the same is hereby, approved, and that the liquidator be, and he is hereby, authorised, pursuant to Section 161 of the Companies Act, 1862, as modified by Article 131 of the Company's articles of association, to enter into an agreement with the British Motor Syndicate (Limited), in the terms of the said draft, and to carry the same into effect, with full power, nevertheless, to agree to any modification or alteration of the terms thereof as he shall think expedient either before or after the execution thereof. (3) That the draft agreement marked 'B' submitted to this meeting be, and the same is hereby, approved, and that the liquidator be, and he is hereby, authorised, pursuant to Articles 130 and 131 of the Company's articles of association, and of every other power enabling him in that behalf, to enter into an agreement with a Company intended to be formed, and to be called the Motor Manufacturing Company (Limited), or by such other name as may be resolved upon in the terms of the said draft, and to carry the same into effect, with full power, nevertheless, to agree to any modification or alteration of the terms thereof as he shall think expedient either before or after the execution thereof."

Mr. HOFFMAN, as a member of the shareholders' committee, who had taken a great deal of trouble in the matter, seconded the resolution. He explained that the committee was formed one day in town at lunch. They decided to send out anonymous circulars. They were tired of litigation. To that circular they had 1,600 replies, which showed that most of the shareholders were tired of litigation. All the large shareholders in London were written to, and out of them a certain number decided to join the committee. Amongst those written to were Mr. William Whiteley, the universal provider, and he subscribed £10,000 in this Company, and Mr. Wagner, who put £75,000 in sovereigns into the Company. He was sure that a better scheme could not have been evolved. The first scheme which was submitted was that a new Company should be formed—the Foreign and Colonial Company—that they should supply money to that Company, and that eventually they should be shareholders. That meant simply printing paper and putting their money in. That scheme was rejected, and then it was proposed they should amalgamate with the Motor Syndicate. It then took another course and became the present scheme. The objection the committee had mostly heard to the present scheme was that the Great Horseless Carriage Company had to hand over money to the British Motor. (Hear, hear.) He quite admitted the force of that objection, but shareholders must not forget that they were becoming part and parcel of that Company. He asked one of his co-members of the committee that morning whether he would rather take £12,000 a year in the British Motor or the dividends likely to be earned in future by the Great Horseless Company, and the reply was, "I think I will take £12,000 a year from the Great Horseless." In the one case there was preference and debenture interest, and in the other there was not. He admired the way in which Mr. Lawson had staked his life on this industry, and was impressed with the earnestness with which he meant to carry the business to a success. He had a large holding of some hundreds of thousands pounds' worth of shares in the motor industry, and his holding in the British Motor Syndicate was not worth a "tinker's cus" till he had paid the new Company £12,000 per annum. If the shareholders got nothing from the Motor Manufacturing Company, which was to take the place of this Company, they would not have lost their money. They, however, should get dividends in the future from the new Company, which would start without litigation. That was a great thing; it was impossible to carry on business with hundreds of law suits looming over their heads. He believed that was the reason there was not more work going on at the present time. The committee went to Paris to examine into the industry. They visited some eight or 10 factories, with 600 men in one and 400 in another, making some wonderful machinery. They were impressed with the strides that motor-cycles had made there. They were all about the streets. Since April 3,000 had been sold by one firm. When they came back they looked into the patents this Company held, and they found that they had no bicycle patent at all. They had altered that, and now they could make motor-cycles. He advised the manufacture of small, cheap things to familiarise the eyes of the public with what they were doing in Paris, and the rest would follow. By the scheme they would get for each £10 share four preference shares, 17*s.* paid, in the parent Company—the Motor Syndicate—and £1 debenture fully paid in the same Syndicate. That bore 4 per cent. interest and the preference shares 5 per cent. They also got six shares in the new manufacturing company. He did not know what the name of the new Company would be, but it would start clear of litigation with 50,000 sovereigns in the bank, and owning all the plant, which he understood had cost £22,000 or £23,000. If they only made £20,000 it would give them £15,000 a year; £15,000 and £12,000 made £27,000. That would mean over 5 per cent. on whatever they might put in. He believed the scheme was a very good one, and the shareholders ought to support it.

Mr. BARR asked for an explanation of paragraph 6 of the scheme, which said:—"The British Motor Syndicate to take over all the liabilities and litigation of the Horseless Company and all risks thereof, and in consideration of this and their other concessions receive back the rights conferred on the Horseless Company under the license and also the remainder of the assets." He also wanted to know whether the Horseless Carriage Company were the exclusive owners of the whole of these premises.

Mr. VAN PRAAGH (solicitor) said that before he dealt with the question he should like to make one or two remarks. There was a great deal of litigation going on now, and perhaps they were not aware that this litigation was being conducted, as far as this Company was concerned, entirely by one gentleman on behalf of a very small fraction of the shareholders, whom he had got together for the purpose by means of circulars. Before a solicitor could get a number of shareholders together by means of circulars he must—looking straight in the face of what he proposed to do—put into those circulars a number of statements calculated to draw to him the clients he required. In this case that course was followed. There were 3,000 shareholders in this Company, and it was not possible to get 3,000 people to entirely agree upon any one thing. This gentleman made certain statements which were so ridiculous that he only succeeded in getting a small fraction together. He said that the British Motor Syndicate had not got the patents, and he said the patents were not valid. He made a number of other statements, and the gentlemen who received the circulars did not know what to make of them. In that circular he accused everybody. He (the speaker) would ask the shareholders to deal very carefully and gingerly with any questions that might arise in their minds through this circular, and not to condemn any man until he was found guilty. They had heard a great deal about the directors, but nothing had been proved. Agreements on the formation of a company of this kind had to be framed with great care. When one had thought out every possible incident which might affect the future, one discovered that some bargain had been made which did not work so well in practice as in theory. They had to pay certain moneys, and to receive a totally different license to that granted to them. In view of that. it had been no easy task for the various solicitors to work out in a technical and legal form the scheme the terms of which the committee supplied. Mr. Barr's question could be best answered by his referring to the paragraph in the scheme headed "Present position of the Company." He would there see the terms of the license under which they had worked precluded them from making the lighter motor-car and the tricycle, from which possibly they would earn most money. Under the present license they had that power. It was originally intended that this Company should be a carriage company, and that another company should be formed for motor-cycles. It had taken months to arrange, and it was in making this new bargain that the arrangements referred to became necessary. If the one paragraph was read in conjunction with the other, they would find the explanation. In answer to Mr. Barr's second question, he replied that the whole of the premises belonged to the Great Horseless Company. The premises were negotiated for at the early stages of the formation of this Company, but, as they were not prepared to buy them at the moment they had to be bought, the promoters of this Company procured another Company to buy them in order that they might get them at the price at which they were offered. They were transferred from that Company to this.

Mr. BARR expressed himself as quite satisfied with the explanation, and said he was prepared to support the resolution. He had not taken sides with the committee hitherto because he felt that the directors ought to have ample time to develop what was a new industry. He had no doubt they had made blunders; it would be extraordinary if they had not. The committee had formulated a scheme which he thought would tend to the prosperity of the Company. He emphasised the remarks of the chairman that nothing should be said to foul their nest, and he sincerely trusted that shareholders would abstain from any kind of harsh statement.

Mr. PLAYER also supported the resolution.

Mr. REA (Blackpool) supported the scheme of the shareholders. With regard to the board of directors, he did not know whether he was speaking to any of the original directors or not, but, if so, he hoped they would put more brains into the management of the concern than they had done previously.

Mr. HODGES (Leicester) asked how many directors there were now on the board, and also how he could obtain the names of the directors.

Mr. VAN PRAAGH replied that there were five directors. The names were:—Messrs. H. J. Lawson, S. Robinson, J. H. Mace, E. J. Pennington, and T. Lambert. The articles of association insisted on their not being less than five. If it had been possible to have fewer, for the purpose of saving expense they would have done so.

Mr. HOFFMAN said he believed the committee would be represented on the board of the new Company. He had been asked to join, and he had not yet decided. The best plan would be for the committee to go on conferring with the present board; then, at the statutory meeting, the shareholders could decide who they would have and who they would not have. It was a matter for consideration whether they should be represented on the board of the Motor Syndicate.

Mr. FRANKENBURGH (Manchester) said he could not agree with the resolution at all. He would not say anything, but he was not satisfied with the whole affair from beginning to end.

The resolution was then put to the meeting, and the chairman declared it carried unanimously.

Mr. VAN PRAAGH said he thought it was desirable to have a poll in the interests of the shareholders here, and particularly in the interests of those who were represented by proxies. They had proxies for over £400,000 worth of shares in favour of the scheme. They could, therefore, reckon how many had not sent proxies at all and how many would vote against the scheme. Taking a poll was merely formal, and for a purpose which they would understand at a later date better than now.

On the motion of Mr. David (Sutton), seconded by Mr. Ramsden, a vote of thanks was given to the committee for the trouble they had taken in drawing up the new scheme.

The meeting then terminated.

THE confirmatory meeting was held on January 7th at the Motor Mills, Coventry. Mr. H. J. Lawson again presided, and Mr. J. H. Mace and Mr. T. Robinson (directors) and about 20 shareholders were present. The proceedings, which were mainly occupied by the reading of legal agreements, were purely formal, and the resolutions, on being put to the meeting, were carried unanimously.

BALANCE SHEET OF THE GREAT HORSELESS CARRIAGE COMPANY (LIMITED), 30TH NOVEMBER, 1897.

Capital and Liabilities.

	£	s.	d.	£	s.	d.
Registered Capital—						
75,000 shares of £10 each ..	750,000	0	0			
Capital subscribed and allotted—						
61,408 shares of £10 each ..	614,080	0	0			
Less calls in arrear	18,937	0	0			
				595,143	0	0
Sundry creditors..				2,574	0	8
The British Motor Syndicate (Limited)—						
Balance of purchase money, plus balance of current account				7,350	15	10
				£605,067	16	6

Assets and Expenditure.

	£	s.	d.
Sundry debtors	812	9	8
Cash in hand and at bank	41,474	3	3
Leases, licenses, patents, patent rights, &c.	503,143	7	2
Machinery, plant, tools, patterns, drawings, fittings, fixtures, &c., including salaries, labour, and other direct expenses	17,317	0	6
Motor-cars, motors, parts, materials, &c.—			
Production and experimenting expenditure, including salaries, labour, and other direct expenses (less sundry credits)	27,608	19	2
General expenditure—			
General staff, establishment and incidental charges (including directors' fees to November 30th, 1896), less bank interest, &c.	5,526	11	0
Leasehold property—			
Manager's house, Coventry	500	0	0
Preliminary expenses—stamp duty, &c.	8,685	5	9
	£605,067	16	6

ALFRED BURGESS, Secretary.

We hereby certify, after having examined the books, accounts, and vouchers in relation thereto, that to the best of our knowledge and belief the foregoing statement is correct.

WHITEHILL AND WHITEHILL,
Chartered Accountants.

December 17th, 1897.

THE REORGANISATION PROPOSALS.

Details of the scheme are contained in the following circular, issued to the shareholders on 11th ult.:—

LOMBARD HOUSE, E.C.,
December 11th, 1897.

SIR, OR MADAM,—The committee are now in a position to communicate with you fully (or as fully as a circular will allow) upon the affairs of the above Company, and with these suggestions.

Constitution and Objects of the Committee.

You will remember that in reply to the first circular of September 15th over 1,600 shareholders, or more than half of the whole number, at once sent in their written approval of the objects for which the committee was formed; those objects being:—1. To investigate into the general position, including the litigation now proceeding. 2. To endeavour to obtain from the Promoters, the British Motor Syndicate, fair proposals for this Company's future, but to submit such proposals to a general meeting for full consideration. The members of the committee are all large shareholders; all but two have paid cash for their shares, and five of them were original applicants and allottees for cash under the prospectus in May, 1896. The committee have held a large number of meetings, and have, by themselves, or representatives, had numerous interviews with the directors and the British Motor Company's representatives; and in addition members of the committee have been to Paris and Coventry to inquire into the future prospects of the motor industry. The committee would very much like to commence by recording their views on the prospectus, but in view of the scheme referred to later on in this circular, they feel that no great benefit could arise from their giving in this circular details of the various points which have been thrashed out between them and the Promoters, and that the shareholders will be more interested in knowing what has been done for their benefit. At the same time, the committee think it necessary to record their opinion that the capital of the Company was much too large, that it has not been wisely expended, that the bargain made with the British Motor Syndicate under the promoting contract has not proved to be a good bargain for this Company, and that as matters now stand the Great Horseless Carriage Company cannot make any progress as a manufacturing company. However, there is a great deal of difference between things that may be considered unfair and things than can be proved to be absolutely illegal, and the committee, therefore, at the commencement of their investigations had to look at the matter from the following points of view:—1. Whether legal proceedings to recover £340,000, the amount invested by shareholders in this Company, would result in judgment for the shareholders. 2. Whether, if so, there is money to pay the judgments. 3. If there is any doubt on either point, then what would be the next best course. Now, with regard to the second point, it appeared at the outset that almost the whole of the money subscribed by the shareholders has been either paid to the Promoters, and by them spent in the purchase of patents, or spent by this Company at Coventry. Under these circumstances, the committee, after directing their solicitors to obtain counsel's opinion as to the first point (litigation), took steps to ascertain the real position and prospects of the motor industry, in order that, if good, they might try to obtain a better position in it.

Future of the Industry.

For the purpose of inquiring into the future of the industry some members of the committee went to Paris, where (there never having been any Government restrictions) the industry was making progress some time prior to the passing of the English Act last November. A detailed description of their visit would take up a large amount of space, but it may shortly be stated that they went over several large factories, each employing some hundreds of hands, and in most cases with the order books full for many months ahead, and preparations for large extensions to increase the output. The principal motors in use were the Daimler, manufactured for vehicles by Messrs. Panhard-Levassor and Peugeot and others, and the De Dion for tricycles, in which latter a very large business is certainly being done, and a little vehicle attachment to this tricycle to hold two people is just out and becoming popular. It was also stated that motor traction is being adopted by the French railways, postal service, and army. The members of the committee returned quite satisfied with the progress and future of the industry in France. A visit was then paid to Coventry where, though the industry is in its infancy as compared to France, still it is clear that real business has already commenced. For example, it appears that whereas at the beginning of this year there were no British motor-cars in existence, the Daimler works are now turning out several motors weekly. The Beeston Cycle Company are turning out De Dion tricycles, and the Humber Company are starting with a regular output. Further, that the Daimler Company are booked up for a long period. In London electric cabs are running satisfactorily. A mail motor-van is now undergoing long-distance tests by the Post Office. In Scotland a line of motor-omnibuses at Hamilton is working successfully, another at Blackpool, and two other lines are being opened in Scotland, the cars for which are now in course of construction. There is at present exhibited at the Stanley Show a number of motor-cars by our Company, but such cars include certain inventions which, according to our license, we have no present right to use. We are also told that the whole of the cars exhibited at such Show, also all those which have been successfully run in England, and those which have been winners of the international competitions, are made under patents which, for this country, belong to the British Motor Syndicate. There is, of course, still a great deal of prejudice to contend with, as there was with railways when they started, and also with the introduction of bicycles, but existing facts show to the committee's satisfaction that the industry has come to stay. If motor-cars can run from Paris to Marseilles, and from John o'Groats to Land's End, as has been done; if, as was personally experienced by members of the committee in Paris, a motor-car can go for miles in the dark, through the most crowded streets, at nearly double the pace of the ordinary traffic, and a full motor-omnibus can go at the rate of 12 to 15 miles an hour to the top of Mont Valerin (which is rather longer and steeper than the journey up Haverstock Hill to Hampstead Heath), and if all this can be done for a fraction of the cost of horse traction, then, so soon as motor-vehicles, with all the latest improvements, are turned out in quantity from a regular pattern, to enable them to be put on the market at reasonable prices, a motor manufacturing company should pay.

The Present Position of this Company.

Now, how far is our Company in a position to meet the above proposition? The answer is that under our present powers it is doubtful if we could make a motor-carriage to-day that would sell. We have no right to new patents since May, 1896, which are of vital importance (particularly in electricity), we cannot make Daimler motors at all, nor "De Dion" cycle motors, which, as before shown, are the two most popular motors at the present time, nor can we make any cycle motors whatsoever. The half interest which we have under our license in any royalties or sums received by the British Motor Syndicate in respect of certain of their patents appears to be a very unworkable arrangement, and at any rate we have received nothing worth mentioning from this source. Further, a great deal of our working capital has been spent, more or less, in experimental work, and at the present time, apart from our works and plant, we have a remaining cash working capital of about £39,000, against which we have liabilities, including claims in the litigation, to a nearly equal amount. The bulk of our directors have left us, and though the remaining directors contend they are now working at a profit, practically nothing sufficient for dividend purposes is being done.

Any reorganisation of the Company's affairs will, therefore, involve two propositions: first, a new board being nominated on the shareholders' behalf; and, secondly, provision for further working capital.

Under these circumstances, two schemes have been considered. The first for the entire amalgamation of interests with the British Motor Syndicate, which is a Company whose policy is directed by Mr. H. J. Lawson, and which Company claims it is in the position of controlling the motor industry for England and the Colonies; but it was felt, with regard to this scheme, that the shareholders might not approve of their assets being handed over to the control of others, and that the second scheme would, therefore, be more popular. This scheme is, shortly, to cut down the excessive capitalisation of the Company; to get back from the promoters £114,000 of the shares paid to them, thus reducing our share capital to £500,000; to reorganise our Company with a proper licence and working capital, and freedom from litigation, and further reduce its capital to £300,000. To get from the British Motor Syndicate for the difference between this £300,000 and £500,000 a preferential claim upon the British Motor Syndicate. The latter point was difficult to arrange, as provision had to be made for working capital and some inducement offered to the British Motor Syndicate to give us these preference shares, since their ordinary shares are standing at a premium in the market whilst ours are at 80 per cent. discount. It was finally arranged that the £200,000 preference shares to be given us should carry a liability of 3s. per share in consideration of their giving us in addition £50,000 debentures, fully paid, out of an issue of £100,000 debentures. The scheme is as follows:—

Scheme.

1. Mr. Lawson and the Motor Syndicate to cancel and surrender £114,080 in shares, reducing the capital of the Horseless Company to £500,000.

2. Remaining shareholders to receive the following, subject to their applying for the exchange in the prescribed form, which will be forwarded to them in due course:—

£50,000	fully-paid debentures out of £100,000 4 per cent. mortgage debentures of the Motor Syndicate, repayable in seven years, or if earlier (at Syndicate's option) with 5 per cent. bonus.
£200,000	cumulative 5 per cent. preference shares (the total issue) of the British Motor Syndicate, with a liability of 3s. per share.
£300,000	total issued shares of the new Company next referred to with a liability of 3s. per share.
£550,000	

3. The said new Company (to be formed) to be called the Motor Manufacturing Company (Limited), to carry out the objects of the Horseless Carriage Company on the basis of a reasonable issued

capital of £300,000, instead of the present excessive issued capital of £614,000.

4. The new Company to have (*a*) the present building, said to have cost £20,000; (*b*) the plant and stock; (*c*) an assured working capital of £50,000; (*d*) a universal free license to manufacture under all patents owned by the British Motor Syndicate, now or in the future.

5. The provision of £50,000 working capital is assured in the following manner:—£25,000 cash is to be transferred to the new Company's bank account from the Great Horseless Company's bank account, and £25,000 is to be obtained out of the moneys payable to the new Company on the shares, the balance (if any) going to the British Motor Syndicate, in which shareholders will remember they are entitled by the scheme to a large preferential interest.

6. The British Motor Syndicate to take over all the liabilities and litigation of the Horseless Company, and all risks thereof, and, in consideration of this and their other concessions, receive back the rights conferred on the Horseless Company under the license, and also the remainder of the assets. The litigation taken over includes actions by about 2 per cent. of the shareholders, claiming return of about £30,000 and costs. These shareholders were organised by, and are acting through, one solicitor.

7. The directors of the new Company (except two to be nominated by the old board) to be chosen by the shareholders and committee, and a director, to be named by us, to join the board of the Syndicate.

Committee's Views on Scheme.

It will be seen that by this scheme very considerable concessions have been obtained from the British Motor Syndicate. These concessions are:—1. The cancellation of £114,000 in Horseless Carriage shares. 2. The giving us £50,000 debentures and £200,000 preference shares, 17*s*. paid, of their Syndicate. 3. The universal licence.

The new Company—the Motor Manufacturing Company—will thus start with an assured working capital, clearly defined rights, and a clean sheet—clear of all the litigation and troubles of the Horseless Company, these all being taken over by the British Motor Syndicate, who intend, we understand, to take the litigation with shareholders to the House of Lords, if necessary. However, we are now clear of it. The committee would have been glad to avoid asking the shareholders to take a further liability—however small—but this is unavoidable, and is more than met by the debentures and preference shares which the scheme gives to shareholders. The new Company can, under its new license, make Daimler motors and De Dion tricycles, and every other kind of motor covered by the patents, including all future patents and improvements. The committee would suggest that the new Company start manufacturing an inexpensive motor-car for country use, the machinery, parts of which would be interchangeable and easily replaced, and also a motor-van on the same lines; and, in the Committee's opinion, there would be a considerable amount of other work which this Company could take in hand at once with the addition of a small amount of special plant, but it will, of course, be necessary in a new industry to proceed cautiously at first. Many inquiries are now being received. Pattern vehicles (now for the first time ready) are being inspected by buyers, and orders booked. In considering whether or not to accept a scheme on the above lines, the shareholders must bear in mind that the only possible alternative—namely, litigation for the recovery of the shareholders' money—is disposed of (first) by the fact that the money is nearly all spent; and (secondly) by the fact that the committee have obtained the opinions of eminent counsel, including Mr. J. Fletcher Moulton, Q.C., M.P., which are unfavourable to the chances of success in litigation and in favour of the scheme. Further, that any such litigation would have to be by personal actions by individual shareholders, many of whom (particularly small shareholders) would not care to incur the loss and risk of a law suit under any circumstances, and many others of whom believe in, and would wish to participate in any success which the motor industry may attain. It must, of course, be understood that the committee are not recommending this scheme as the best possible investment for a person about to invest a sum equivalent to the money he already has in the Horseless Carriage Company, but as the best possible means they can arrange by which a shareholder, whose money is already invested and practically lost, may have—as the committee believe he will have—a fair chance of ultimately recovering the whole of it. Practically it amounts to this: That every holder of an existing £10 share in the Horseless Carriage Company will get in exchange—

A 4 per cent. British Motor Syndicate (Limited) debenture of	£1 0 0	fully paid.
Four 5 per cent. British Motor Syndicate (Limited) £1 Cumulative Preference Shares	4 0 0	each, 17*s*. paid.
Six ordinary £1 Shares of the new Company, the Motor Manufacturing Company (Limited)	6 0 0	each, 17*s*. paid.
	£11 0 0	

So that, for a further liability of only 3*s*. per share on the above 10 shares, payable by easy instalments (no payment being necessary on application for the exchange), each £10 Horseless share will entitle the holder to exchange for the above 10 shares in addition to the fully-paid debenture. Or, looking at it in another way, shareholders get, in addition to a much improved prospect of dividends on manufacturing, nearly 2½ per cent. dividend on their money already invested, or over 15 per cent. upon the amount put up to save this money, secured by a preferential claim on the motor industry, as controlled by the British Motor Syndicate. In accordance with the committee's promise to the shareholders, this scheme will be submitted to a general meeting, which has been called for the 22nd inst. for the purpose. The committee have also asked that an audited balance-sheet shall be ready for the meeting. As the bulk of the shareholders are scattered over the country, many of them being in Scotland and Ireland, their views should be represented at the meeting, and with this object the committee enclose a form of proxy, which, if it is to be of any use, must be returned to the committee and received by them not later than the 18th inst., and they earnestly ask each shareholder in his or her own interests, if not in return for the time and trouble they have given to this matter, to make a point of strengthening their hands at such meeting, by returning this proxy as asked without fail, and as soon as the resolutions are passed and confirmed the shareholders will receive the necessary forms for exchange of their shares as explained.

We remain, yours faithfully,

THE GREAT HORSELESS CARRIAGE SHAREHOLDERS' COMMITTEE.

F. OFFOR, *Secretary*.

The members of the Committee are:—

		In shares.	
M. H. Buckea	.. .. .. holder for cash of	£2,500	And also representing over one-half of the shareholders.
T. C. Boorn	.. .. .. " "	£1,000	
S. De Brath	.. .. .. " "	£400	
R. Hoffman	.. .. .. " "	£500	
C. Mann	.. .. .. " "	£1,000	
Norman Tronson	.. holding and representing	£6,000	
R. Wheeler	.. .. " " "	£1,300	
F. W. Woodhouse	.. .. holder for cash of	£1,000	
J. W. Wagner	.. .. .. " "	£7,500	

Also approve of the scheme.

Accompanying the circular was a slip to the following effect:—

With regard to those shareholders in the Company who have commenced litigation, and who by so doing have individually incurred liability for the costs of numerous firms of solicitors representing the 11 defendants being sued, the committee have been able to make arrangements whereby any of such shareholders wishing to take the benefit of the scheme referred to in this circular in preference to the delays, expense, and risks of litigation, may, by communicating to that effect to the committee before the general meeting, be relieved of any liability as to costs, and have their actions ended free from such liability. Further than this the committee cannot take any responsibility in the matter.

It should be pointed out that the bulk of the committee being, like yourself, original subscribers for shares, had the same right to bring actions as yourself if they had thought it worth while.

MR. W. J. Hunter, the solicitor acting on behalf of the dissentient shareholders in the Great Horseless Carriage Company (Limited), replied to this circular by sending the following communication to his clients:—

24, FINSBURY CIRCUS, LONDON, E.C.,
December 15th, 1897.

Great Horseless Carriage Company (Limited).

DEAR SIR,—I have just received a copy of the circular, dated the 11th instant, sent out by the "Shareholders' Committee," recommending the adoption by the shareholders of the scheme therein set forth.

Under this scheme, a shareholder assenting thereto would have to pay a sum of 30*s.* on every share now held by him, and would receive in exchange—what?

The answer is, four £1 shares and one £1 debenture of the British Motor Syndicate, and six £1 shares of the proposed new Company, to be called the Motor Manufacturing Company (Limited).

In view of the state of affairs disclosed by the recently-issued balance-sheet of the British Motor Syndicate, and of the fact that many actions are now pending against that Company, the value of its shares and debentures would appear to be nil, and as the proposed new Company would practically entirely depend upon the success of the British Motor Syndicate, it is difficult to see how its shares could have any greater value.

The result of agreeing to the scheme would, therefore, be, in my opinion, the throwing away of good money after bad, as you would be paying 30*s.* on your present shares, and receiving in exchange paper probably of no greater market value than the shares you now hold.

The committee's views on the prospects of litigation are somewhat curious. It will be observed they give no answer to the first point into which they say they inquired—namely, as to whether legal proceedings would result in judgment for the shareholders. They merely say that it appeared that the Company had spent most of its money, and entirely ignore the fact that the plaintiffs in the pending actions look more to the personal liability of each of the original directors for the satisfaction of their claims than to any remaining assets which the Company may possess, and further these plaintiffs are not seeking to recover £340,000, but only about a tenth of that amount.

The opinions of counsel referred to in a later portion of the circular as being unfavourable to the chances of successful litigation are obviously dependent upon the nature of the case and facts submitted for their consideration, and I have little doubt but that if all the facts as known to me were submitted to the same counsel, their opinions would be different.

The threat about taking the litigation with shareholders to the House of Lords, and the green slip inserted offering to relieve the same shareholders from all liability as to costs if they will only be so good as to agree to the proposed scheme, can only serve to call to mind certain other circulars which you have lately received (ostensibly from another quarter), also intended to induce you to abandon the apparently much dreaded litigation.

I can only advise all my clients to pay no attention to these new proposals, and above all to sign no proxies; but to proceed resolutely with the pending actions as the only practical means of recovering their money.—Yours faithfully, WILLIAM J. HUNTER.

A meeting was then called of the dissentient shareholders, which was held on December 30th, the following being a summarised report of the proceedings sent out by Mr. Hunter accompanied by his letter immediately following, dated January 3rd, 1898:—

24, FINSBURY CIRCUS,
LONDON, E.C.

Great Horseless Carriage Company (Limited) Shareholders' Combination.

Report of Meeting of Plaintiffs, held at Anderton's Hotel, Fleet Street, on Thursday, December 30th, 1897.

In response to the notice convening the meeting, a representative gathering of members attended, several coming from such distant centres as Nottingham, Bradford, Edinburgh, and elsewhere.

The meeting being of a strictly private character and in the nature of a conference between counsel (Mr. W. J. Disturnal), solicitor (Mr. W. J. Hunter), and clients, or their private solicitors, no professional reporter could be admitted, and consequently a verbatim report of the proceedings could not be furnished, nor would it be in the interest of the members that such a verbatim report of many of the statements made at the meeting should be given the publicity necessarily involved in sending out this intimation of what took place.

Mr. Hunter explained that the meeting was called to consider and decide as to what would be the best course for the members to adopt in view of the reconstruction scheme recommended by the "Shareholder's Committee" having been carried, and of the effect of Mr. Samuel Green's circular and the committee's offer inducing members to withdraw their actions. He stated that only 10 out of the 93 members had notified him of their intention to agree to the scheme and of their desire to withdraw from the litigation. After stating what he had learned as to the origin and formation of the "Shareholders' Committee," Mr. Hunter called upon Mr. Disturnal, the counsel, who from the beginning had advised in these proceedings and also in the actions against the British Motor Syndicate, to address the meeting.

Mr. Disturnal then proceeded, in an exhaustive speech of over an hour's duration, to explain the legal position of the plaintiffs in view of the reconstruction scheme, and the grounds for believing the actions, if continued, would succeed, and to discuss the proceedings of the "Shareholders' Committee," the manner in which it had conducted its investigations, the scheme recommended by it, Mr. Lawson's statements at the general meeting as given in the printed report sent to the shareholders, the financial position of the British Motor Syndicate as disclosed by its balance-sheet recently issued, the chances of success of the new Company under its proposed new licence, Mr. Moulton's opinion, and other matters, and then intimated that there were three courses open to the members to adopt, namely, the following:—

1. To proceed with the pending actions.
2. To withdraw the actions, and assent to the reconstruction scheme.
3. To withdraw the actions, refuse assent to the reconstruction scheme, and so treat the money paid for their shares as lost.

It was not, he explained, within his province to advise upon anything that was in the nature of a speculation; he could only advise upon the legal aspects of the questions at issue, and leave it to the members themselves to decide, as business men, what, after the explanation they had listened to, would be the best course for them, under the circumstances, to adopt.

Discussion by the members was then invited, and several members expressed their views in favour of continuing the litigation. Some questions were put, and answered by Mr. Hunter or Mr. Disturnal, it being explained, in answer to one question, that if the actions were continued, and proved unsuccessful, the plaintiffs would not then be able to fall back upon the reconstruction scheme and accept the new shares. They must definitely elect to adopt one course or the other.

Mr. Hunter read some letters he had received from some members who were unable to attend the meeting, in which they gave their opinions and offered suggestions. He also pointed out that in one respect the reconstruction scheme might be of advantage to the members if they should decide to continue the litigation, in providing funds to meet the plaintiffs' claims, should they be successful.

Mr. Hunter then took the opportunity of expressing his thanks to Sir H. A. White for the great assistance the latter had been to him in helping him to reply to the personal attacks made upon him in certain circulars issued by the defendant Company.

Sir Henry Arthur White, in reply, stated that he was very pleased to have been of any service in the matter of the unwarranted attacks in question, and that he felt quite satisfied with the manner in which Mr. Hunter had conducted the litigation. He then advocated the continuance of the actions, and expressed his opinion that the proposed new shares would be practically worthless. He was also of opinion that the members present, having had the advantage of hearing Mr. Disturnal's able explanation on many important points affecting the decision to be arrived at, were in the best position to form a correct judgment on the matter, and that therefore the decision should be taken on the vote of that meeting.

After some further discussion, and consideration of the terms of the agreement signed by each member on joining the combination, whereby it appeared that each signatory could be compelled, notwithstanding any notice of withdrawal, still to contribute his agreed proportion of the costs, a resolution to the following effect was proposed by Sir H. A. White, seconded by Mr. De Hersant, put to the meeting, and carried without a single dissentient vote:—

Resolution.

That the members of the combination of shareholders taking action against the Great Horseless Carriage Company (Limited), and its directors, as represented by the members present at this meeting, called for the purpose of arriving at a final decision as to the best course to be pursued by the combination in regard to withdrawing or proceeding with the pending litigation, are of opinion that such litigation be proceeded with and that it be resolved accordingly.

The proceedings then terminated.

The above is a correct and fair report of the proceedings at the above-mentioned meeting.

(Signed) HENRY A. WHITE.
WILLIAM J. DISTURNAL.
WILLIAM J. HUNTER.

24, FINSBURY CIRCUS, LONDON, E.C.,
January 3rd, 1898.

Great Horseless Carriage Company.

DEAR SIR (or MADAM),—I now enclose report of the meeting held at Anderton's Hotel on the 30th ult., from which you will see that the decision arrived at was not to accept the reconstruction scheme, but to continue the actions.

It appears that certain forms for the exchange of the shares under the scheme are to be sent to the shareholders after the confirmatory meeting on the 7th inst. Probably the non-signature of such forms would be sufficient indication of dissent, but as the new shares carry a substantial liability, it would be advisable, to avoid any question as to silence being an acceptance, for each member to write to the secretary immediately on receipt of this letter, giving formal notice of his dissent, as follows, viz. :—

"I hereby give you notice that I do not approve of the resolutions passed at the extraordinary general meeting of your Company on the 22nd December last, and do not propose to accept the new shares to be issued under the scheme."

Address it to Alfred Burgess, Secretary, Great Horseless Carriage Company (Limited), 47, Holborn Viaduct, London, E.C. Keep a copy of your letter, and send it, or another copy, to me.

As to those few members who have been induced to sign a consent to the withdrawal of their actions, or any proxy in support of the scheme, I can only advise them to preface their letter with a notice that they cancel such withdrawal or proxy, on the ground that it was signed by them under a misapprehension of their position. They should also send a similar letter to the Shareholders' Committee, Secretary, F. Offer, Lombard House, E.C.—Yours faithfully,

WILLIAM J. HUNTER.

The following is an interesting letter in regard to this reconstruction scheme :—

SIR,—From the secretary's account of the meeting at Coventry on the 22nd ult. of the Great Horseless Carriage Company one might think that the entire body of the shareholders in this Company followed Mr. Lawson and the self-constituted committee of shareholders like a flock of silly sheep. Naturally, nothing was said about the protests received from those shareholders who knew a little more than Mr. Lawson chose to tell them. Mr. Lawson's solicitor told the meeting that the litigation against the directors had been got up by the plaintiff's solicitor by means of circulars. This is absolutely incorrect. I was at pains to find the solicitor who was already acting for another shareholder, in order to put my action into his hands. But even at this late hour I would gladly withdraw from this action if there was the slightest chance of the proposed scheme of reconstruction saving any appreciable part of the money I was foolish enough to subscribe to this Company. I object to the proposed scheme on the following grounds :—(1) Because Mr. Lawson is still to be on the board, and had even the effrontery to take the chair at the meeting. (2) Because the committee was never appointed by the shareholders, and did not make an honest attempt to carry out their programme by seeing the plaintiff's solicitor, and in other ways allowed themselves to be laid open to the suspicion of working in Mr. Lawson's interests. (3) Because the proposed debentures in the British Motor Syndicate, a draft of which I have seen, are not worth waste paper, as they permit the holders of three-fourths of their value to withhold the interest. Mr. Lawson himself already holds something like half, and the remaining quarter required will not be difficult for a gentleman of his talents to command. (4) Because from a sentence in Mr. Lawson's speech I gather that the new Company, like the old, will be bound by an agreement with the Daimler Company not to make the motors, for the right of making which half a million was paid. This is, of course, apart from the general want of confidence inspired by the proceedings of this precious committee. *Timeo Danaos et dona ferentes.* I therefore remain among the considerable body of sensible shareholders who prefer recovering their money at law to entrusting Mr. Lawson with any more of it. It is no affair of ours that some of the shareholders have been foolish enough to cut themselves off from this remedy, but one cannot help feeling sorry for them. It would be still worth their while to insist upon inspecting the debenture form at the statutory meeting on the 7th.—I am, &c., B. H. THOMSON.

January 3rd, 1898.

British Motor Syndicate.

AN INGENUOUS (?) OFFER FROM MR. H. J. LAWSON.

We understand, says the *Financial Times*, that a communication to the following effect has been received by shareholders in the British Motor Syndicate, or Company, from Mr. Harry J. Lawson :—

The British Motor Industry,
Harry J. Lawson.

40, HOLBORN VIADUCT, E.C.,
November 27th, 1897.

DEAR SIR,—I have pleasure in enclosing you herewith debentures representing 20 per cent. on the shares held by you, which please accept on the terms of the within receipt.

You will, of course, understand that the debentures only become your property upon your signing and returning me, per return post, the within receipt, otherwise you must return the debentures.—Yours faithfully, HARRY J. LAWSON.

The form of receipt referred to is as follows :—

THE BRITISH MOTOR COMPANY (LIMITED).

Debenture Receipt.

Received, the sum of £ in 4 per cent. debentures, in consideration of which I give you a call or right to buy the shares already held by me in the British Motor Company (Limited), during the next 12 months, at the price paid by me for the same, in addition to 20 per cent. premium thereon as profit, such price and premium to be paid to me in cash, this arrangement being in accordance with a statement made at the general meeting, the report of which I have received and read.

The price paid by me for my shares was

Dated this day of 1897.

To Harry J. Lawson, Esq.,
40, Holborn Viaduct, E.C.

The debenture bond which accompanies the above documents declares that "The Company hereby charges with such payments (of principal and interest) its undertaking and all its property present and future, but not including its present or future uncalled capital, if any." Several conditions are endorsed on the bond, the following one being of particular importance :—

The holders of three-fourths in value of the outstanding debentures of this series may sanction any agreement with the Company for any modification or alteration of the rights of the holders of debentures of this series, as a class, including the release of any property charged thereby, and any postponement of the time for payment of any moneys secured thereby, and any increase or reduction of the rate of interest. And an agreement so sanctioned shall be binding on all the holders of debentures of this series, and notice thereof shall be given to each debenture holder, and each debenture holder shall be bound thereupon to produce his debentures and, if necessary, deliver up all the coupons for any interest then due or to become due thereon, and to permit a note of such agreement and the sanction thereof to be placed on such debentures. If the said coupons or any of them which may be so delivered up as aforesaid shall be cancelled, the Company shall issue fresh coupons, if necessary, so as to give effect to any such modification or alteration of the rights of the holders of debentures of this series as may under the provisions of this clause be sanctioned.

New Companies Registered.

[Under this heading we give a full list of new Companies registered which take power to make, deal, or become interested in any manner in automotor vehicles.]

	Capital.
Automobile Proprietary, Ld. 20 members, each with £1 liability.	
Boulton and Paul, Ld. (Rose Lane Works, Norwich) ..	£128,000
Chitty Dynamo and Motor Co., Ld. (St. George's House, Eastcheap)	200,000

	Capital.
Dublin Carriage and Rubber Tyre Co., Ld. (39, Mountjoy Street, Dublin) (Irish Company)	£25,000
Electric Hansom Cab and Carriage Syndicate, Ld. (28, Brook Street, Grosvenor Square)	2,000
Electric Street-Car Manufacturing Syndicate, Ld. (Wolverhampton)	25,000
F. Jackson and Co., Ld. (77, Oxford Street, W.)	5,000
Glasgow and West of Scotland Motor-Car Co., Ld. (180, Hope Street, Glasgow) (Scotch Company)	10,000
Henry White and Co. Ld. (Pontymister Works, Newport, Monmouthshire)	50,000
Holden Juvenile Cycle Co., Ld. (61, Caldmore Road, Walsall)	3,000
Hydro-Pneumatic Traction Syndicate, Ld..	3,000
International Steam Carriage Syndicate, Ld. (18, Hertford Street, Coventry)..	1,083
Middlesex Railways Extension (Motor Scheme) Ld. (40, Holborn Viaduct)	100
Northampton Cycle Traders' Association, Ld. (18, Market Square, Northampton)	250
Patent Folding Perambulator Co., Ld.	10,000
Preston and Beck, Ld. (Birmingham)	11,000
Rippingille's Albion Lamp Co., Ld. (Birmingham) ..	50,000
Thomas Kendrick, Ld. (Birmingham)	70,000
Turrell Motor Manufacturing Co., Ld. (40, Holborn Viaduct)	10,000
Ulster Carrying Co., Ld. (12, Queen Street, Belfast) (Irish Company)	2,000

ANOTHER VESTRY ON MOTOR-VEHICLES.

On December 16th, at a meeting of the Vestry of St. George, Hanover Square, a discussion took place on the question of motor-cars. Colonel Sir Howard Vincent, M.P., moved that it be referred to the Committee of Works to consider the application of electric or motor traction for the service of the parish. The hon. member said the Vestry had of late wasted a good deal of time in discussions with reference to the purchase of horses. He thought motor traction would prove a good substitute for horses in the parish, at least there would be no harm in trying the experiment. Major Skinner seconded the motion, and in supporting it Mr. Owen-Smith remarked that the time was speedily coming when it would be the most common thing to see a motor-car, and the most uncommon thing to see a horse. Mr. Tolley strongly opposed the introduction of motor-cars into municipal life in the interests of the farmer. He thought it was a very serious matter to attempt to destroy the very thing the farmer mainly relied upon for a living, particularly in view of the recent appeal to Parliament for help on behalf of those suffering through agricultural depression. What would become of the straw? (A member: "Use it in straw hats.") Colonel Ogilvy said the dangers of the streets of London were already very serious for poor old people, and he should certainly vote against increasing those dangers. Major Grimstone said he would much rather have horses than motor-cars, but he could not help thinking that the adoption of motor traction would be to the advantage of the Vestry. He thought, however, that motor-cars would cause the Vestry much more troublous discussion than horses had ever done. The motion was finally carried by an overwhelming majority. We congratulate Colonel Sir Howard Vincent and his colleagues. Poor Mr. Tolley! poor British farmer! whose "last straw" cannot break the motor camel's back.

Death of M. Roger.—We regret to hear of the death of M. Roger, the well-known manufacturer of automobiles. For the last three months M. Roger had been laid up with an attack of paralysis, and had to give up all work. He was born in 1850. After acting as engineer in the celebrated Cail Engineering Works, he, in 1883, started as a maker of gas-engines. He introduced the Benz motor for automobile purposes, and did much to popularise automobilism. He was the first one to drive n petrol motor in Paris. He was an original founder of the Automobile Club, and was generally most highly esteemed by all who came into contact with him.

!" Cuando escribe, refiérese Al "The Automotor and Horseless Vehicle Journal."

CONTINENTAL NOTES.

There will be an automobile exhibition at Turin in July next.

There will be an International exhibition of automobiles in St. Petersburg in 1899.

La Compagnie Nationale d'Automobile has been formed in Paris with a capital of £1,080.

It is said that the sales in France of the De Dion motor-tricycle have amounted to £30,000.

The Peugeot Company is busy on a nice little order for 150 motor-vehicles, each of 3½ H.P.

It is proposed to establish a service of automobiles from Konakry, a French coast port in West Africa, to the Niger.

The Automobile Club Belge has arranged a concours for June 26th next, and have voted £800 for the expenses of the festivities.

Another automobile Company has been established, viz., the Société Industrielle des Véhicules Automobiles, with a capital of 100,000 francs.

M. Leon Bollée is constructing a remarkable voiture. It will be of 12-15 H.P., and will weigh 700 kilos. There are no less than 10 changes of speed.

Le Chemin de Fer to Orléans is the latest railway to adopt petroleum automobiles for suburban parcel delivery service. When will our behind-the-times railway and cartage companies awake out of their lethargy?

La Salle Wagram, as an exhibition of automotors, must be classed in the same category as our Agricultural Hall—as a fiasco. There are very few motor-vehicles to be seen and little to be learnt about automobilism.

We are obliged to our excellent contemporary *La France Automobile* for reproducing in its issue of January 8th Dr. Clarke's weather table from The Automotor Pocket-Book. Our contemporary might have mentioned, however, its source of information.

It is curious to observe that both English and French shipowners take a great interest in automobilism. In Great Britain two well-known shipowners Mr. A. L. Jones and Mr. A. Holt are keenly interested in automobilism, while in France the President of the Republic, himself a shipowner, has done much for automobilism. We now notice that another distinguished French shipowner, M. Fraissinet, of the well-known Fraissinet line of steamers, is on the committee for the Marseilles-Nice concours.

The lot of the Paris automobilist is like a policeman's—not a happy one. He has to carry about a whole portfolio of documents in which the French official so much delights. Nothing in France can be done without the inevitable document. Among the mass of official literature that the automobilist has to carry and produce on demand are documents giving the weight of the vehicle and weight per axle, description of the motor and specification, method of supplying the power, description of brakes, name and place of abode of makers, official tests of motor, official number, employment of the machine, district in which it is intended to be used, the place where it is kept, two photographs, certificate of birth of the owner, and certificate of residence. Really, this is not enough. We would suggest to the Paris municipal authorities the desirability of compelling the unfortunate automobilist to have two photographs of his dog, together with the authenticated pedigree of the latter; also the abode of the proprietor's washerwoman, and a certificate of M. Le Maire to the effect that he was not in debt.

LAW REPORTS.

Great Horseless Carriage Company.

SHAREHOLDERS' APPEAL DISMISSED.

IN the Court of Appeal on the 16th ult., before the Master of the Rolls and Lords Justices Chitty and Vaughan Williams, judgment was given on the appeal of Mr. De Hersant from an order made by Mr. Justice Kekewich on November 26th in connection with the Great Horseless Carriage Company (Limited), refusing to grant an injunction restraining, until the trial or further order, the defendant Company, its directors, managers, or officials from executing or from proceeding with negotiations for a proposed agreement for transfering the assets of the Company to the British Motor Syndicate (Limited). Mr. Disturnal appeared for Mr. De Hersant, whilst the Great Horseless Carriage Company was represented by Sir Edward Clarke, Q.C., M.P., Mr. J. F. Moulton, Q.C., Mr. Warmington, Q.C., and Mr. Kirby.

In the course of his argument, Mr. Disturnal said the defendant Company was promoted in May, 1896, by the British Motor Syndicate, with a nominal capital of £750,000, divided into 75,000 shares of £10 each. The object of the Company, as defined by the prospectus and the memorandum and articles of association, was to take over the licence to use certain patents which were said to belong to the British Motor Syndicate promoters; and the consideration to the British Motor Syndicate for the licence to use those patents was the sum of £500,000, divided into £250,000 in cash, and £250,000 in fully paid-up shares of the Company. The prospectus was duly issued, and, amongst others, Mr. De Hersant applied upon the faith of it for shares, which were allotted to him. He (Mr. Disturnal) might tell their lordships that upon the prospectus about £300,000 was allotted to the public, in addition to the £250,000 paid-up shares to the British Motor Syndicate. There were now about 90 actions pending against the Company and against the directors in respect to the fraudulent statements contained in the prospectus, and Mr. De Hersant was one of the plaintiffs. These actions were for damages for fraud, or in the alternative to set aside the allotment and return the money in respect to the shares. The plaintiff held 60 £10 shares, all fully paid up. The British Motor Syndicate was what was called a one-man company. It belonged to Mr. Lawson, and to Mr. Lawson alone. The capital of the Company at one time was £150,000, and of that Mr. Lawson had 147,993 shares, whilst a Mr. Sturmey had 2,000 shares, leaving six or seven more, which were held by somebody else. All those shares were fully paid up, and were issued to Mr. Lawson and Mr. Sturmey in consideration of the assignment by them of certain patents to the British Motor Syndicate. In August, 1896, a special resolution of the Syndicate was passed to increase the capital from £150,000 to one million sterling. On October 21st an agreement was entered into between the British Motor Syndicate and Mr. Lawson. By the first clause that gentleman purported to assign to the British Motor Syndicate six patents which he said belonged to him. Then, as to the third clause, that stated that the consideration of the sale contemplated by the agreement should be £750,000, which should be paid and satisfied by the allotment and issue to the vendor or his nominees of 750,000 shares of £1 each, which said shares should be created and be for all purposes as fully paid up. Then Clauses 4 and 5 provided that an account should be taken of the assets of the Syndicate at the date in question, and that the balance of the assets should be divided amongst the original holders of the capital in the Syndicate, to the exclusion of the people who were to subscribe to the new capital about to be issued. Then Clause 6 provided that the holders of the 750,000 shares, which were about to be issued in pursuance of the agreement, should not be entitled to participate in any distribution in cash or shares in pursuance to Clauses 4 and 5. Their lordships would see, therefore, that under that agreement Mr. Lawson was to get £750,000 of the new capital and the balance of the old as being practically the only shareholder in that one-man company. For that he assigned to the Company five patents, which the learned counsel said he would not discuss the value of, but they were sworn to be of no commercial value. As a sample of them, one was a sort of gipsy's caravan, to be built of steel, to be driven by a motor fixed underneath.

On the 26th ult. an order was made by Mr. Justice Kekewich, in connection with the Great Horseless Carriage Company (Limited), refusing to grant an injunction restraining, until the trial, or further orders, the defendants from executing or from proceeding with negotiations for a proposed agreement for transferring the assets of the Company to the British Motor Syndicate (Limited). The plaintiff now appealed against that order of the learned Judge, and counsel submitted that, under all the circumstances, their lordships should uphold the appeal.

Sir Edward Clarke, on behalf of the defendants, contended that there was no suggestion that Mr. Lawson was using unfair and improper means. It was not suggested that he should be restrained from voting in respect to his shares, and the Company was entitled to do as it pleased. There was only a comparatively small interest in the Company attached to the appellant.

Lord Justice Chitty asked where the contract was, if any, that showed the scheme.

Mr. Warmington, Q.C., said there was no scheme. In comparing the positions of plaintiffs and defendants, he contended that Mr. Hersant could only sue as a shareholder. He, however, as long ago as June last, commenced an action for decision upon the ground that in equity he was not a shareholder. The action was brought upon an affidavit which showed the object of the action, and he (the learned counsel) was now taking the affidavit to be true. The affidavit itself put forward the case of the plaintiff, and what was it? That the Great Horseless Carriage Company had an assessment of £50,000, and that that sum would be, but for certain proceedings, available to the plaintiff and those associated with him to answer the plaintiff's claims. It was not put forward that there was anything *ultra vires*, which was the usual thing in the case of shareholder against company. Then, again, could anyone read the affidavit in question to mean that this application was made on behalf of the shareholders as a body? The plaintiff was really seeking to get an embargo placed upon the assets. The action was really brought by a shareholder (admitting that he was a shareholder) for an injunction, and the object of the injunction was to keep in the coffers of the Company the sum of £50,000. But what was that for in reality? Was it for the benefit of the shareholders? No; on the contrary, it must be transparent to the Court that it was merely to answer claims by persons who said they were not shareholders.

The Master of the Rolls, in giving judgment, said that a great many topics had been touched upon as to which he did not propose to say anything; and in particular he did not propose to express any opinion upon the propriety of the proceeding sought to be restrained. From a legal point of view there was one clear and short answer to the suit, and that was that it was not brought by the plaintiff in the character in which he purported to sue. Upon that ground alone the appeal ought to be dismissed.

Lord Justice Chitty concurred. He said the plaintiff was suing not for the benefit and in the interest of the shareholders, but of those who had brought actions to recover a large sum of money from the Company.

Lord Justice Vaughan Williams also agreed.

The appeal was, therefore, dismissed with costs.

Bankruptcy Court.

A SITTING of the London Bankruptcy Court was held on the 11th inst. before Mr. Registrar Linklater for the public examination of Charles Nigel Stewart, 39, Victoria Street, Westminster, whose accounts show liabilities £13,566, and a deficiency of £11,532. Under cross-examination by the Official Receiver the debtor stated that in 1895 he became chairman of the Universal Electric Carriage Syndicate (Limited), whose patents and stock were sold in the following year to the British Motor Syndicate (Limited). The last-named Company formed a branch Company in May, 1896, entitled the Great Horseless Carriage Company (Limited), and witness acted as manager at a salary of £300 a year until last June, when he resigned, owing to disagreements with one of the directors. He was afterwards connected with other companies. Witness attributed his insolvency to embarking on enterprises of which he had no previous knowledge, to Stock Exchange speculations, and to his liabilities in connection with the British and Continental Syndicate (Limited) and the Lombard Financial Syndicate (Limited). The examination was concluded.

The Danger of Restive Horses.—On December 11th an inquest was held at the St. Clement Danes Vestry Hall on the body of James Taffy, aged 38, a cab attendant, lately residing at 12, Gee's Court,

M 2

Oxford Street, who was fatally injured by a cab on November 19th. Mrs. Hettie Meyer, landlady of the Red Lion, Clarges Street, Piccadilly, stated that on the evening mentioned the deceased was minding the horse attached to a hansom cab outside her house when some friends of hers arrived in a motor-cab. The latter made the horse very restive, and some minutes later the animal bolted, causing the deceased to fall. He was taken to St. George's Hospital, but he failed to disclose the nature of his injuries. On the 4th inst. he went into King's College Hospital, where he died on Thursday. The medical evidence showed that death was due to blood poisoning, the result of the injuries, and the jury returned a verdict of "Accidental death."

Claim for the Repair of a Motor-Car.—At the Bradford County Court on January 4th, before his Honour Judge Bompas, Q.C., Messrs. S. Clayton and Co., Paradise Street, engineers, sued the Yorkshire Motor-Car Company, of Bradford, to recover £13 10*s.* 7*d.* for work done. Mr. Freeman appeared for the plaintiffs, and Mr. J. V. Curry for the defendants. It appeared that in July last the motor-car called the Victoria was sent to the plaintiffs' works to be repaired. The plaintiffs said that the car was of German make, and parts of it which required renewal, being unobtainable in England, had to be specially made. When the car was returned it was found that one or two things had not been put right, but these were subsequently remedied. For the defendants it was contended that the work was not done according to contract, and though a man was afterwards sent to effect the necessary repairs, the motor-car would still not run satisfactorily, and was ultimately repaired by the defendants' own men at a cost of over £8. His Honour, after hearing evidence on both sides, gave judgment for the plaintiffs on the claim, and for the defendants for £4 on the counter-claim.

An Object Lesson Illustrated.—Louis Tetlow, motor-carman, employed by the London Motor Van and Wagon Company, of 86, Chiswell Street, E.C., appeared on a summons at the City Summons Court, on the 11th inst., for driving a motor-car to the common danger of the public. The evidence was very clear that at 10.50 a.m. on the 3rd inst. Mr. Douglas Graham, merchant, of 2, Copthall Buildings, City, was passing through King William Street with Mr. Chadick, railroad builder, of Suffern, New York. He was telling his friend how admirably the City police regulated the traffic, and pointed to Police-constable Jefferies, 688, who was performing that duty opposite St. Swithin's Lane. Suddenly Jefferies made for the pavement, but a motor-car, driven by Tetlow, was too quick for him, struck him, and sent him heavily to the ground. Defendant pulled the car up in the space of about 10 yards, and said he sounded his horn for the policeman to get out of the way. The pace, it was said, was about 10 miles an hour; the horn was not sounded till about six or eight yards from the officer, who could have been easily avoided, but the car was kept in the centre of the road. The officer was not seriously injured. The defence was that the pace was five miles an hour, the horn was sounded 20 yards from the policeman, and the car would have been pulled up sooner, but the asphalte was "greasy." Mr. Alderman Strong said this car was going at a pace that was too rapid for the traffic of the street. He must hold the case proved, but, on the other hand, he did not wish to inflict the severe penalty laid down for this class of vehicles. He thought the justice of the case would be met by a fine of 10*s.* and costs.

A Policeman on Speed.—At Bow Street, on December 22nd, Mr. Robert Hankinson, of 35, Ferndale Road, Brixton, appeared, before Sir James Vaughan, to a summons charging him with unlawfully driving a locomotive—namely, a motor-car—at a speed greater than was reasonable; and dangerous, having regard to the traffic on the highway on which it was being driven, contrary to the regulations made under the Locomotives on Highways Act, 1896. Police-constable 256 E stated he saw the defendant driving a motor-car on the Embankment, near the Temple Station, at the rate of about 10 miles an hour. He called upon him to slacken his speed, but he took no notice. A cabman had to pull his horse on the footpath to avoid a collision, and foot passengers had to scatter right and left. The defendant (who had some gentlemen with him) said he did not think he was doing any harm. The motor appeared to be driven by electricity. The defendant now said he was driving an oil-carriage, which might be driven at fixed speeds—four, seven, or 13 miles an hour. These were definite speeds, but the motor might be driven at almost any speed. When he was spoken to by the constable he was driving at the second speed, or seven miles an hour. As a rule, a motor-car appeared to outsiders to be going at a greater rate than it really was, owing to the absence of a horse. Sir James Vaughan thought the defendant must have made some mistake as to the rate at which the car was going, and imposed a fine of 10*s.* and costs. It was stated that this was the first case of its kind decided in London.

"Chuting" with a Motor-Car.—Oliver Bush was summoned at the City Police Court for driving a motor-car to the common danger of the public. Mr. George F. Sutton, solicitor, defended. Police-constable Hunt, 262, said at 4 p.m. on the 22nd ult. the defendant drove at a pace of 14 miles an hour into Holborn Circus going east. He gave no alarm of his approach, and continued at the same pace across the foot-crossing, colliding with a gentleman, and knocking him off his feet. The gentleman fell on the car, which was of low construction, was carried some yards on it, and then the defendant stopped. George Walter Thompson, pawnbroker and jeweller, an elderly man, corroborated the constable, and said he was the person collided with. The car came at a fierce pace, and was down on him before he had a chance of getting out of the way. He jumped or fell on the car. Cross-examined: So far as he knew at present he was not permanently injured. He could not write the same night, as his fingers were so swelled. Mr. Sutton said the defendant was the engineer to the Great Horseless Carriage Company, of 47, Holborn Viaduct, and a very expert driver. This was a motor-tricycle he was driving, and was only geared up to 10 miles an hour, but it was out of gear at the time, as it was simply running downhill by its own force. He thoroughly understood the machinery, and had driven the Duke of York. Had Mr. Thompson not stood hesitating in the road he would not have been touched. Sir Joseph Savory: You know the summons is under the City Police Act, 1839? Mr. Sutton: No; I thought it was under the Light Locomotives Act. Sir Joseph (after references to the Acts) said the defendant was clearly guilty under both. "Expert drivers" were sometimes liable to show off their skill by driving in a reckless manner. He imposed a fine of 10*s.* and costs.

LES POIDS LOURDS.

Report of the Commission—II.

After stating these general considerations the Commission proceeded to study each vehicle in particular. As these vehicles have already been described in our columns (*see* Automotor, Nos. 11 and 12, vol. 1), we need now only briefly recapitulate the leading features of each, commencing with the "Scotte" Omnibus, officially known as No. 1. It is constructed to carry 12 passengers and their luggage. The speed is stated at 8·7 miles per hour on a good level road, and 4 miles per hour on steep gradients.

Dimensions and Weight.

Weight empty, 9,240 lbs. = 4·125 tons.
„ on fore axle, 5,082 lbs.
„ on rear axle, 4,158 „
„ of water, 1,540 „
„ of coke, 220 „
„ of two men, 308 „
„ of tools, &c., 242 „
„ of cargo, 2,640 „
Total weight in working order, 14,190 lbs. = 6·335 tons.
Of this total weight the wagon weighs 65·1 per cent.
„ „ cargo weighs 18·6 „
„ „ fuel, stores, &c., weigh 15·6 per cent.
Fore wheels, 30·3 inches diameter.
Rear „ 35·4 „ „
Wheel base, 9·348 feet.
Length of wagon, 17·11 feet.
Breadth „ 5·576 „
Boiler (empty), 880 lbs.
Contained water, 110 lbs.
Steam pressure, 171 lbs. per square inch.
Grate area, 1·39 square feet.
Heating surface (not stated).

Weight of motor, 594 lbs.
Two simple engines, 4·3 inches by 4·5 inches.
Revs. per minute, 400.
I.H.P., 14.
Consumpt of coke per square foot of H.S., 67·4 lbs., nearly.
" water per lb. of coke, 5·3 lbs.
Commercial speed, 6·3 to 6·6 miles per hour.
Weight of coke burnt per ton-mile of total weight, 2·16 lbs.
" " " cargo, 11 lbs.
Total weight per I.H.P. = ·4525 ton.
The daily expenses are as follows:—

Price of omnibus, 22,000 francs.

	frs.	cents.
Interest at 6 per cent.	4	40
Repayment of capital, maintenance, and repairs (15 per cent.)	11	0
Driver at 200 francs a month	8	0
Stoker at 75 francs a month	3	0
Firing	1	10
Lubrication	1	70
Total	29	20
General expenses, 10 per cent.	2	92
Daily fixed expenses	32	12

The estimate of the kilometric working cost for a daily journey of 110 kilometres is based upon the following expenses:—

——	⅓ load.	⅔ load.	Full load.
Kilometric tons	577	621	665
Coke consumed—			
Weight .. kilogr.	358	385	412
Cost .. fr.	12·53	13·47	14·42
Water consumed—			
Volume .. litres.	1,968	2,118	2,268
Cost .. fr.	3·94	4·24	4·54
Daily expenses—			
Coke and water .. fr	16·47	17·71	18·96
Fixed expenses .. fr.	32·12	32·12	32 12
Totals .. fr.	48·59	49·83	51·08
Effective kilometric tons	44	88	132
Working cost—			
Passenger kilometre, with luggage or 100 kilos. of merchandise fr.	0·110	0·057	0·039
Passenger kilometre, without luggage .. fr.	0·079	0·040	0·028

The De Dion et Bouton Omnibus.

Official No. 14.

This omnibus is built for 16 passengers—12 inside and 4 on the platform. The speed that may be obtained is 12·4 miles per hour on the level and 6·7 miles on steep gradients. Its price is 22,000 francs, the same as that of the Scotte. The useful weight or cargo that can be carried is 3,250 lbs., but on the trials only 2,464 lbs. were carried.

Weight of wagon empty, 9,438 lbs. = 4·213 tons.
" water carried, 990 "
" coke " 264 "
" 2 men " 308 "
" tools, stores, &c., 88 "
" cargo carried, 2,464 "
Total weight, 13,552 lbs. = 6·05 tons.
Weight on fore axle, 4,312 lbs.
" rear " 9,240 "
Of total weight, wagon is 69·6 per cent.
" " cargo is 18·2 "
" " fuel, stores, &c., 12·2 per cent.
Length of wagon, 20·8 feet.
Breadth " 6·56 "
Diameter of fore wheel, 31·49 inches.
" rear " 39·37 "

Boiler, weight, empty, 1,056 lbs.
Steam pressure, 199 lbs. per square inch.
Grate area, 1·9 square feet.
Heating surface, 60 square feet.
Motor weight (not stated).
Revs. per minute, 600.
I.H.P., 25.
Consumpt.—Water evaporated per lb. of coke, 3·1 lbs.
" Coke burnt per square foot of H.S., 30·7 lbs.
Total weight per I.H.P. = ·242 ton.
The commercial speed is 8·4 to 8·7 miles per hour.

The consumpt of coke per ton-mile of the average total weight was 1·1 lbs., and of water 6·14 lbs., while the consumpt of coke per ton-mile of cargo was 6·13 lbs., and of water 38·06 lbs. The fixed daily expenses are as under:—

Price of vehicle, 22,000 francs.

	frs.	cents.
Interest at 6 per cent.	4	40
Repayment of capital, maintenance, and repairs (15 per cent.)	11	0
Driver	8	0
Stoker	3	0
Firing	1	42
Lubrication	5	90
Total	33	72
General expenses, 10 per cent.	3	37
Fixed daily expenses	37	09

The Panhard and Levassor Omnibus.

Official No. 10.

This omnibus has been constructed for passenger and light parcel service. It has accommodation for 14 passengers, the baggage being carried on the roof. The speed attained on the level is from 9·9 to 11·1 miles per hour, but this drops as low as 2·5 miles per hour on stiff gradients. The cost of the vehicle is 18,000 francs.

The following table gives the particulars of the distribution of the weight, &c.:—

Weight empty, 4,618 lbs.
" 1 conductor, 160 "
" water, 441 "
" *petrol, 71 "
" cargo, &c., 2,210 "
Total weight, 7,500 lbs. = 3·35 tons.
" on fore wheels (drivers), 2,425 lbs.
" on rear " 5,070 lbs.
Of total weight the wagon is .. 61·7 per cent.
" " cargo is .. 29·5 "
" " fuel, stores, crew, &c., is 8·8 "
100·0 "

Weight per H.P., $\frac{3 \cdot 35}{12}$ = ·28 ton nearly.

Length over all, 14·76 feet.
Breadth, 6·89 "
Height, 9·80 "

Of this length 4 feet are occupied by the machinery space, leaving 7·75 feet for passengers and cargo, and 2·95 feet for the rear platform.

Motor.—This is of the Daimler-Phœnix type, using light oil and incandescent ignition tubes. Its power is 12 H.P. Revs. per minute, 750.

There are four cylinders placed vertically two and two, thus giving two impulses or turning moments on the shaft at each revolution. The diameter of the cylinders is 3·537 inches, and stroke 5·3 inches.

When running at less than full load the speed of the motor would increase, and to avoid this a regulator is employed, whose action is as follows:—In these motors the exhaust valve is operated by a cam on a counter-shaft which makes two revolutions to each one of the crank-shaft, and the inlet valve is operated by the vacuum produced after the "scavenger" stroke. The action between the exhaust

* 50 litres, or 11 gallons at ·700 sp. gr.

valve and the cam on the counter-shaft is effected by a rod which is in two parts, and adjusting these the exhaust is delayed, either in one or all cylinders; in other words, the burnt gases are cushioned to any desired extent.

The consumption of petrol at ordinary speeds is 1·56 pints per mile, and of water 7·1 pints. The quantity of each that can be carried suffices for a run of about 62 miles. The commercial speed was found to be from 6¼ to 6½ miles per hour. The consumption of petrol per ton-mile of the average total weight was ·417 pint; and per ton-mile of cargo it was 1·4 pints; the consumption of water per pint of petrol was 5 pints.

The following is a statement of the fixed daily expenses:—

Price of omnibus, 18,000 francs.

	frs.	cents.
Interest at 6 per cent.	3	60
Repayment of capital, maintenance, and repairs (15 per cent.)	9	0
Driver	8	0
Lubrication, &c...	3	50
Total....	24	10
General expenses (10 per cent)	2	41
Fixed daily expenses	26	51

In order to arrive at the exact cost of working, and also to enable an accurate comparison to be made between the various vehicles the following tables have been prepared:—

Data for Ascertaining Working Cost.

Price of vehicle in francs—		
Scotte, 1 ..		22,000
De Dion, 14		22,000
Panhard, 10		18,000
Power of motor—		
Scotte, 1 ..	I.H.P.	14
De Dion, 14	,,	25
Panhard, 10	,,	12
Commercial speed—		
Scotte, 1 ..	miles per hour	6·3—6·6
De Dion, 14	,, ,,	8·7—9·0
Panhard, 10	,, ,,	6·25—6·50
Weight of cargo and for passengers carried = U—		
Scotte, 1 ..	lbs.	2,640
De Dion, 14	,,	2,464
Panhard, 10	,,	2,210
Dead weight in working order, *Pm—		
Scotte, 1 ..	lbs.	11,575
De Dion, 14	,,	11,110
Panhard, 10	,,	5,290
Total weight when beginning journey, Pt = U + Pm—		
Scotte, 1 ..	lbs.	14,215
De Dion, 14	,,	13,574
Panhard, 10	,,	7,500
Mean dead weight, *i.e.*, with half stores, &c. = P'm—		
Scotte, 1 ..	lbs.	10,693
De Dion, 14	,,	10,483
Panhard, 10	,,	5,083
Mean total weight P't = U + P'm—		
Scotte, 1 ..	lbs.	13,338
De Dion, 14	,,	12,953
Panhard, 10	,,	7,238
Mean total weight per H.P.—		
Scotte, 1 ..	lbs.	952
De Dion, 14	,,	518
Panhard, 10	,,	601
Adhesive weight at full load, Pa—		
Scotte, 1 ..	lbs.	8,576
De Dion, 14	,,	9,269
Panhard, 10	,,	5,071
Ratio, $\frac{Pa}{Pt}$—		
Scotte, 1 ..	lbs.	·63
De Dion, 14	,,	·68
Panhard, 10	,,	·61
Ratio, $\frac{U}{P'm}$—		
Scotte, 1 ..	lbs.	·20
De Dion, 14	,,	·18
Panhard, 10	,,	·30
Consumpt of coke per ton-mile for mean total weight—		
Scotte, 1 ..	lbs.	2·2
De Dion, 14	,,	1·1
Consumpt of petrol per ton-mile for mean total weight—		
Panhard, 10	pint	·517
Consumpt of coke per ton-mile for cargo—		
Scotte, 1 ..	lbs.	12·07
De Dion, 14	,,	6·14
Consumpt of petrol per ton-mile for cargo—		
Panhard, 10	pints	1·39
Water evaporated per lb. of coke—		
Scotte, 1 ..	lbs.	5·5
De Dion, 14	,,	6·2
Consumpt of water per ton-mile of mean weight—		
Scotte, 1 ..	lbs.	12·10
De Dion, 14	,,	6·82
Consumpt of water per ton-mile of cargo—		
Scotte, 1 ..	lbs.	60·5
De Dion, 14	,,	38·07
Consumpt of water per pint of petrol—		
Panhard, 10	pints	5·

* This is the total weight less weight of cargo.

PAPERS ON AUTOMOBILISM.

IN the Engineering Lecture Room of the Yorkshire College on December 13th, Mr. J. Sidney Critchley, M.I. Mech. E. (Coventry), gave an address on "The Daimler Motor and its Application to Autocars." Mr. J. H. Wicksteed (the President) occupied the chair, and there was a good attendance. The lecturer said the Daimler motor was the invention of Gottleib Daimler, who was at one time associated with Dr. Otto in his researches in connection with the gas-engine. The present revival of automotors was the outcome of experiments made 10 years ago. He gave a description of the different classes of motors—steam, oil, and electric—now in use, and contended that for all practical purposes the oil-motor was the most satisfactory, and that of the various types the Daimler occupied the foremost position, and was the best. It was a light oil-motor. Its special features were absence of smell, absence of vibration when on the road, and length of distance which the car could run without re-charging. A number of lantern slides were shown, one of which was of a Daimler motor-car which had been driven from John o'Groat's to Land's End. It carried two persons and 400 lbs. of luggage at an average speed of 10 miles an hour, and successfully surmounted all hills. In addition to exhibiting slides of various types of English-made carriages, Mr. Critchley illustrated types of several French cars—steam, petroleum, and electric, and he also gave views of carriages made by Hancock, Gurney, and others which were in use before the introduction of railways. The motor-car industry was only 12 months old in this country, but, in his opinion, motor-cars had come to stay.

ON December 31st, under the auspices of the Helsby Literary and Scientific Society, Mr. E. Shrapnell Smith, honorary organising secretary of the Self-Propelled Traffic Association (Liverpool Branch), gave a lecture on "Automobilism." The lecture was illustrated by lime-light slides, and was extremely interesting. It was divided under three main headings, viz., "Past," "Present," and "Future." The first section comprised a *résumé* of the past history of motor-cars, dating back to a time even in advance of the Victorian era. The lecturer dealt in an amusing style with the futile efforts of the Hon. Evelyn Ellis to secure a summons in order to bring on a test case. After speaking in a general manner on the advantages and disadvantages of oil and steam motors for self-propelled traffic, he enlarged at some length on the simplicity and undoubted future before electricity as a means of road locomotion, especially the freedom from vibration ensured by its use, as well as the self-starting advantages. In treating of electrical vehicles, he referred in detail to the *modus operandi* of the London Electrical Cab Company with reference to the recharging of the cells. Some humorous slides representing possible scenes in the streets of a large town some years hence, when the advent of the motor-car has been more thoroughly established, concluded the lecture, which resulted in a vote of thanks being passed to the lecturer for a thoroughly enjoyable evening.

THE LIQUID FUEL COMPANY'S AUTOMOBILE TRAIN.

In our last issue we described this train, which has been built by the Liquid Fuel Engineering Company, of Cowes, to run between Cirencester and Fairford, in connection with the Midland and South-Western Junction Railway. We now give an illustration showing the train. As will be seen, it consists of a motor-tractor carrying goods, &c., and a passenger car. This novel conveyance is much appreciated in the district, and forms a much-needed and valuable object lesson.

We understand that amongst other orders the Liquid Fuel Engineering Company have just secured a contract to build two of their vans for Messrs. Spiers and Pond, and as demonstrating the practical value of the Company's steam-vans it is worth noting that the van portion of the above train has been running at Swindon for some weeks during Christmas time for suburban deliveries on behalf of the railway company, delivering an average of 5 tons each morning before midday without a single hitch. The railway company, for whom this work has been done, estimate that it would have been impossible to have done the same amount of work with two pair-horse vans. An ounce of facts of this description is worth a hundred pounds of theory as to the future of the motor-car.

The Motor-Car Emporium (Limited).— Under this title a Company was recently formed for the purpose of constructing, importing, and dealing generally in motors and motor-cars, this Company being the sole agents for several of the leading Continental manufacturers, including Emile Mors, Paris; Compagnie Générale des Automobiles, Paris; Compagnie des Moteurs et Automobiles, M.L.B., Paris; Établissement Hurtu, Paris; Henri Vallée, of Le Mans; and Th. Cambier and Co., of Lille. We understand that the Company are already able to show some specimen carriages, and are prepared to execute orders with practically no delay; and they claim that amongst several useful inventions of which they have the sole monopoly is a patent apparatus of MM. les Fils de A. Deutch, of Paris, for the purpose of getting rid of the unpleasant smell resulting from the imperfect combustion in oil-motors. The managing director is Mr. Charles Heyermans, 10, Clanricarde Gardens, W.

THE HEAT OF COMBUSTION OF ACETYLENE.

Engineers quite commonly estimate the calorific value of a fuel from its chemical composition; and, speaking generally, the figures thus obtained are accurate within quite a small percentage. Exceptions, however, do occur, and acetylene is one of them. Its chemical composition is given by the formula $C_2 H_2$, so that 13 lbs. of the gas consist of 12 lbs. of carbon and 1 lb. of hydrogen. Now, 12 lbs. of carbon burnt to carbonic acid gas will give 174,600 British thermal units, and 1 lb. of hydrogen, burnt to H_2O, will liberate 61,560 British thermal units, making a total of 236,160 units. Actual experiment, however, shows the heat set free on the complete combustion of acetylene to be much greater, viz., 281,250 heat units, or nearly one-fifth more than that calculated from its chemical composition. Similarly, it is found that the actual heat of combustion of cyanogen ($C_2 N_2$) is nearly one-third more than that calculated from its carbon content. The explanation of the discrepancy is, of course, to be found in the fact that a large quantity of energy is absorbed in the production of these compounds, which is liberated in the form of heat on burning them. It is this fact, says *Engineering*, which renders compressed acetylene so dangerous an explosive, as, quite apart from any question of combustion, there is a large store of energy available for destructive purposes by the mere decomposition of the body into its elements. Some French experiments, indeed, showed the explosive energy of liquefied acetylene to be comparable to that of dynamite. It should, however, at the same time be stated that at pressures not exceeding two atmospheres it was found impossible to produce an explosive decomposition of the gas which, under such conditions, is as safe as lighting gas. It is interesting to note that many food stuffs, such as starch and sugar, exhibit the same peculiarity as acetylene, their heat of combustion being greater than that estimated from their chemical composition.

Automobile Journals.— The not inconsiderable number of journals devoted to automobilism in its various phases is already large, but has been again added to by the appearance of a new paper called *La Cote financière de L'Automobile et du Cycle.* As its name implies, it deals with the financial aspect of automobile companies, and if it does this with independence and with clean hands it will be in the position to render good service to the French public.

NOTICES.

Contributions and articles likely to prove of interest to our readers will receive due attention, but in all cases the name and address of the writer must be given, not necessarily for publication.

All matter intended for publication should reach us not later than the 10th of each month, and be addressed to THE EDITOR OF "THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL," 62, *St. Martin's Lane, London, W.C. Stamped envelope must be sent if the manuscript is required to be returned. The Journal is published the middle of each month.*

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INDEX TO VOL. I

Is Published Free with the October Number.

NOTICE.—The price of Volume I, bound complete, was first raised to One Guinea net, and then Two Guineas, and is now entirely out of print.

COVERS FOR BINDING VOLUME I

OF THE

AUTOMOTOR & HORSELESS VEHICLE JOURNAL

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The Automotor and Horseless Vehicle Journal.

A RECORD AND REVIEW OF APPLIED AUTOMATIC LOCOMOTION.

JANUARY 15TH, 1898.

DIARY OF FORTHCOMING EVENTS.

Notices to be included under this heading should reach the Office not later than the 12th of each month.

[*For full programme and proceedings of the Self-Propelled Traffic Association, see p. 105.*]

1898.	
Jan. 20-29 ..	Midland Cycle and Motor-Car Exhibition, Bingley Hall, Birmingham.
Feb. 3-12 ..	Sheffield Cycle, Motor-Car, and Accessories Exhibition, Drill Hall, Sheffield.
Feb. 14 ..	Yorkshire College Engineering Society—"The Steam Turbine Engine and its Applications," by John D. Bailie (C. A. Parsons and Co., Newcastle).
March 6 and 7	Marseilles and Nice Race (organised by *La France Automobile*).
May 2, 9, 16, 23	Society of Arts Cantor Lectures—"Electric Traction," by Prof Carus Wilson.
May 24 ..	Self-Propelled Traffic Association (Liverpool Centre) Heavy Vehicle Trials.
June	Motor-Vehicle Exhibition, Paris. Automobile Club of France. Sections—(*a*) Automotor vehicles which have given proof of their practical efficiency; (*b*) Industries connected with automobilism; (*c*) Motors adapted for automotors; (*d*) Vehicles adapted for automotors.
	Concours of the Automobile Club Belge.
July 5.. ..	Race from Paris to Amsterdam, under the auspices of the Automobile Club of France.
1899	Race from Paris to St. Petersburg, under the auspices of the Automobile Club of France.
1900	Paris International Exhibition — Great Display of Automotor-Vehicles and Allied Trades.

ANSWERS TO CORRESPONDENTS.

RUSTICUS.—We have forwarded your letter to a respectable firm of patent agents, who will doubtless communicate with you.

CHICHESTER.—The address is Whitehall Court, London, W.C.

ELECTRIC.—Your information was quite correct, but although all arrangements were made, the van did not start on Monday last.

J. LEDGER (Dunstable).—The vehicle you require could be obtained from the Daimler Motor Company, 219, Shaftesbury Avenue, W.C.

REVERSING (Manchester).—(*a*) No. Decidedly not. What you suggest is practically impossible (*b*) You will find the fullest details in our AUTOMOTOR POCKET-BOOK for 1898.

GERMANICUS.—The agency has only just been taken up for this engine in England. If space permits we are giving a full description in the current issue, but failing this, it will be in our next.

No. 1 (Liverpool).—Volume I is entirely out of print. Although we raised the price, first to one guinea and afterwards to two guineas, every copy has gone. We can still send you all the back numbers at 7*d.* per copy, with the exception of No. 1. Thanks for good wishes.

INVESTOR.—It is impossible for us to repeat the figures and particulars you ask. Refer to our index to Vol. I, published in our October number, and all references both to the Syndicate and kindred matters can easily be traced.

P. F. (Dundee).—Our 1898 POCKET-BOOK was published just at the end of last year. We feel sure you will find in it all you require, and we should advise you seeing Messrs. Julius Harvey and Co., Consulting Engineers, of 11, Queen Victoria Street, E.C., upon the matter.

HIGH OR LOW TEST PETROLEUM.

As our readers are aware, for some years past an agitation against the use of low-test petroleum burning oil for domestic purposes has been carried on by various newspapers and persons who, under the guise of protecting public interests, really pander to popular ignorance and popular prejudice. This agitation has derived much of its force from the fact that the supply of burning oil to this country has virtually been an American monopoly. The burning oil so supplied complies with our Petroleum Acts and "flashes" between 73° and 78° about. That a vast number of deaths and much family distress have accompanied the use of this oil is only too true, and hence the uninformed, non-technical, but very hysterical writers in the daily Press have got in the habit of speaking of ordinary burning oil as the "deadly 73°." Now in those cases of death or maiming where a careful examination of the exploded lamp is made, it is invariably found to be the case that the lamp was of improper construction, that it was dirty, that it was not properly trimmed, and, lastly, that the user was crassly ignorant of the means to be taken, not only to ensure a good light but also safety. We have, in short, a cheap and wholly improper lamp in which is burnt a cheap oil, and the thing is used by the least educated classes of the community, with the natural result that fires and explosions occur with alarming frequency. To say, however, that this state of things can be remedied by raising the flash point is inaccurate. Perhaps the best and most effective means of avoiding these disasters would be to give practical instruction in the Board Schools on the use of petroleum and lamps. The writer proposed this a few years ago to the London School Board, but that body was too busy over the more vital and soul-absorbing question of religious teaching. However, Parliament has been asked to raise the flash point to 100° F., and since 1894 a Select Committee has been sitting at intervals, but so far has not yet reported, and we should not be surprised to learn that their finding will be to the effect that the commercial disadvantages attending a high-flash point are far greater than the risk attaching to the use of low-flash oil. While we quite admit that oil of 100° F. is safer than oil of 73° F., yet to render the use of the former compulsory by legislative enactment is a drastic measure only justified by the most urgent necessity. We must recollect that in tens of thousands of families the so-called "deadly 73°" is used with perfect safety simply because common sense obtains in most households.

The experience of the whole community is to the effect that this so-called "deadly 73°," if burnt in good lamps, is a perfectly safe illuminant. If while raising the flash point to 100° F. steps were also taken to ensure the employment of reasonably safe lamps, then the object ostensibly aimed at, viz., the safety of the workers' lives, would be achieved, but raising the flash point to 100° F. and then burning the oil in defective and improperly-made lamps is like putting new wine in old bottles. Besides, the small increase in the proposed flash point would not greatly promote safety. If danger lies in the use of low-test oil in bad lamps, will this be much, if at all, lessened by raising the test by the small amount of 27° and burning the oil in the same description of lamp? On the other hand, raising the test means increasing the price. The public, or rather that section of it that gets burnt, will always buy the cheapest article irrespective of quality, and if it be logical and praiseworthy to prevent them buying low-test oil, is it not equally so to prevent them buying cheap and defective lamps? In this question we must carefully avoid the claptrapand drivel with which it has been surrounded by such papers as the *Daily Chronicle*, *Star*, *London*, and others after that kind. We shall, of course, be told that we are defending low-test oil for any but righteous motives. As a matter of fact, we defend the low test because this oil is extensively used in oil motors. This oil is easily volatilised and converted into gas, and the higher the test the higher the temperature at which the oil is gasified. If we have a legal high test it will mean the abandonment of a reasonably safe oil (low test) and using the still more dangerous lower flashing hydro-carbons. And the automobilist and the store dealer must ask, Is it safer to keep a store of 73° petroleum or of spirit which flashes at ordinary temperatures? All things considered, we say no sufficient case has been made out for raising the legal limit. Really, however, all the hysteria indulged in by the uninstructed daily papers of a certain political complexion springs, not so much from any desire to benefit the working classes as from a wish to break down the practical monopoly of the sale of petroleum enjoyed by the Anglo-American Oil Company. We quite sympathise with this up to a certain point. The Anglo-American, or rather its parent, the Standard, controls the oil production of the United States. The other great oil field is in South-East Russia, and is controlled by the Rothschilds and Nobels. Similar oil to the Russian is obtained in Galicia. These two oil-producing centres practically supply the world. We are now told that the American monopoly is about to be broken down, by the placing upon the English market of a "Water White" Russian oil, flashing at 103° F., by another group of monopolists, headed by the Rothschilds. We are not greatly concerned in the matter, any further than if it means a reduction in price we shall welcome the competition; and if this high-test Russian oil can compete with the American low-test oil so much the better. It is, however, worth while to point out that the heavy Russian oil does not burn so well in common lamps as the lighter American. We, of course, welcome every improvement in manufacture which enables a better article to be supplied at a lower price, and so are quite content to see Rothschild and Rockfeller fight for the English market. What, however, we protest against, in the interest of automobilism, is the placing of any further legal restrictions upon the sale and storage of petroleum, and hence we are in favour of the low-test limit being maintained.

G. H. L.

PERSONAL.

It is gratifying to us to note the very widespread manner in which our Journal is being quoted in regard to various matters connected with motor-vehicles, a special instance being an item of news which we exclusively published in our issue of December 15th last, announcing the inauguration of steam motor Post Office parcel vans, known as the "Lifu," by the Post Office authorities. Amongst a very large number of leading newspapers that gave due prominence to our exclusive information, we are pleased to note the following:—The *Times*, *Engineer*, *Financial Times*, *Daily Mail*, *Evening News*, *Star*, *Daily Graphic*, *Sun*, *Liverpool Journal of Commerce*, *Birmingham Daily Post*, *Leicester Mercury*, *Electrical Review*, *Rialto*, *Engineer and Iron Trades' Advertiser*, *Local Government Journal*, *Railway Times*, *Civil Service Gazette*, &c. In most instances, as befits high-class journalism, full credit was given to us for the information, but we are sorry to note some exceptions, viz., the *Daily Telegraph* and *Daily News*. Considering the reputation these papers are credited with we must confess we were somewhat surprised. They certainly did not use the information on the day of publication, but rightly or wrongly no doubt took the trouble to check its accuracy before making any announcement upon such an important departure; but the paragraph which appeared in their issue of December 15th was followed on the 17th by a leading and also special descriptive article upon the same subject. We are happy to believe that this sudden interest in the matter was the result of the information with which our Journal had supplied them; but we certainly think that a slight acknowledgment of its source would have been not more than courtesy required, to say nothing of journalistic etiquette.

Who Makes the Post Office Motor-Vans?

Referring to this Post Office departure, a "G. H. Shareholder" writing to the *Financial Times* asks "whether the successful motor-van being used by the General Post Office was built by any of the Lawson group of companies, or is in any way covered by any of the 'master patents' of which we have heard so much."

The latter part of the following reply from the B.M.S. Secretary is sublime in its condescension and assumed superiority:—

To the Editor of the Financial Times.

Sir,—Replying to the letter in to-day's issue respecting the use of motor-vehicles by the Post Office, I should like to say that the department has been using and testing our vans for some time past. The vans have punctually done duty day after day, calling at the various offices to a fixed time-table, receiving Her Majesty's mails, and punctually discharging the same. Several routes were tried with complete success. We carried 12 cwt., but beyond this size we have nothing in stock at present. The Post Office authorities expressed their extreme satisfaction at the splendid manner in which our motor-vans performed their duties. As a result, we are now building three larger and more powerful vans to especially meet the requirements of the Post Office night work and heavy loads. The expense of working was only fractional to the expense of horse-drawn vans. We understand a steam van, in which petroleum is burnt as fuel to heat the boiler to generate the steam necessary to drive the engine, is also being tested, together with other systems. We use a few drips of petrol spirit and a few pints of atmospheric air at every stroke to move the engine, which is exceedingly clean, and works so perfectly that smoke, sulphur, and other offensive fumes are entirely absent in working. Our little petrol engines are being proved "master patents," but we do not claim the use of petroleum as fuel, and without wishing to discourage experiment in that direction, we think, from the result of our own experiments, that the intolerable fumes of petroleum when it is being burnt as fuel would make it quite insufferable for ordinary street traffic. No doubt for traction-engine purposes along a country road it might be used with a fair amount of success.—I am, &c., Charles Jarrott, Secretary.

The British Motor Company (Limited),
40, Holborn Viaduct, E.C., *December 21st*, 1897.

THE DAILY PRESS AGAIN.

The daily Press professes to advise and instruct the public on everything—especially motors. With absolutely no technical knowledge or experience the scribes in Fleet Street will criticise a yacht or an armour plate rolling mill. These are the ignorant people who inform their readers that a new battleship designed by the ablest men in the country is "50 feet too short" or too long, or too anything. Naturally the performances of the Heilmann Locomotive, which we shall describe next month, came under this critical survey, and many and curious are the opinions that have been expressed. Thus the *Daily Chronicle* labours under the idea that the Heilmann locomotive can hardly pay because it is worked by accumulators! It were charitable to assume that the writer of this precious "opinion" made a mistake, as we are all prone to do, but this is to expose his crass ignorance, because no one with any knowledge of accumulators or locomotives could for a moment make such a blunder. We then have the *Daily News*—a paper of literary reputation—publishing a leading article on the "Transmutation of Metals," and inferentially asking its readers to believe that, thanks to the discoveries of an American "scientist," silver can be transformed into gold. Of course the *Daily News* has been badly "had"; but really in this age of education is it too much to ask that newspapers of standing and reputation should refrain from publishing as sober, solid information matter which any fairly well educated boy would at once classify as "rot"? We should not allude to the shortcomings of our daily contemporaries were it not that many of them in their capacities as "leaders of thought," "framers of public opinion," and "voices of the masses" publish such erroneous statements concerning automobilism. Thus in our last month's issue we showed how deplorable was the ignorance of a leader-writer of the *Daily Telegraph* on the turning powers of automotor vehicles. We therefore feel it incumbent upon us to show by actual example that the opinion of the daily Press on technical matters is, to put it mildly, utterly unreliable. So long as they report facts as they observe them, the lay Press is always interesting, if not instructive. On politics, religion, art, and such like matters which do not admit of scientific solution and which require no special knowledge in order to express an opinion or criticism, the daily Press is also interesting if not useful. When, however, it expresses opinions on material things which are directly subject to physical laws, then it is neither interesting, instructive, nor useful, and it justly incurs animadversion.

IMPORTANT CORRECTION.

We regret to have to make a rather important correction in our Pocket-Book, and one which we discovered ourselves and are not indebted to (as is usually the case) any of our readers.

On p. 79 we give a formula for determining the horse-power required to propel a vehicle on an incline. This should read—

$$\text{H.P.} = \frac{(\text{R. Cos } a \pm 2240 \text{ Sin } a)\ \text{W.V.}}{375}$$

In the Pocket-Book the expression Sin a has been omitted.

The Liverpool Heavy Weight Competition.—We trust that manufacturers are going to show our Continental friends that the hand of the British designer has not lost its cunning, and that in spite of the restrictive—and we think needlessly so—clauses as to weights that, if not the proverbial coach and four, a heavy motor-wagon can be, as we think it can, driven through the Locomotives on Highways Act. The successful builder of such a vehicle will not, we can assure him, find his work unappreciated. On the contrary, he will have his hands full of orders for the next few years. Apart from the advertisement to be derived from gaining a prize from the S.P.T.A. there is thus a distinctly solid inducement held out. One well-known Liverpool shipowner, largely interested in cartage, has publicly announced his intention to place an order for 50 wagons directly the first one is passed by the judges. The large carriers of London are closely watching developments and, as we are assured by one of them, they will discard horses on the first opportunity. We may say from our own knowledge that French and German firms are competing, and it will be a thousand pities if the prize has to go to an alien.

LINDSAY'S COIL CLUTCH.

With the extension of automobilism and the use of oil-motors for vehicles, the demand for a really good clutch is not likely to flag. In the majority of automotor vehicles the weak point is usually the speed-changing gear, and this, sooner or later, gives trouble because the motion is either arrested or imparted suddenly. A clutch which acts not only as a means of transmitting power, but which permits

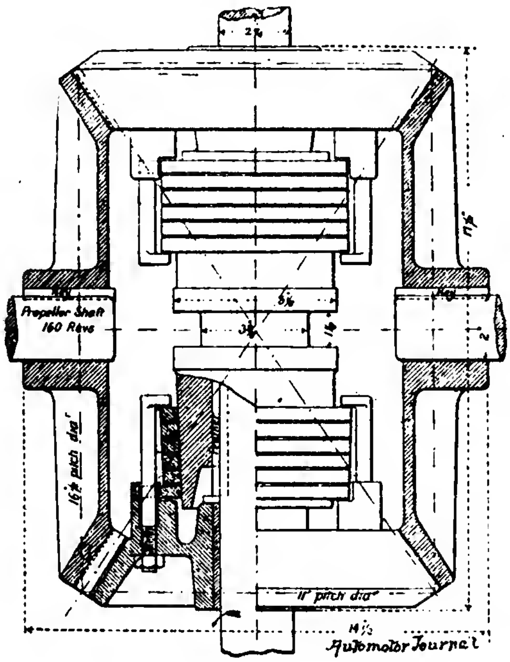


Fig. 1.

this to be transmitted in either direction or varied, as regards speed, without the slightest shock or noise, and which also acts as a most efficient brake, finds its proper rôle in automotor vehicles. Such a clutch is Lindsay's Coil Clutch, which we illustrate in the accompanying drawing. The principle of this transmitting device is very simple. One of the cheapest and most efficient brakes is that employed by winchmen on board ship, and also by most French makers of automotor vehicles. A rope, either of hemp or wire, is made fast at one end, and a few turns taken round the rotating axle or shaft, and the free end lightly pulled; frictional resistance tightens up the rope, and so close is the grip that the motion is quickly arrested, but not instantaneously. Really, such a device is an absorption dynamometer. By employing a rope sufficiently strong, and using enough turns, the motion of shafts of the largest sizes can be more effectually arrested than by any other means. In applying this principle various modifications, in which the coil is applied, may be employed. But the Coil Clutch and Pulley Company, of Slough, the manufacturers of Lindsay's patent, make two types. In the one, a coil of steel, of square section, is attached to the pulley or pinion to be driven; on the driving-shaft is a steel-covered sleeve which is keyed to and revolves with the latter. By means of a sliding clutch the other end (the free end) is made to engage the sleeve; the result is that the whole coil grips the sleeve with an intense and uniform force all round its periphery, and the motion of the driving-shaft is communicated or, conversely, by releasing the grip the motion of the driven shaft or pulley is arrested. In the illustration we show how this coil clutch is applied to launches worked by uni-direction oil-engines. It will be seen that the coned clutches are connected to the wheels, and the sliding sleeve is inserted by means of a lever into that one it is desired to drive.

Another form of coil clutch is shown in Fig 2. This clutch consists of a chilled sleeve keyed to the shaft, around which chill a steel coil, of diminishing section, is wound, and by means of a bell-crank lever, actuated by a sliding plate, the coil is tightened on the sleeve and, coil friction being set up, the clutch commences to drive.

This clutch is lighter and takes up less room than the other type (of equal power), and has the advantages of starting and stopping instantly. It can, if desirable, be put slowly into gear so as to pick up the heaviest of drives without shock, and yet be released in an instant.

It is quite shockless in its action, and particularly suitable for heavy drives, such as the heaviest kind of motor vehicles; for the lighter vehicles we should recommend a modification of Fig. 1. These clutches have been extensively used in tramcar propulsion, indeed, it is only by their use that gas and oil engines can be used for this work.

The coils are forged from gradually tapering steel bars, and are wound into helices. The varying section supplies the strength at the part where it is needed, and renders the coil more elastic and delicate in action. So sensitive is it that a very small boy can, and does, manage a rolling mill, reversing it several times a minute, and without putting more than the minutest amount of end friction on the clutch disc. Immediately the pressure is released from a coil it liberates itself with absolute certainty, while the moment it is pressed it takes up its work without noise or shock. The clutch bosses, or sleeves, are of deeply chilled cast iron, ground to a fine surface. Naturally there is an enormous pressure on them, and it is for this reason that they are made as hard as possible. As an evidence of the extreme delicacy of coil clutches, we may mention that the same coil will act both as clutch and a brake. For instance, if such a clutch be fitted to a winding drum or hoist, the load may be held stationary in mid-air without stopping the engine, the friction between the coil and the sleeve being so readily graduated that the road neither runs up nor down. If the hoist is to be driven both ways by power, then a double-acting coil is fitted, consisting of a coil with a central head and with right and left-handed convolutions on either side, and the load may be held either in ascending or descending.

These clutches seem to us to meet a very practical problem in motor-vehicle design, as they not only act as transmitting clutches but, by the means shown in the illustration, they enable the direction of the driven shaft to be so easily reversed or the motion stopped. Should any readers be interested in the matter, the Coil Clutch Company state that enquiries can be addressed to the following manufacturers of motor vehicles, who have used these clutches:—Messrs. Urquhart and Bolee, 57, Barton's Arcade, Manchester; Messrs. Roots and Venables, 100, Westminster Bridge Road, London; and the Clement Cycle Company, Paris.

The Motor-Car Company.—This Company has recently removed from their former premises in Red Lion Square, and has taken larger and more extensive premises at 93 and 94, Long Acre. They have a large stock of motor-carriages on show, among them being several very fine specimens of the carriage-builder's art. In particular they have a steam landau fitted with two pairs of vertical engines, thus dispensing with differential gear. Steam is supplied from a coil boiler, and the heat is obtained from a Bunsen burner of special construction. We hope to illustrate this fully in a future issue. At present the trials have not been completed.

REVIEWS OF BOOKS.

Whitaker's Mechanical Engineers' Pocket Book.—If there be one book more than another that is almost an essential to the man of affairs, it is "Whitaker's Almanack," which is *sui generis*, but as regards pocket books relating to the engineering profession there are not a few, and we do not think Messrs. Whitaker will find such a demand in the future for their new venture as they have experienced for their better known volume. Not but what the present work is in every way worth its money. It is edited and compiled by a well-known engineer—an authority in his own special branch—Mr. Phillip R. Bjorling, while the paper, printing, binding, and general get-up make it resemble an *edition de luxe* rather than a prosaic book of figures intended for office use. A Pocket Book for "Mechanical" (*sic*) Engineers is rather a large order, as the field of mechanical engineering is so vast that the data, &c., relating to many important branches cannot be gathered together in much less than ponderous tomes. At the same time Mr. Bjorling has performed his task well and ably, and really covers a lot of ground. He gives no less than 130 separate tables. In his arrangement, too, he is properly methodical, and all the subjects are classified. One thus has no difficulty in finding a thing, or if one has, a very copious and complete index can be consulted. It is much to be desired that the Institutions of Civil and Mechanical Engineers would arrive at a suitable nomenclature. Thus, one maker of pocket books calls a speed S, another V; with one a weight is W, with another it is P, or some other letter. Mr. Bjorling does not seem to have followed any of the leading writers on engineering in this respect, but has adopted the alphabetical system of writing his formulæ. We already have not a few ways of expressing the same thing, and this at times leads to confusion in drawing offices, where one man uses Molesworth, another Seaton, and another Mackrow; and the latter name reminds us that Mr. Bjorling has not included much information relating to marine engineering or naval science in his book. On those subjects with which Mr. Bjorling's name is honourably identified—pumps and water—the information is distinctly good and in many respects original, the data relating to hydraulics being especially so. Mining machinery is also well treated, and the same remark applies to gearing. On that particular branch of engineering with which we are more particularly concerned, viz., automobilism in its various forms, not much is said, but what is, is good. In conclusion, we can honestly recommend the work, which is not dear at the price—5*s*.

CATALOGUES.

PORTABLE RAILWAYS, or, as we should term them, light railways, are a subject occupying a good deal of attention just now at the hands of County Councils and others. Messrs. Bolling and Lowe's catalogue of their light railway plant affords a deal of very useful information which may be studied with advantage. They supply all kinds of railways, from the temporary line laid down to transport sugar or other produce, to the kind of line which would pass the Board of Trade. They also give prices to all the various parts, and this will greatly assist in getting the estimates, while the numerous illustrations give a large field for selection.

THE "TRUSTY" OIL-ENGINE is a well-known and highly appreciated motor; since its advent some years ago it has been from time to time improved, and at present is, perhaps, as perfect as an oil-engine operating on the Beau de Rochas cycle can be. In this last catalogue we notice that the makers have introduced some new types of portable engines which we should think would sell readily in country and colonial districts, or wherever a reliable motor was wanted and where petroleum could be obtained. A good point about these motors is that they consume common lamp oil and cost little or nothing in the shape of skilled attendance. The catalogue which the makers have sent us contains the records of tests, &c., made by various engineers. It is worth noting that the Trusty Oil-Engine can be easily converted into an ordinary gas-engine.

THE POST OFFICE MAIL VANS.

NOTHING can be more satisfactory than the performance of the "Lifu" mail vans under the Post Office arrangements. So far there has been no hitch or delay of any kind. On the contrary, as will be seen by Messrs. Julius Harvey and Co.'s letter elsewhere, the schedule times have been beaten repeatedly, and it has been abundantly demonstrated that much less time than is accorded to horse-drawn vehicles is required for the delivery of mails, &c., when efficient automobiles are employed. Messrs. Julius Harvey and the Liquid Fuel Company have achieved a distinct success; they have practically demonstrated the superiority in every way of the automotor, and its great advantages for postal service. It is a distinct triumph for mechanism over animal power. While congratulating the firms mentioned, we must also congratulate the Post Office officials on their quick appreciation and foresight. The above illustration shows the general appearance of the van.

Waiting for the Perfect Dust-Cart.—A short time ago the Vestry of Kensington instructed the Plant and Wharves Committee to report upon the employment of motor-carts for the collection of house refuse. In this connection the Committee, at a recent Vestry meeting, submitted the following report from the Vestry Surveyor:—"I have considered the question of motor-vans for the parish work, and am of opinion that steam or oil motors are unsuitable for the work of the Vestry, but that the adoption of electrically-propelled vans, as suggested in my report of March 12th, 1892, is highly desirable. The only question is whether the time is ripe for their adoption. Upon this point, after carefully considering the subject and all the details connected therewith, and after consulting the best authorities in the metropolis, I am of opinion that the subject should be deferred for the present. I may add that as I was the first municipal surveyor to suggest the employment of electric traction for the haulage of dust-carts, I will take care that this Vestry shall not be behindhand in the prudent adoption of such motors, but at the present time I am of opinion that it is not advisable to go in for same." In presenting this report the Plant and Wharves Committee expressed their concurrence in the opinion therein stated. We would like to know what technical knowledge of automobilism this Vestry Surveyor possesses, what degree or certificate of engineering he holds, and who are the "best authorities." We would suggest to the Kensington Vestry that they reconsider the matter, as on the face of it the advice is not, we think, justified by present practice.

NOTES OF THE MONTH.

HORSE cardrivers and conductors in Leeds are required to have an extra license before they are allowed to act as "motor" men.

HIS MAJESTY LEOPOLD, the King of the Belgians, has accorded his patronage to the Brussels Cycle and Automobile Show, on the committee of which are M. Le Baron de Zuylen and Sir David Salomons.

GENERAL BILLOT was much struck by the work done by the automobiles tested last autumn over a tract of country 120 miles in length, and he has ordered two carriages from M. Peugeot and MM. Panhard and Levassor.

THE motor-vehicle has made its appearance in Cape Town, Messrs. Koenig and Co. having imported what seems from the description in the *Cape Times* to be a Benz motor. It can carry eight persons, and has a range of speed varying from 1 to 16 miles.

WHO is responsible for disseminating the absurd canard to the effect that the Coachmakers' Company is offering prizes this year for the best designs of motor-vehicles? Quite a number of papers have been thus hoaxed. As a matter of fact, as we point out elsewhere, the Company assure us that they are not offering any prizes this year.

THIS is from the *Globe* :—From a journal of the distant future we cut, with a prophetic pair of scissors, the following paragraph :—"Some 29 inmates of the Home of Rest for Motor-Cars enjoyed their New Year's dinner on Saturday. Each motor-car received two gallons of best paraffin and a pint of machine oil. The oldest inhabitant of the home is Rattle-your-Bones, the only surviving car which took part in the famous initial run to Brighton in 1896."

AT a recent special meeting of the Hamilton Town Council an application by the Stirling Motor-Carriages (Limited) for a feu plot of the vacant ground on the town lands for this new industry was considered. It is proposed to plant the works on the same site as the gasworks. The Motor Company asked for three acres of ground, and the recommendation of the committee was to grant this at 3*s*. 6*d*. per pole. An amendment, however, was proposed fixing the amount at 2*s*. 6*d*. a pole, and this was eventually carried.

WHILE many municipalities and vestries are displaying a gratifying eagerness to obtain motor dust-carts—a progressive and liberal wish with which we strongly sympathise and encourage—Camberwell intends to use motor watering-carts, a most capital and economical idea. The water can thus be used for cooling and condensation at absolutely no cost. We observe that Mr. Daldorph intends to ask the Clerkenwell Vestry to instruct the clerk to ascertain the cost of purchasing and maintaining an electric water-van for street watering in the parish, and to report on the question to the Works Committee.

WITH the village carrier we are all familiar, but he, like all human institutions, is liable to change, and we are afraid that the horse and cart that used to jog comfortably between one town and another is likely to be replaced by the swift, rushing motor-van. Mr. Love, of Kirkaldy, N.B.—a daring iconoclast —has started a carrier's business with a motor-van, and is carrying parcels, goods, &c., in it with considerable success. From an account in the *Fifeshire Advertiser*, it would seem that Mr. Love has the nucleus of a big business in his hands. We wish him every success.

AT Partick, N.B., one of the local Councillors, Mr. Logan, speaking on offers for the proposed extension of the lighting department, said it had been suggested that they should do away with horses for the fire brigade and use motors. In that case the present stables could be utilised for the lighting department. The Provost said there was no particular reason why they should rush the matter, and he thought they should be very cautious about adopting motors for the brigade. They might break down at the most critical moment. Ultimately it was agreed to delay acceptance of the offers for a month. Perhaps some of our readers will enlighten the worthy Provost.

THIS is from a new paper called the *Sunday Special* :—"The world is badly in need of a genius who will invent a new form for motor-cars. The electric cabs on London streets are too much like growlers that have forgotten to bring along their shafts and horses, and the tricycle hansom, which the *Globe* bemoans has not found favour in English eyes, is too much like unto a bath-chair to meet with the approval of able-bodied beings. Some new form is wanted, something dainty, fragile-looking, tasteful, aristocratic, and airy, yet as unsinkable as a bell-buoy. Anything with the elegance of a gazelle and the gazelle's speed, but strong enough to crush a brewer's dray, will do."

ALL the horse tramcars have been taken off the streets of Buda-Pesth. The whole of the tramway lines have been converted into electric lines for a length of 70 English miles, while the Buda-Pesth Underground Railway also has electric traction for a further distance of 53 miles. This is not bad for a town of only 600,000 inhabitants; but the Hungarians are not yet satisfied, and plans for an extensive system of electric elevated and underground railways have just been made public, and received with general approval, like everything else tending to embellish or improve the thriving city. It is said that Buda-Pesth is the only large town in Europe in which the horse has been banished from the streets, so far as the trams are concerned.

ONE "J. G. S." writes from the New Club, Glasgow, to *The Engineer* thusly :—"Some time ago I noticed in your advertising columns notices of self-propelled carriages. I do not see any advertisements of this kind now. Are the makers of these carriages now so busy that they have no need of more orders, or is it that they have been unable to cope with such orders as they have received? Being desirous of obtaining a motor-carriage driven by electricity or other power, I find that after examining the advertising columns of the technical Press, and of bicycling and sporting papers, I am still unable to find any clue as to where I should address myself. I enclose my name and address, and should be very pleased if any of the makers should consider it worth their trouble to fulfil my wants."

"THERE must be many people," says the *Newcastle Chronicle*, "who sigh for the advent of the automotive car on humanitarian grounds. In the vicinity of Elswick the other day (writes a correspondent) a pony attached to a heavily-laden cart was being thrashed unmercifully up a very steep bank by its driver. The poor animal, judging by its projecting bones and meagre appearance, seemed half starved; the load being sufficient for a well-fed horse, the excessive strain upon the pony can be more easily imagined than described. The ordinary whip in this instance proved inadequate; therefore the driver belaboured the exhausted pony with a heavy cudgel, forcing it, against its limited strength, to the top. This kind of ill-treatment is unfortunately very common with boys leading coals and other household requisites, but something better is looked for from those who have arrived at years of discretion. There is, however, some consolation in the reflection that in the near future these cruelties will terminate with the installation of motor traffic."

ALTHOUGH Coventry is supposed to be *a* home, if not *the* home of the motor industry, the local Solons have hardly appreciated the fact. We read that at a recent meeting of the Town Council Councillor Johnson called attention to the possibility of using motor-power for Corporation dust-carts, as was done at Chiswick. The saving he estimated at £1,000 a year. Councillor Lee had a few words on the same subject, and it appeared from an extract read by Alderman Marriott from the city engineer's report on the reorganisation of his department, that in his estimate he had uot considered the possibility of using motor instead of horse power, but if such a thing were possible it would save a large expense on horse keep. Just conceive, if you can, the abysmal ignorance of a person who says *if it were possible* to employ a motor dust-cart, &c. Had the proposal been to employ balloon cycles a doubt might well have been expressed, but after Chiswick there can be no question of possibillty.

UNDER legal intelligence we report a case in commenting upon which the *Globe* says :—"A policeman on duty in Holborn Circus on Thursday had a rather novel experience; for he saw an old gentleman who was crossing the road suddenly caught up and whirled away by a motor-car, which was travelling at the rate of 14 miles an hour. The case suggests possibilities for the future. When the horse disappears from our street traffic, we may thus be able to put an end to street accidents. A modification of the railway cow-catcher in front of each car will either tenderly lift up the careless pedestrian or shovel him gently aside. Perhaps inventive science will even produce a kind of man-catcher, which would receive the foot-passenger in a funnel-shaped net in front, conduct him through a flue under the body of the carriage, and let him gently out behind, off a platform which would tip up vertically and land him on his feet. There might also be apparatus which would collect his gloves and umbrella, and replace his hat on his head, after a rotatory iron and pad attached to the rear axle had given it a glossy polish. This, however, might lead to abuses by persons who would deliberately get in the way of motor-cars in order to get their hats done up free of charge. Meanwhile, a system of buffers such as are used upon locomotives, and fenders such as are used upon boats, might enable the cars to bump and jostle each other with impuuity."

IMPROVEMENTS IN MOTOR-CARS.—According to the *Aberdeen Free Press* an ingenious, and what has all the appearance of an important, arrangement in the construction of motor-cars has been devised by Mr. John T. Clark, Rose Street, Aberdeen. By this arrangement accumulator cases, containing accumulators sufficiently charged for ordinary driving purposes, are situated in a receptacle built under the bottom of the vehicle, but having all the appearance of forming part of the body of the latter, so that no unsightly appearance whatever is presented to the eye. The cab to which it is proposed to apply the new arrangement is designed like an ordinary cab, to carry four persons inside, but on the seat in front, which is covered by a neat canopy, there is room for one person on each side of the driver. Mr. Clark has also introduced a new hansom to Aberdeen which has the merit of being a distinct improvement on the usual type. Ordinarily the front of a hansom folds open in two halves, which the passenger swings outward on wishing to alight. In the improved hansom, however, the front is circular and upright—the upper part being of glass. It is in two halves, which run on grooves at the bottom and top, and on wishing to open the front the passenger simply takes hold of two handles within easy reach on either hand and slides the two halves backward—one along each side. The doors can be moved also by a handle from the driver's perch, and altogether the arrangement can be worked with the greatest facility.

*** OWING to the pressure on our space this month we are obliged to hold over many items of interest.

THE BUFFALO INJECTOR.

FOR boiler feeding feed-pumps are usually employed, but in situations such as heavy steam-operated automotor vehicles, where it is absolutely necessary to avoid unnecessary weight and to economise in space, an injector is unquestionably the thing. The advantages of a good injector are very numerous: they contain no moving parts; they are automatic; they require but little steam; they can inject at any pressure and at nearly all temperatures; they are very light; and, lastly, they are, as compared with ordinary feed-pumps, very inexpensive. Their principal disadvantage is that, as usually made, they are not very accessible for cleaning, and any substance brought over with the feed is liable to prevent their working. In order to surmount these practical objections, Messrs. Green and Boulding, engineers, of 21, Featherstone Street, City Road, London, who have had many years' experience with all classes of injectors, have placed in the market the "Buffalo" Injector, which we illustrate, and which has been designed to remedy the troubles previously referred to. The B. Class is made so as to meet all ordinary conditions, and will work either lifting its supply water or receiving under pressure without any regulation or adjustment whatover. This machine is

STEAM

SUCTION

made to work with steam pressure up to 140 lbs. per square inch. The steam and suction connections, as will be observed from the illustration, being in a vertical line, in order to examine under steam it is only necessary to slack the three connections and turn the machine on the pipes when (and this is a great feature of this injector) the forcer combining tube can be withdrawn by hand for examination or cleaning. The injector is worked entirely by one handle and is automatic, restarting in its action. For pressures above 140 lbs. and where high duty, such as warm water and long lifts, have to be encountered, the A. Class or higher grade machine must be used. This is also worked by a single lever, and the working of the machine is of the simplest character. These injectors have only been on the market some 2½ years, but they have had a very large sale, thus testifying to their utility.

As we say, we think them especially suitable for feeding the steam boilers of heavy automotor vehicles.

THE RIKER ELECTRIC CARRIAGE.

THE accompanying illustration represents a type of electric motor-vehicle which has been successfully placed upon the American market by the Riker Electric Motor Company, of New York. As will readily be understood, the car body can be of any desired kind, and the Company manufacture several different styles of body; the same type of mechanism and its arrangement is applied to all. As will be seen, the framing is tubular, the tubes being of steel and 1¼ inches diameter. The wheels are of bicycle pattern, but, of course, much stronger; the steering wheels are 30 inches, and the driving wheels 36 inches diameter, the wheel base being 6 feet. On the rear axle, which is, of course, in two parts, is the differential gear. The fore axle is in one piece, the ends projecting within the centres of the front hubs, where they are cupped, top and bottom, to receive adjustable cones which pass through the inner hub. The wheels swivel on these cones which replace the fifth wheel in the ordinary vehicle. As the upper cone, the lower cone, and the point of contact between the ground and tyre are all in a line and in the same plane, it is apparent that any obstacle in the path of the wheel would not slew it aside or affect the steering lever.

THE RIKER ELECTRIC CARRIAGE.

A motor of special design has been adopted. It is of a rectangular multipolar-frame type, with two wound and two salient poles. At one end the motor is swung by means of double-bearing clamps on the rear tube at the side of the gear casing, and at the other it is held by a double-spring suspension. The sides through which the armature projects are entirely encased by aluminium jackets having movable covers. The motor is series connected, with sectional-wound cast steel field. The armature is form wound on a slotted core, and has a large commutator. Its normal capacity is 2 kilowatts, at 80 volts and 25 ampères, but it will stand a very large overload. It weighs 142 lbs. complete, and operates at a normal speed of 1,000 R.P.M.

The desire to reduce the weight of the battery equipment while maintaining or even increasing the discharge rates obtainable with the present forms of battery has led to the development of a new lead-zinc type of storage cell. The positives of this new battery are of lead, while the negative is composed of a zigzag band of electrically deposited zinc-coated copper alternating with each lead plate. This combination gives an average E.M.F. of 2·3 volts, and a maximum of 2·5 volts. Each cell, as used in the vehicle, consists of a rubber-retaining jar, six positive plates, measuring 6¼" × 6" × $\frac{3}{16}$", weighing 28 ozs., and a single negative consisting of a zigzag zinc-copper band. The complete battery equipment consists of 36 such cells, arranged in four boxes or trays of nine each, weighing 190 lbs., and making a total battery weight of 760 lbs. Considering that this battery has at 2·3 volts per cell a 150 ampère hour capacity at a 10-hour rate, or 120 ampère hours' capacity at a 4-hour rate, the weight and size are certainly very small. A door under the rear seat gives ready access to the battery box, and the four battery trays can be easily placed or taken out, connections being automatically made.

An interesting element in connection with this vehicle is the system of electric control and regulation. At the left of the front seat will be seen an upwardly projecting lever. This lever is fitted to the spindle of the controller, which is located under the seat. A series parallel control is effected by means of this controller between the batteries and motor, giving four combinations forward and two reverse, and four corresponding speeds of 3, 6, 12, and 15 miles per hour. The controller is moved to either side of its normal position for a corresponding direction of carriage travel, the extent of movement either way determining the speed. In general construction it consists of a steel shaft, mounted on which are a number of insulated radial contact shoe arms, making various connection between a row of stationary contact terminal brushes. Aside from the operation of this controller, the driver of the carriage need not trouble himself about the proper performance of the motor or batteries.

Two brakes are provided, one a band brake acting on a brake pulley on the motor shaft, and actuated by a pedal, and the other a shoe brake, acting on the tyre of the driving wheels, and operated by an upright hand lever at the left of the front seat. This double-braking gear furnishes an element of great assurance to the operator, who can always rest satisfied that, at no matter what speed the vehicle is operating, one or the other or both of these devices is at hand.

It is intended that the batteries should be charged at about 110 volts, but, by charging through the controller with the motor cut out, it is possible to charge at a smaller potential by arranging them in other combinations. A rheostat is also provided in the charging circuit which will dissipate the surplus voltage up to 500 volts. In connecting the battery-charging cable to the supply conductor, no attention need be paid to the polarity, as an automatic switch is provided to take care of this condition. It is simply necessary to connect the conductors, the switch automatically connecting the suitable polarity to the corresponding battery terminal. As far as these features go, the mechanism seems to operate on the "you push the button, we do the rest" plan, and it does it positively and without complication. Another feature is the safety-stop lock switch, which is operated by a Yale lock and key, and turns off the main current when operated, guarding against malicious starting of the vehicle.

As a whole, this motor vehicle, intended to carry four persons, and easily capable of accommodating five, when its weight, which is but a little over 1,800 lbs., is compared to its travelling capacity, makes a very superior showing. With the normal four-hour discharge rate, it has a capacity on good roads of 40 to 50 miles at about

12 miles per hour. The storage battery does not seem to be such an insurmountable evil after all. (For many of the above particulars we are indebted to the *Electrical World.*)

ELECTRICAL ROAD TRACTION.

In country districts, where, owing to the cheapness of fuel or the convenient vicinity of a waterfall, electrical power is cheap, a form of electrical traction such as we illustrate below may be indulged in by anyone who owns a vehicle fitted with a motor. The overhead wire or trolley system is, so far, confined to tramcar propulsion but, needless to say, it is applicable to vehicles of all kinds, from a baby's perambulator to a locomotive. We hope to see the overhead wire running from one village to another, and the farmers mowing, binding, and transporting their hay, or digging and carting 'wurzels by the ubiquitous "current." There is no reason why this should not be done. In many parts of England and Scotland current can be made for the mere cost of putting down plant. As in so many other things, however, the difficulty is not physical or economical, but the sublime, ineffable, genuine, good old true British spirit of Chinese-like conservatism constitutes the barrier to progress of all kinds. And hence the country wagons roll along the roads just as they did, and of the same make and pattern as they were, 100 years ago. In the United States, where, as might be imagined, this novel and convenient method of traction originated, it has answered every expectation. The system is the invention of Mr. W. G. Caffrey, of Reno, Nevada, who has been working on the system for the past three years. A line of ordinary poles was set up near the Reno foundry, and the dynamo placed therein. The two wires were secured to the poles about 18 inches apart and 17 feet from the ground, and a trolley with a lazy tongs arrangement allowed the current to be furnished to the wagon. The problem which the inventor had to solve was a difficult one, as a perfect circuit must be maintained at all times, and the contact must be flexible enough to allow a wide divergence from the regular road if necessary.

The improved form of trolley works admirably. It consists of a metallic frame having two over-running wheels, and underneath these are the two locking wheels, which effectually prevent the top wheels from leaving the wire and still allow the frame to pass the support, holding the wire on the pole. On the lower wire a similar device is used. The two trolleys are connected by an insulated pantograph, or lazy tongs, equipped with suitable guides, thus providing for unequal tension on the trolley wires. The poles are 24 feet long and 6 inches in diameter at the small end. They are placed at intervals of 125 feet. On the inner or road side of these poles, are two supports or "pass-bys" of malleable iron. No. 0 bimetallic wires are used. The current is supplied to the wagons by cable, which runs on an automatic reel on the wagon, permitting the cable to run out 200 feet if necessary or wind up to a short length, thus allowing the wagon to follow the ordinary road and permitting it to turn or do anything required of it. The ordinary trolley pole may also be used, but the cable permits of running the wagon on either side of the ordinary road, allowing it to meet or pass vehicles without difficulty.

The four-wheeled cart shown in our engraving has wheels 48 inches in diameter. The rear wheels are fastened to a shaft geared to a spring-suspended motor. The motor is a 2 H.P. one of the Westinghouse crane type. In front of the motor a commutator controller is suspended, the handle of which is within easy reach of the person steering the wagon. The front axle is trussed, and the spindles are pivoted to the wheel hub with an arm extending forward about 18 inches fastened rigidly to the spindle. These two arms are connected, and the connecting bar again connected to the steering bar. This gives quick turning qualities with easy manipulation. The generator used was a 5 H.P. compound wound Westinghouse 500-volt dynamo. It is said that on the trial trip a speed of 15 miles an hour was reached with a load of 2,500 lbs. on the wheels. The control of both the motor and the steering apparatus was all that could be desired. The system has much to recommend it, and some of our large landowners might well give it a trial. For many of the technical details in the foregoing account we are indebted to the *Scientific American.*

ELECTRICAL ENGINEERING.

Growth and Prospects of a Great Industry.

At the annual general meeting, on the 10th inst., of the Northern Society of Electrical Engineers, Mr. John S. Raworth, M. Inst. C. E., delivered his presidential address. He pointed out that the history of electrical engineering, apart from telegraphy, is so short that probably all those present could carry the whole of it in their memory. When they entered upon the business they had practically only one commercial outlet, namely, lighting, and they were unable by any amount of sophistry to make the public believe that electric light was cheaper than gas. Now the conditions were changed, and one engineer had told him that in one town the working man and the fried-fish shop were his best customers, and was actually realising Mr. Preece's oft-derided statement that the electric light is the poor

The Trolley System adapted to Road Motor-Cars.

man's light. Even to-day the one outlet with which they started—lighting—was their mainstay, but other developments were growing so rapidly that one found it impossible to keep pace with them. For instance, electro-chemistry, old in conception, new in economic application, which was now showing such vitality that the hope—he might even say the assurance—was rising within them that Widnes and St. Helens may soon cast out the "devils" which "possess" them by redigesting their waste heaps. As to the more pressing question of tramways and light railways, hitherto they had done next to nothing, and the small experiments which had been undertaken had been carried out almost entirely with American machinery. Even under these conditions the results had been satisfactory. They must not, however, lose sight of the fact that they possessed several home-made electric tramways. The total mileage of electrically-worked tramways in Great Britain was now 93. The projected lines, however, amounted to no less than 340 miles in length, and the capital required for their equipment would certainly not be less than £3,000,000. But even this large amount of prospective business represented only the beginning of the demand. Very soon horse traction would be superseded by electricity on the whole 1,000 miles of tramway now existing; and, in addition to this, London would be honeycombed with subterranean electric railways, and provincial towns would adopt systems of surface tramways far more elaborate and extensive than those which now existed even if they had to widen their streets to accommodate them. There was already sufficient indication of what was coming in the attitude of Manchester, Leeds, Sheffield, and Glasgow. The fact was that electric trams paid both the owner and the user; wherever they ran no one could afford to walk, except for exercise, for the saving of time was enormous. Even in England, where the eight miles an hour rule was in force, there did not appear to be any difficulty in getting over the ground. What was wanted was to get rid of the horse in cities. They would then make the streets of hard asphalte as smooth as a billiard table and would keep them quite clean; the electric motor-carriages would run with so little friction that even the present batteries would fulfil all the conditions. In conclusion, the President said the keynote of his address was faith—faith in themselves, faith in electricity, faith in the new dispensation which was dawning on the world.

HUNTER'S MOTOR.

The number of oil motors which have been brought out for the propulsion of vehicles is already very large, and it must be said that as a rule they are mostly of one predominant type, differing only in slight details from each other. Mr. John Hunter, of Lewisham, has endeavoured to improve upon this sameness, and has lately brought out an oil motor which possesses several features, differentiating it markedly from others actuated in a similar manner.

Mr. Hunter has set himself the task of producing a motor which shall at once be very compact, which shall run without undue noise and vibration, and which shall have high efficiency. After a good deal of experimental work, attended with the usual disappointments and failures, Mr. Hunter has succeeded in evolving a motor which certainly fulfils these conditions with a considerable degree of success, and which is, moreover, distinguished by many distinctly novel features. We illustrate this motor in the accompanying drawings, of which Fig. 4 (*see* p. 149) represents the general external appearance; Fig. 1 is a side elevation partly in section; Fig. 2 is a plan also partly in section; while Fig. 3 is an end view.

As will be seen, the motor comprises two cylinders, C and C[1], each fitted with radiating gills, coupled to the central crank chamber, A, in which the cranks revolve. By the ordinary means the connecting rods turn the shaft, B. The cranks, by the way, are placed at angles of 180° with each other. Clearance is avoided as much as possible, but a pipe, D, connects the ends of the cylinders, and this forms a chamber, or rather two chambers, through which the explosive energy of the ignited gas and air is transmitted. These two pipes meet in a firing chamber, E, which is subdivided into two chambers, e^1 and e^2, leading to the exhaust and inlet passages, *g* and *h*, and opening respectively by means of the valves, G and H, into this chamber, E. This valve, G, is held on its seat by a light spring, and it allows the charge to be drawn in by the piston when not under compression. The valve, H, is also held to its seat by a spring being opened at the right moment so as to allow the waste products to escape through the discharge outlet, *h*. The exhaust is opened by means of the tappet, I, which again is actuated by the cam, K, which is geared with the crank spindle and revolves at half the speed of the latter. The firing of the charge is effected by an electric ignition; but whereas the method usually adopted consists in the employment of a direct current, Mr. Hunter effects his ignition by means of the secondary coil of a Rhumkorf inductorium. In this way he gets a spark of high potential, and with more certainty of obtaining it. The make and break, instead of being made by the magnetic action of the soft-iron and attracted armature, is effected by a lappet arrangement shown at F. If desired, ignition can be effected by a hot tube or other means. The motor, it is needless to say, acts on the Beau de Rochas or Otto cycle, and the sequence of the operation is as follows:—The explosive charge is drawn through the valve, G, on the outstroke and fills the outer ends of the two cylinders and the chamber and passages, forming an open communication between them. The charge is then compressed on the following instroke and fired. The explosion acts on both pistons at the same time, and when the pistons have reached the other end of the stroke the exhaust valve, H, opens, thus completing the cycle.

The idea underlying this system is that the shock of the explosion is neutralised by acting on both pistons at the same time, thus reducing or destroying the vibration. That this is effected to a very great extent is undoubtedly true, as we have witnessed. Another point is that the firing of the explosive charge being effected in the passage connecting the two cylinders, which passage is always at a high temperature, there is thus little loss of efficiency through the cooling of the expanding gases. By this means also the cylinders do not become unduly hot.

We have lately witnessed some trials of this motor and were much impressed with its lightness and compactness. It gives off about $3\frac{1}{2}$ H.P. at 800 revs., and weighs but 140 lbs.

FIG. 1.

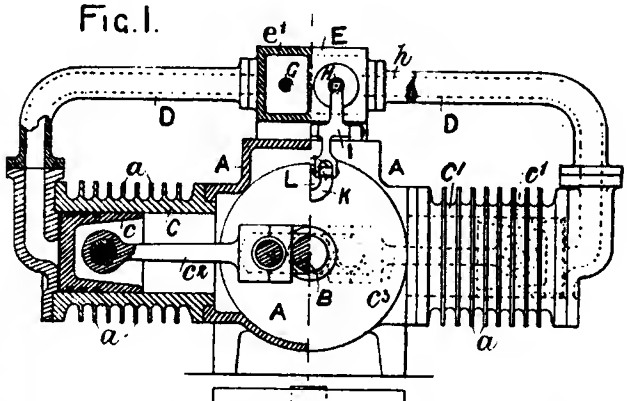


FIG. 2.

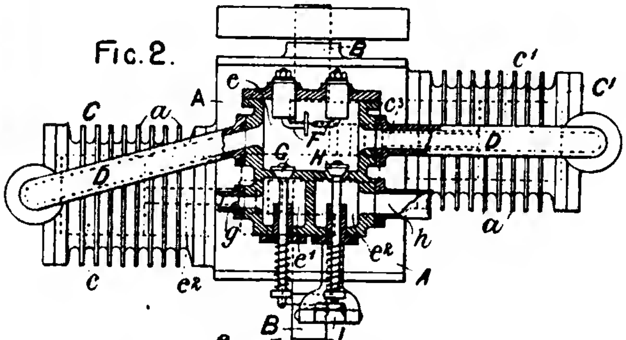
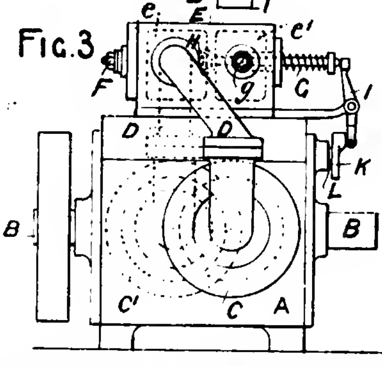


FIG. 3.



Mr. Hunter is at present perfecting the gearing for attaching the motor to a light carriage. In conclusion, we are bound to say that we were favourably impressed with the lightness, compactness, and simplicity of this motor, and shall be glad to know that its manufacture is a commercial success.

New and Mayne (Limited).—The scheme of arrangement in this matter was on the 12th instant before Mr. Justice Wright, in the Chancery Division of the High Court of Justice, when the scheme as set forth in a recent number of this Journal was duly approved by his Lordship, subject to the filing of proper evidence that the meeting approving of the scheme was duly convened.

CORRESPONDENCE.

⁂ We do not hold ourselves responsible for opinions expressed by our Correspondents.

⁂ The name and address of the writer (not necessarily for publication) MUST in all cases accompany letters intended for insertion or containing queries.

AUTOMOTOR VEHICLES AND STABLE BOYS.

To the Editor of The Automotor and Horseless Vehicle Journal.

Sir,—In the December issue you say in a postcript to Dean Tait, D.D., that it is possible to get a motor-carriage for two in which there will be no objectionable features and which will be easily handled by a stable boy. Would you kindly send me maker's name and address of place where I can get such an article, as I think of getting one?—Yours truly, A. E. Flaxman.

P.S.—I, too, am a constant reader of your journal.

[If our correspondent will consult The Automotor Pocket-Book for 1898 he will find complete lists of makers. If he have not this

Fig. 4.—Hunter's Motor.

at hand, we would suggest that he consult Messrs. Roots and Venables, Westminster Bridge Road, London, S.W.; the Lifu Company, Cowes, Isle of Wight; or the Daimler Company, Shaftesbury Avenue.—Ed.]

THE GREAT HORSELESS CARRIAGE COMPANY.

To the Editor of The Automotor and Horseless Vehicle Journal.

Dear Sir,—There are a few things in the speech made by Mr. Lawson at the Great Horseless Carriage Company meeting which we do not think are quite logical. Would you allow us to bring these to the notice of your readers, many of whom are shareholders in this concern?

A shareholder at the meeting remarked—and it appeared to us a very sensible remark—that if they were not able to build electric motor-cabs they ought to be. Mr. Lawson agreed with the remark, but he was careful not to give any explanation why the Company were not in a position. He is a director, and has had a considerable lot to do with the management and ought to know. Mr. Lawson says there is *room* at the works for putting £5,000 to £6,000 heavy machinery down: may be, but can he or anyone show a reason for spending all this money? We were told by a former chairman that the works were full of machinery; and, from what the writer saw of the place last July, it certainly had the appearance of being ready to turn out plenty of work, but any work that is done does not seem to be for sale. At least, we wanted to hire a machine with a view to purchasing (last July), and were simply told that they were not in a position to supply motor-vans, though we saw some about. We believe they have a great many made now, and still they are not selling them.

Can anyone explain this? Since then we have got a parcel-van from the London Motor-Van and Wagon Company on hire, with a view to purchase, and if the Great Horseless Carriage Company had been alive to the business they might have had the order.

Another remark made by Mr. Lawson was that they could either build the electric cabs in their own or other works. This seems absurd—to say you have works of your own doing nothing and giving the work to other firms. No private firm would do anything so absurd who was alive to its own interests. Mr. Lawson was good enough to say also that "they would have to continue to be customers of the Daimler Company, because the Daimler were good customers of theirs."

The Daimler Company are customers of ours simply because it suits them, and when they find that they can do better elsewhere they won't remain customers a day or an hour longer. We should do the same, and being tied down to any concern like this is detrimental to its prosperity. It cannot succeed. We regret that none of the shareholders at the meeting referred to these points, and if you will kindly bring these matters to the notice of your readers, many of whom are shareholders, we should feel greatly obliged.

We think if we have men on the board of sound business principles and common sense it will succeed, but so far, what has struck us as being lacking badly is a little ordinary business sagacity and business management.—Yours faithfully,

pro John Love, Jr., & Co.,
J. L.

AN APPRECIATION.

To the Editor of The Automotor and Horseless Vehicle Journal.

Sir,—Will you please forward two copies of your Automotor and Horseless Vehicle Pocket-Book, for which we enclose 3*s*. 4*d*.

We are always interested in your paper, and in the thorough way you report and illustrate everything connected with automobilism. Wishing you every success in the New Year.—Yours faithfully,

Didsbury, Manchester. Simpson and Bodman.

THE POST OFFICE MAIL VAN.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

SIR,—We have now completed four weeks of our contract under the Postmaster-General for conveying Her Majesty's mails by steam motor-van from London to Redhill, and thus far all has been most satisfactory.

We began on December 16th, and, as you know, are timed to leave Mount Pleasant Post-office at 10.30 p.m., and to arrive at Redhill at 1.42 a.m., returning to Mount Pleasant Post-office at 4.45 a.m.; but we have generally been able to get in from 15 to 30 minutes before time both on the outward and return journeys, and on December 30th we made our record run, when we reached Mount Pleasant at 3 45, as against 4.45.

Our arrivals during the first two weeks have been as follows:—

Dec. 16th.	Arrived Redhill	28	minutes before time.	
	Returned Mount Pleasant	18	" "	
" 17th.	Arrived Redhill	32	" "	
	Returned Mount Pleasant	16	" "	
" 18th.	Arrived Redhill	34	" "	
	Returned Mount Pleasant	18	" "	
" 19th.	Sunday. No run.			
" 20th.	Arrived Redhill	34	" "	
	Returned Mount Pleasant	15	" "	
" 21st.	Arrived Redhill	34	" "	
	Returned Mount Pleasant	10	" "	
" 22nd.	Arrived Redhill	33	" "	
	Returned Mount Pleasant	12	" "	
" 23rd.	Arrived Redhill	29	" "	
	Returned Mount Pleasant	14	" "	
" 24th.	Arrived Redhill	27	" "	
	Returned Mount Pleasant	18	" "	
" 25th, 26th, and 27th.	Christmas holidays. No run.			
" 28th.	Arrived Redhill	20	minutes late.	Joint
	Returned Mount Pleasant	25	" "	broke.
" 29th.	Arrived Redhill	19	minutes before time.	
	Returned Mount Pleasant	35	" "	

We have thought you might be disposed to give a short notice of the success of our steam motor-vehicle for mail traffic, this being a matter of considerable public interest. Thanking you for your valuable support, we are, yours faithfully,

JULIUS HARVEY AND CO.

[Most satisfactory in every way.—ED.]

SPEED GEAR.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

SIR,—On p. 97 of your December issue you refer to M. Mors having introduced a *variable* speed gear, stating that you had not yet seen what might logically be described as such. But you are of opinion a change speed gear is that meant. The distinction is a little too subtle for me. In your October number you refer to M. Pretôt's speed gear as a variable speed gear, and one of the best designs you had seen. Are you of the same opinion still; and do you think the Pretôt autocar has a future for it? It seems to be a favourite in Paris.—Yours faithfully, Y. Z.

January 11th, 1898.

[Our remarks upon the Mors Speed Gear seems to have attracted a good deal of notice, not only from you but from other correspondents. The only variable speed gear that we know of which can be strictly called "variable," in the sense that any desired variation can be obtained within the limits of the mechanism, is that known as the Houldsworth gear, as used in cotton-spinning factories. The Pretôt speed gear gives a large number of definite speeds within the limit of the machine, but unlike the former the speed cannot be varied indefinitely. The ordinary speed-changing devices give a small number of definite changes. In mathematical language, in a real variable speed gear the differential coefficient $\frac{dx}{dy}$ should be infinitely small, whereas in the ordinary speed-change gear this is definitely large. We intend to discuss this subject at length in a near issue. We think that the Pretôt automotor-vehicle stands as good a chance of obtaining popularity as any other. We do not see why it should not.—ED.]

SIX-WHEELED VEHICLES.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

SIR,—In his lecture before the Liverpool Self-Propelled Traffic Association on November 26th last Mr. Worby Beaumont hinted that "a form of vehicle with six or eight wheels, all dirigible, must be designed." May I remark that a simple design for a six-wheeled vehicle has been already published in the correspondence columns of the AUTOMOTOR, viz., fore and aft steering with central driving wheels. A. J. A.

December 20th, 1897.

[We should very much like to see a six or eight-wheeled vehicle, all wheels dirigible, and the whole vehicle complying with the Locomotives on Highways Act as regards weight.—ED.]

THE DE DION TRICYCLE.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

SIR,—Having seen that the De Dion Company, of France, are supplying their 1¼ H.P. motors without the tricycle, do you think it possible to get one here? Could you tell me the maker in England (I am assuming that the Company have sold their patent rights to a firm here); if not, could you oblige me with the De Dion firm's address in France? I think your suggestion as to a central depôt for the sale of motors and parts would give good results if carried out. The AUTOMOTOR is the most interesting and useful I read, and I would gladly remit if double the cost.—Yours, &c.,

Nelson, Lancs. W. BARRACLOUGH.

[Apply to the Beeston Motor Company, Cheylesmore, Coventry, or to MM. De Dion et Bouton, Puteux, Seine, France. Glad of your good opinion.—ED.]

SERPOLLET BOILER.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

SIR,—I have for some time been experimenting with a flash boiler of my own design and construction, but have met with only partial success, due to the fact that I have unfortunately made the tubes too thin, a grave error in a boiler of this type, as I now realise. I have determined to construct a second boiler upon the same lines, but before doing so wish to arrive definitely at the proper heating surface necessary per I.H.P., and also the thickness of tube required. My present tubes are ¼ inch thick, but I find that in increasing the feed beyond a certain limit the tubes gradually become cooled, and saturated steam is the result.

Farman, in his description of the Serpollet tramway system, gives the heating surface of the boiler as 43 square feet for engines developing 20 I.H.P. Does not this seem low in comparison with the power developed? Again, in your article on the Serpollet light locomotive in the AUTOMOTOR of November, the heating surface is given as 11·32 square metres, which, I think, is about 120 square feet, which differs considerably from Farman, although I confess I do not quite see how such a great area of heating surface can be obtained from the 44 tubes which comprise this boiler.

I hope I have not intruded too much upon your time with these queries, but as I intend to go into the car industry as soon as I can obtain satisfactory results from this form of generator I shall take it as a very great favour if you can oblige me with the information I require. If you can answer me privately I shall be greatly obliged, as it is some time yet ere the January number comes out.—Yours truly, JNO. SIMPSON.

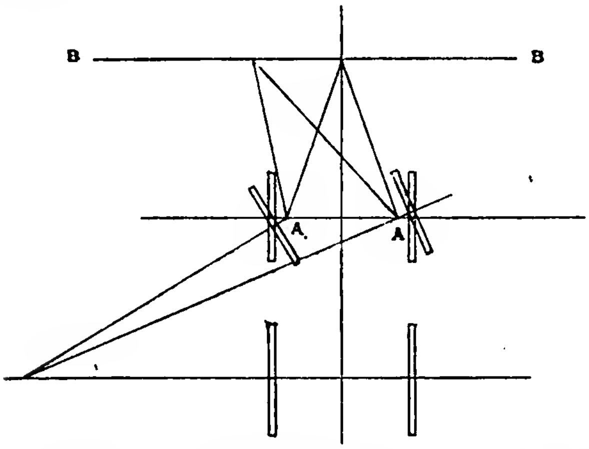
[We have verified our figures relating to the Serpollet boiler, and we now repeat them:—Grate area, 46 square decimetres = 4·95 square feet "surface de chauffe." Furnace, *i.e.*, heating surface, 11·32 square metres = 121·8 square feet. Weight of boiler, 2,850 kilos. = 6,270 lbs. From this it will be seen that the ratio of grate to heating surface is 1 : 24·6, which quite agrees with ordinary marine practice. As regards the I.H.P. per square foot of grate, the figures given by our correspondent give ·465 I.H.P. per square foot of H.S., which is high compared with, say, the "Economic" boiler, by Mr. Davey Paxman, which only gives ·154-·185 I.H.P. per square foot of H.S. On the other hand, the comparison between H.S. and I.H.P. is, in small motors, always unsatisfactory. Your better plan would be, we think, to base your H.S. upon the pounds of water evaporated per B.H.P. per hour, and lastly allow an ample margin on everything. We cannot reply to correspondents privately as this would be contrary to all recognised journalistic practice, and, besides, very inconvenient. We mention this for the benefit of others, whom we would ask to observe another newspaper canon, and that is, to write on *one* side of the paper only.—ED.]

DAVIS'S STEERING GEAR.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

SIR,—In the notice of my steering gear which you have been good enough to give, no reference was made to the geometrical principle of the arrangement. Of course, most of your readers are familiar with the arrangement of independently pivoted wheel arms on a steering axle, but my system, I believe, is the only one that secures accuracy of alignment, instead of an approximation, for all positions. The control, too, of the wheel arms is better than with link-work steering gear, because the leverage increases with the angle of lock, instead of becoming less, as is the case with previous gears of this type.

As the method to be used in the alignment of my gear may be of interest to your readers, may I ask you to insert the following short description?



Let the figure represent a plan of any proposed road-carriage in diagram form, AA being the pivots of the steering wheel arms. Draw a line, BB, parallel to the steering axle and as far removed from it as one axle is from the other. Cause the lines that represent the steering tillers to intersect on this line and also on the centre line of carriage. This gives the position of the wheel tillers for a straight course. For all other positions the wheels will be found to be correctly placed if the lines representing the steering tillers meet in some point on this parallel line—I am, Sir, yours faithfully,

115, Lewisham Road, London, S.E., HENRY T. DAVIS.
December 29th, 1897.

[Our correspondent is mistaken. Reference *was* made, and very clearly too, to the geometrical principle of the arrangement. We thus stated it (*see* p. 110 of the December number):—"The two wheels must make some angle with each other, and this angle will vary as the ratio of the beam or distance between the two fore wheels and the radius of the curve. In fact, each wheel is tangential to its own radius." The latter sentence would read better if we say "each wheel," *i.e.*, the vertical plane as represented by a wheel, "is normal to its own" radius. This is the simple and sole geometrical principle involved. The line, B'B, is unnecessary, in that it has no geometrical connection with the positions of the two fore wheels. If the gear ensures that in all positions the normals to the vertical planes of the wheels always intersect in the same point, then it undoubtedly has merit, but unless this condition be fulfilled exactly, more or less side-slip will be produced. Whether this condition is or is not fulfilled, we, of course, cannot say.—ED.]

WE understand that the Lambeth Vestry have authorised the Wharf Committee to purchase three motor convertible dust and water vans.

President	Sir DAVID SALOMONS, Bart.
Secretary	ANDREW W. BARR, Esq.
President of the Liverpool Centre	The EARL OF DERBY, K.G., G.C.B.
Hon. Local Secretary	E. SHRAPNELL SMITH, Esq.
Semi-Official Journal of the Association	THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

SELF-PROPELLED TRAFFIC ASSOCIATION
(INCORPORATED).

THE annual meeting of the Self-Propelled Traffic Association took place at the Cannon Street Hotel on the 20th December last, and, after the reading of the notice and of the minutes of the previous meeting, was adjourned until January 20th inst., at 3 o'clock, at the same place.

LIVERPOOL CENTRE.

Programme for 1898.

January 25 ..	Paper: "Some Points in the Design of Automobile Vehicles intended for Heavy Traffic." Mr. GEO. H. LITTLE, Technical Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.
February 8 ..	"An Account of our Trials and Experiments, with the Conclusions drawn therefrom." Mr. D. S. SIMPSON and Mr. W. L. BODMAN, Joint Authors.
February ..	"Steel Springs." (Date and author in abeyance.)
March 29 ..	Paper: "Recent Improvements in Accumulators and in their Application to Traction on Common Roads." Mr. J. T. NIBLETT.
April 19 ..	Paper: "Arrangements for the May Trials." The HONORARY SECRETARY.
May 24–27 ..	Trials of Motor Vehicles for Heavy Traffic.

THE paper on "Leather Tyres," which it was hoped would be read next month by Mr. Henry S. Fearon, Assoc. M. Inst. C.E., has been postponed to the 1898–99 session.

The May Trials.—A number of preliminary arrangements have been dealt with during the last few weeks, and it is probable that important announcements relative to (*a*) judges, (*b*) subscriptions to guarantee fund, (*c*) foreign vehicles, and (*d*) the general programme, will be made in our next issue.

Mr. W. Hugh Woodcock on Roller Bearings.*

So many papers have lately been read on the subject of roller bearings, that the author fears it will be difficult for him to introduce any new matter before the members of this Association, particularly as most of the recent papers refer to results obtained from the same series of experiments as form the foundation of this paper. On the other hand, the subject is attracting such general interest at the present moment that he ventures to hope his paper may prove of interest, even though it be not free from the defect of recapitulation.

It is, in the first place, advisable to obtain clear ideas as to the main difference existing between rolling and sliding motion, as we can only thus form a true estimate of the advantages to be derived from the application of the former, in place of the latter, to bearings. Perhaps the simplest illustration of the efficiency of the two forms of motion, as measured by the resultant resistance, or friction, and which at once shows the advantage of the former, is the difference in the force required to draw a load upon a level road, when carried upon wheels which are free to revolve, as compared to that required to draw the same load on the same wheels when skidded—the former being rolling, the latter sliding motion. The wheel is certainly the most general application of rolling motion, and no one would think of comparing its high efficiency as a load carrier, where heavy loads have to be transported over more or less uneven surfaces, with that of the sledge runner, which may be said to represent sliding motion.

Another simple illustration of the same fact—if the palms of the hands be slightly pressed together there will be found considerable resistance to movement of the one over the other, but if a pencil or roller be placed between them the lateral movement becomes easy.

The object of roller bearings is to apply the same form of motion between wheels and their axles, or between revolving shafts and their bearings, as now exists between wheels and the surfaces upon which they roll.

The comparative amount of the friction arising from the two forms of movement is simply shown by placing a roller on a true plane with its axis at right angles to the direction of movement, and then gently raising one end of the plane until movement of the roller takes place by rolling; the angle that the plane then forms with the horizontal is the "limiting angle of friction" for rolling motion, and will be found to be very much less than that which will be necessary to cause movement of the same roller, when its axis is placed parallel with the direction of movement, or where movement takes place by sliding.

The coefficient of friction, in either case, is equal to the tangent of the limiting angle, or, in other words, if we consider the surface on which movement occurs as being the hypothenuse of a right-angled triangle, the base of which is the horizontal, then the coefficient of friction is equal to the perpendicular of such triangle divided by its base. The difference of this coefficient, though varying considerably with the materials experimented upon, may, for hard and polished surfaces, be taken as much as 12 to 1 in favour of rolling motion.

The French physicist, Coulomb, more than a century ago, determined the law of rolling friction, which may be stated as under:—

"So long as the wheel (or roller) and the surface on which it rolls is uninjured, the resistance (or friction) is proportional to the weight, and diminishes as the diameter of the wheel, or roller, increases."

Or, practically, the surfaces must be kept uninjured, and the rollers as large as possible.

It is generally accepted that with hard materials, such as metals within the limit of abrasion, friction varies only with the pressure, and is independent of the extent of surface, time of contact, and velocity.

The reason for the great difference in the coefficient of friction is that in the case of loads resting on rollers the combination is always in a state of unstable equilibrium, whereas when resting on plane surfaces it is in the condition of stable equilibrium.

In the case of bearings, if a load be imagined to rest on a perfectly cylindrical roller, which in its turn rests upon a perfectly cylindrical journal, and assuming that no distortion of the touching surfaces takes place, the slightest horizontal force applied to the load will destroy the equilibrium of the combination, and movement of the load will take place. Although in practice it is impossible to obtain the above conditions, as there must be some distortion of the touching surfaces, even when under comparatively small loads, the amount of force required to overcome the equilibrium is very small compared to that required when the load is resting on surfaces that have, before movement can take place, to slide one upon the other. Undoubtedly good lubrication very materially reduces the coefficient of friction in sliding movement, as lubrication may be considered as providing an infinite number of small particles, or rollers, placed between the moving surfaces, whereas lubrication acts rather as a retardation than otherwise to rolling motion.

The above is a short statement of the difference between rolling and sliding motion.

Mr. W. Bayley Marshall, M. Inst. C.E., in his paper read before the British Association at Toronto last August, stated that the requirements of a satisfactory roller bearing may be described as under:—

1st. That the various parts must be proportioned with reference to their relative movements so that nothing but rolling motion takes place between the surfaces engaged; and beyond this, that they must be constructed of materials suitable to withstand the stresses imposed upon them.

2nd. That the bearing rollers must be kept parallel with the axis of the axle or journal upon which they roll, that they must not be allowed to touch each other, and that they must be of sufficient diameter and length to bear the fatigue of the duty they have to perform.

3rd. That adequate provision must be made to meet the end thrust, or tendency to lateral movemont, not only of the rollers and other moving parts themselves, but also of the axle, or shaft, when revolving within a fixed bearing, or of the bearing itself, when revolving upon a fixed axle.

4th. That the bearing as a whole must contain as few working parts, and that these parts must be as simple as possible, and that they must be so designed that they can be applied and adjusted by any intelligent workman.

5th. That in applying the bearings to existing vehicles or shafts, as little alteration as possible is required to be made in the connections, such as axle-box guards, spring seating, pedestals, wheel hubs, &c.

6th. The most important of all, from a commercial point of view, that the bearings shall be produced at reasonable cost, that they can be trusted to work without special attention, and that they are capable of performing an extended duty either in mileage or number of revolutions, at small charge for maintenance.

In the author's opinion the above statement cannot be improved, but he ventures to amplify it by the following remarks. As to requirement No. 1, a simple method of determining whether the moving parts of any roller bearing have nothing but true rolling motion is to consider each such part as a unit in a train of toothed gear, the pitch of the teeth in which is infinitely small; if the diameters are then found to be relatively correct, the moving parts will truly roll upon each other. Upon the fulfilment of the second part of Mr. Marshall's first requirement greatly depends the success of roller bearings in practice. Where permissible, it is of undoubted advantage to have all the moving surfaces of polished, hardened steel, or case-hardened wrought iron, as such materials produce the least friction, and have the greatest resistance to wear; it is not often possible to use only such materials, and this by reason of the cost of manufacture. It is interesting to note that polished, hardened journals are now being used on the Great Western Railway for carriage stock fitted with ordinary bearings, and that the best wrought-iron axles for road vehicles have long been provided with case-hardened arms. Where it is not possible to use such high-class materials, the best results, so far as the author's experience goes, have been obtained by using cast steel for the casings where heavy loads and high velocities have to be resisted, as in the case of railway bearings, and hard cast iron (cylinder mixture) for lighter loads, or lower velocities; such as tramway and ordinary shaft bearings.

The rollers, when running on unhardened steel journals, should be of polished steel of a quality slightly softer than that of the journal, so that in the long run the rollers wear rather than the journal, it being a comparatively small expense to renew a set of rollers, whereas if the journal has to be turned up, this necessitates a new set of rollers of larger diameter than the original ones, added to the cost of turning up the journal.

Requirement No. 2.—The devices which have been tried for spacing and keeping the rollers parallel are so numerous that it is only possible, within the limits of this paper, to glance at a few representative ones.

Many attempts have been made to space the rollers by placing balls or subsidiary rollers between necks formed on the main rollers, one such ball or roller being placed at each end between each pair of

* Excerpt from a paper read before the Liverpool Section of the Self-Propelled Traffic Association.

main rollers, so that there are twice the number of balls or subsidiary rollers in any bearing than of main rollers. The objections to all these arrangements are that there is a strong tendency for the balls or subsidiary rollers to fly outwards by reason of pressure and centrifugal force, and that when such tendency is met by the introduction of floating rings, there is nothing to prevent the whole combination taking a spiral form on the journal which, if once set up, is fatal to the good running of the bearing. To overcome this last objection, in some devices the spacing subsidiary rollers or balls are connected or formed at the ends of rods, thus compelling both ends to move at the same velocity. When this is done and the floating rings are also introduced, a form of bearing is obtained which is theoretically perfect so far as its movements are concerned, and which has given most excellent results in practice. By the kindness of Mr. Cottrell an example of this form of bearing is exhibited here this evening. The objections to this form are, however, very serious, viz., the bearing must be made with extreme accuracy, there are a great many working parts, they require skilled workmen to put them together, and last, but not least, they are very costly.

The next device for spacing the rollers, and which in the author's opinion is the one most likely to survive, is the floating cage. This is shown on the diagrams and in most of the models and bearings exhibited here this evening. Its great recommendation is its simplicity, and the ease with which bearings so constructed can be taken off and replaced in position. It is true that in this particular form of bearing there is a certain amount of sliding friction. This amount, is, however, very small, it being only that resulting from the force sufficient to overcome the resistance of the cage to revolution, no part of the load being carried by the cage.

It should be borne in mind that the number of revolutions of the cage is considerably less than that of the axle or journal; the absolute relation in this respect depends upon the proportion of the diameter of the journal to that of the rollers, taking the ordinary proportions in railway bearings, where the rollers are slightly less in diameter than half the diameter of the journal, say 1⅝-inch rollers for 3¾-inch journals. The journal revolves three times to one revolution of the cage.

As to the second part of Mr. Marshall's requirement No. 2, namely, that the rollers must be of sufficient length and diameter to bear the fatigue of the duty they have to perform, it is difficult to lay down any hard-and-fast rule. It is, however, advisable in determining the diameter and length of rollers for any given duty, to assume that the whole of the load is at certain times borne on one roller. The question of velocity is also of great importance as affecting the fatigue of the metal.

The resisting power of the roller, so far as the author's experience goes, increases as the square of its diameter, and with journals and rollers of unhardened steel he does not recommend that a greater load than 2 cwt. per lineal inch should be placed upon rollers of ¾-inch diameter, or 8 cwt. per lineal inch of rollers of 1½ diameter. Taking a case of a railway bearing carrying 3 tons and where rollers of 1½ diameter can be used, the length of such rollers should not be less than 7½ inches.

Requirement No. 3.—There are several methods by which the end thrust of a bearing can be controlled, but to do this simply and effectually is not so easy as might be thought. In railway and tramway bearings the end thrust can be taken on a pad inserted in the end cover of the bearing, this pad being made of phosphor-bronze or other suitable material; when this is done there is, of course, nothing but sliding or scrubbing friction between the end of the journal and the pad. In cases where the end thrust is excessive, as for instance where long fixed wheel bases are used in railway work, an anti-friction arrangement can be introduced consisting of a ring of balls or, what is more satisfactory, a series of cones between the end of the journal and the cover of the bearing. A simple arrangement of cones running in a floating cage has been devised for vertical and thrust bearings, and a modification of this can be adapted to take the end thrust in horizontal bearings, whether for axles or shafting.

Requirements Nos. 4 and 5.—These are so evident that they need no special mention from the author.

Requirement No. 6.—This is to a great measure dependent upon the more or less successful fulfilment of Nos. 4 and 5, as it is impossible to produce a complicated bearing at comparatively small cost, added to which simplicity is imperative in mechanical arrangements which are required to work without special attention, and at small cost for maintenance. After describing the results obtained with roller bearings on railways, the author proceeded :—

In tramway working the tractional force necessary to start a car and maintain its speed is very high, probably only the horses know how high.

It has been endeavoured to get some reliable estimate of what this tractional force is, but it is found that authorities differ widely, owing mainly to the varying conditions under which the experiments have been made. Mr. D. K. Clark, in his work on tramways, gives as an average 25 lbs. as the tractional force required to keep one ton moving continuously, and the starting effort as 50 lbs. per ton, or double the tractional force.

The above figures are, however, subject to great variations, and it is proposed later on to put the results of some tests before you, that have been made to demonstrate the advantages of fitting tramcars with the bearings under consideration.

For the present it will be admitted that the work the tramcar horse is asked to perform is very severe, and although his daily mileage (about 12 miles) is not high, his life is short, which fact is no doubt due to excessive strain.

The cyclist has been put much in the same position as a horse, but has the advantage of being able to speak and demand alleviation. He very early discovered the advantages to be derived from roller bearings, and the universal adoption of the ball bearing for cycles is the result.

The ball bearing, however, admirable as it is for the light weights carried on the cycle, has never succeeded under heavy loads, owing mainly to the fact that all the weight is carried by only one or two balls at any moment of time, and the balls only touch the races, or ball paths, on a point, the result being as before stated that either the balls crush or the races are indented.

Lubrication is not required for rolling motion, as is shown by the fact that we do not put oil or grease on the rail; and yet the periphery of the wheel, where it is in contact with the rail, has a much greater speed than has its boss where it touches the journal, but this latter requires much lubrication, the explanation being that in the first case there is rolling motion, and in the second sliding or scrubbing motion.

Gravity Test.

A tramway-car fitted with ordinary bearings and weighing 2 tons 15 cwt. was let loose from a point 56 feet up an incline, with 1 foot 6¼ inches rise. It ran down this incline and 57 feet along the level line at foot of same, or a total distance of 113 feet. The force expended was, therefore, 6,160 lbs., falling through 1·521 feet, or 9,364 foot-lbs. The average frictional resistance was 9,364 ÷ 113, or nearly 83 lbs., equal to 30·5 lbs. per ton, the coefficient of friction being ·0134.

A similar car fitted with roller bearings being let loose from the same point ran the full length of the level line available, namely, 320 feet, and had not then quite come to rest, the total distance traversed being 376 feet. The force expended was again 9,364 foot-lbs. The average frictional resistance was 9,364 ÷ 376 = 24·9 lbs., or about 9 lbs. per ton of load, and the coefficient of friction ·004, a saving of 70 per cent.

The following figures are of interest, and are founded on the results of actual experiments :—

Relative starting effort of a tramcar on a gradient of 1 in 20—ordinary bearings 100, roller bearings 77, saving 23 per cent.; on a gradient of 1 in 80—ordinary bearings 100, roller bearings 50, saving 50 per cent.; on a gradient of 1 in 140—ordinary bearings 100, roller bearings 39·6, saving 60·4 per cent.—results which require no comment.

Roller bearings have been fitted to many horse cars, with results most beneficial to the animals employed, and it is estimated that the use of them would so prolong the life of the horses, that the reduction in their depreciation alone would show a saving of considerably over £10 per car per annum.

The Corporation of Blackpool have had some of their tramcars fitted with roller bearings, and these cars have been running on their electric tramway for over three years, with results so satisfactory that they have applied similar bearings to all the new cars which have been constructed since the advantages of these bearings were established, and their consulting engineer some short time ago certified that at least 30 per cent. of electrical output is saved by the use of such bearings, as compared with those in ordinary use.

There remains the question of first cost, which is undoubtedly high. On this question let us look back for a moment to first principles. What is the object of a railway or tramway? It is to reduce "traction" by the use of a smooth and hard surface.

If it be worth while to spend £5,000 a mile on the construction of a tramway for the purpose of reducing traction, and that this can further be materially reduced by the use of any appliance for improving the carriage which is to roll on this costly road, it would be taking a narrow view to question the first cost of that appliance when it is insignificant as compared with the cost of the tramway, or even with that of the tramcar.

There are many ways of realising the undoubted advantages in traction, so as to pay for the greater first cost of the roller boxes, and also to improve the dividend-paying power of Companies when these boxes are used, thus:—

1. Leave the number of horses as they are with their daily mileage and food, and take the saving in the longevity of the horses.
2. Increase the speed and so reduce the number of cars and drivers to work a given service.
3. Substitute two mules for two horses and make the saving in the first cost of the mules and in their keep.
4. Reduce the number of horses required by increasing their mileage per diem.

The last method is the most profitable way of turning to account the saving to be gained by the roller bearing.

Taking a hypothetical case of a line of tramway six miles long, with a 10 minutes service all day, and assuming that it takes a car 2 hours and 20 minutes to make the round journey, there will then be 14 cars on the road when in full work, and supposing that the first car leaves the depôt at 8 a.m. and the last at 9.50 p.m., then there will be 84 car journeys per diem, and the total car mileage will be 1,008 per diem. If each pair of horses is worked 12 miles per day with one day off in seven, then the total number of horses required to work the foregoing traffic will be 196.

If by the introduction of roller boxes the traction is so much reduced that each pair of horses is able to travel 16 miles per diem with six days off in 28, then the total number of horses required to work the traffic will be 160, showing a saving of 36 horses or 18·4 per cent., which at the rate of £55 per horse per annum for keep and renewals would show a total saving of £1,980 per annum, or say 1¼*d.* per car mile, without considering the saving in the cost of lubricant.

The Board of Trade Return on Tramways, September, 1893, shows that a saving of only 1*d.* per mile run would increase the net receipts by nearly £300,000, and convert many failing concerns into dividend paying properties; the published report shows that the capital expended on tramways paying no dividend is more than £1,750,000.

Tramway working expenses absorb so large a proportion of gross receipts that any saving in the latter soon becomes appreciable in the dividend payable; 55 per cent. of the average 80 per cent. representing total expenses, is due to horses, showing that that is the item where saving will be the soonest appreciable in dividend.

Assuming a tramway paying 5 per cent. dividend with 80 per cent. working expenses, then 20 per cent. gross receipts is equal to 5 per cent. dividend; a reduction of 4 per cent. working expenses will equal 1 per cent. dividend.

Now, taking 55 per cent. of the working expenses as due to horses, and reducing the number of horses by 18 per cent. as above, there should be a saving of 18 per cent. of 55 per cent., or about 8 per cent. of total working expenses, reducing them to 72 per cent., and increasing dividend to 7 per cent. instead of 5.

Road Vehicles.

With reference to the application of roller bearings to vehicles running upon ordinary roads, it is impossible to estimate the saving, as the tyre friction of such vehicles varies so considerably. A committee of the Society of Arts reported some years ago that a loaded omnibus showed the following resistance on various roads:—

Description of road.	Speed (miles per hour).	Resistance (lbs. per ton).
On macadam, new granite ..	3·51	101·09
On macadam, graveled ..	3·45	44·48
On wood paving	3·34	41·60
On asphalte paving	3·56	27·14
On granite paving	2·87	17·41

Showing a variation of nearly six to one. No doubt when this report was made the asphalte and wood pavings were not so good as at present.

A glance at the above table shows the wisdom of using granite paving where heavy loads have to be dealt with. The application of roller bearings to the wheels of road vehicles will undoubtedly greatly reduce the force required to propel them, the percentage of such saving depending upon the character of the road.

The reduction of the starting effort must, however, be of great advantage in all cases of self-propelled vehicles, and especially so when the motive power is electricity.

The simple form of roller bearing exhibited here this evening, namely, that with the floating cage, will, in the author's opinion, be found to most satisfactorily resist the shocks arising from the inequalities of ordinary roads, this opinion being founded upon results obtained from their application to agricultural implements.

PROCEEDINGS OF TECHNICAL SOCIETIES.

Mechanical Propulsion on Canals *—(*concluded*).

Towing by Locomotive.—The last method of traction to be considered is towing by means of a locomotive running on the bank. Some experiments on this plan were made by the Prussian Government during a period of four months upon the Oder-Spree Canal, over a distance of 1·86 mile which was purposely chosen on account of the number of windings it contained. Although up to the present no conclusive results have been obtained as to cost, yet, judging from former experience and from the calculations given, it would be too high to stand competition, even for regular and extensive traffic. In France, however, a service of this kind was working for several years on the Neufossé, Aire, and Deûle canals, between Les Fontinettes and the neighbourhood of Douai, over a distance of 47·8 miles with only a single lock. The locomotive was used only for going up stream; each train that it towed consisted generally of two or three fully laden barges, and the speed was about one mile per hour. But it could not compete with the horse towage service of the Deûle Canal, and was finally abandoned.

At the present time some experiments are being made upon the Bourgogne Canal with a small electric traction-engine, which runs on the towing path without rails; but in view of the failure which has always attended this method of haulage, the author thinks it will never get beyond the experimental stage, notwithstanding that it has been stated to be satisfactory thus far.

From the consideration of these four different methods of traction the author is of opinion that the only plan suitable for English canals, which are usually both shallow and narrow, is propulsion by means of screws, driven either by steam or by electric or oil motors. Haulage on a sunken chain or wire rope is quite inapplicable to the winding course of English canals; and on the Continent it is only upon long straight reaches with frequent tunnels, or where strong opposing currents are encountered, that it proves a commercial success.

Cost of Traction.—On the all-important question of cost, some plans which may be better from a mechanical point of view may be ruled out of court; while others not so good mechanically, but cheaper, succeed owing to their cheapness.

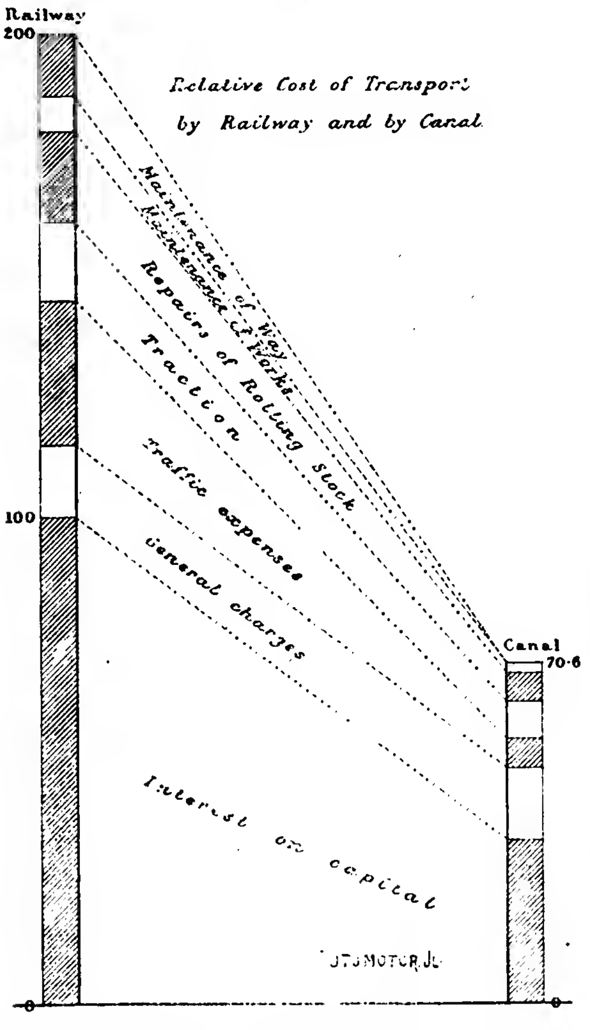
The cost of traction varies on every canal, and is dependent upon the regularity of the traffic, the freedom from locks, and other conditions. A method of mechanical propulsion which is remunerative on one canal might not be able to compete with horse traction on another. As an example: with the boat trains introduced upon the Aire and Calder Navigation by Mr. Bartholomew the cost of traction is about the lowest that has been reached, namely, 0·034*d.* per ton-mile; but, as he stated before the Select Committee on Canals in 1883, on a navigation like that of the Leeds and Liverpool Canal the same plan would cost 0·3*d.* per ton-mile, that is to say, ten times as much.

It is rather difficult to arrive at an exact basis of comparison for the cost of traction upon foreign and upon English canals, because most of the Continental inland navigations are State-aided, and in some cases the cost of maintenance is borne entirely by the Government, to the extent even of carrying the traffic at a loss; and therefore the cost per ton-mile includes merely the actual cost of the haulage and whatever tolls the Government may think best to put upon the canal, independently of whether it is paying or not. Whereas on our English canals the tolls have to be sufficient to ensure payment of interest, cost of maintenance, &c. In 1866 the

* Excerpt of paper read by Mr. LESLIE ROBINSON at the Institution of Mechanical Engineers.

cost of haulage by steam upon the Gloucester and Berkeley Canal was 0·077*d.* per ton-mile, while upon the Grand Junction Canal it was 0·166*d.* The difference may be traced directly to the difference in dimensions of the two canals; for while the Gloucester and Berkeley Canal is practically a ship canal, the Grand Junction is one of the shallowest in the country. According to the State Engineer's Report on the canals of New York State, the cost of traction upon the Erie Canal and Hudson River was as high as 0·238*d.* per ton-mile, including tolls. In his evidence before the Select Committee on Canals in 1883, the late F. R. Conder gave the cost of transport by steam traction on Belgian canals as 0·284*d.* per

PLATE 5.



ton-mile against 0·315*d.* by horse traction; these figures include tolls. The cost of traction by screw steamer towing three other boats on the Erie Canal was placed in 1892 by Mr. Bogart, an American engineer, at 0·082*d.* per ton-mile; the three boats towed each carry 250 tons of cargo, and the steamer carries 180 tons. By horses towing two boats the cost comes to 0·109*d.* per ton-mile. The speed with horses is 1·6 mile per hour, while with steamers it amounts to 2·5 miles per hour.

Considering the cheapness of transport by water, it would be remarkable that the English canals are not more extensively used, were it not for the fact that most of them are in the hands of the railway companies; or at least one or two of the junction canals which join important routes are so controlled, and upon these there are prohibitive rates in force, with the result that the traffic is kept down on the canals, and is nearly all monopolised by the railways. Even with the old mode of traction by horses it is found that minerals can be sent by canal considerably cheaper than by rail.

Time is, of course, an important factor for general traffic, but it is not of so much consequence for minerals, for which cheapness of transport is the first consideration. On the Continent the canals are the principal means employed for the conveyance of goods, and improvements are still being carried out in the way of widening and deepening their channels for facilitating the passage of boats; whereas in this country many of the canals are choked up with weeds, and have been allowed to fall into disrepair.

In support of the assertion that even with horse traction it has been found cheaper to carry minerals by canal than by rail, it may perhaps be well to quote some evidence. There are three principal causes which render transport by canal cheaper than by railway, and they are, briefly, the following:—First, on a canal there is no item of cost corresponding with the wear and tear of rails, sleepers, or fittings, though the cost of maintaining banks and locks must be taken into account. Second, there is a corresponding saving of the repairs required by rolling stock and locomotives in consequence of their running on a rigid permanent way. Third, the most important reason is that the maintenance of works on a canal is much less costly on an average than the corresponding outlay upon a railway, not only from the absence of vibration, but also from the much smaller magnitude of the works themselves. In his evidence before the Select Committee on Canals, Mr. Conder gives the accompanying Table 8, compiled from information at his disposal, and plotted

TABLE 8.—*Relative Cost of Transport by Railway and by Canal. See Plate* 5.

Items of Cost.	Railway.	Canal.
Maintenance of way	13	0
Maintenance of works	7	2·3
Repairs of rolling stock	19	6
Traction	16	8
Traffic expenses	30	6
General charges	15	15
Interest on capital...	100	33·3
Total	200	70·6

as a diagram in Plate 5, which shows the relative costs for an equal tonnage transported an equal distance by rail and by canal. It will be seen that the carriage of heavy goods by canal costs about one-third of that by railway.

In Table 9 is added a summary of the average cost per ton-mile of the different modes of traction on canals:—

TABLE 9.—*Average Cost of Different Modes of Traction on Canals.*

Name of Canal.	Mode of Traction.	Cost per Ton-Mile.
		Penny.
Canal de l'Oise	Horses	0·057
Sambre Canal	,,	0·0659
St. Quentin Canal	,,	0·053
Branch Canal de l'Aisne	,,	0·0785
Canal des Ardennes	,,	0·0706
Bourgogne Canal	,,	0·078
Canals du Loing, de Briare, and du Centre ...	,,	0·064
Mauvage reach of canal between the Marne and the Rhine	Sunken Chain	0·052
Canalized Meuse	,,	0·168
St. Maur and St. Maurice Canals...	Running Rope	0·039
Aire and Calder Navigation (tug carrying cargo, and allowing 10 per cent. for depreciation and repairs)	Boat Train	0·029
Forth and Clyde Canal	Tugs	0·143

Conclusions.—The reason why the cost of transporting goods by canal is so much cheaper than by railway lies largely in the cost of construction. Taking the average cost of the Manchester, Sheffield, and Lincolnshire and the Lancashire and Yorkshire Railways, which was £65,700 per mile, and the cost of the Birmingham Canal, which was £15,000 per mile, the former is more than four times the latter; and the cost of maintenance will be proportionately greater for the railways. In view of the smaller initial outlay on canals, and the cheapness of mechanical traction thereon as compared with horse traction, it may well be asked, why has mechanical traction upon canals in this country not come more to the front? The answer is, not that mechanical engineers are unable to design machinery to do the work cheaply and expeditiously, but that the main difficulty arises from vested interests. The all-powerful railways have by some means or other obtained the control over a portion and even in some cases over a whole network of canals. Their control over even only one section of a canal means that they control the canal throughout its entire length, together with the branches opening into it. On many canals this leads to their falling into disrepair, or to certain portions being blocked, thereby effectually preventing any through traffic. Owners who would gladly have sent large quantities of goods by canal, and would thereby have opened up a remunerative field for mechanical propulsion, have reluctantly been forced to send their goods by the quicker but more expensive railway route. Continental canals on the other hand are controlled by the government, who in the interests of the whole community at large, foster this method of cheap transit; and this is the main reason why mechanical propulsion on canals is more widely developed on the Continent than in our own country. The cause of the non-success of mechanical propulsion in this country may clearly be considered to be beyond the forces which can be controlled by mechanical engineers.

The best method of mechanical propulsion for our own country, on canals which are still in the hands of private owners, must undoubtedly be that which necessitates the least alteration to the existing boats and canals in their present conditions, so as to be applicable to the boats in their present form, without structural alterations, and without in any way preventing them from passing through existing locks. The machinery should occupy as little weight and space as possible, and should be of simple construction and capable of being managed by an ordinary bargeman; the cost of first outlay and of maintenance must be small; and last but not least, the cost of traction per ton-mile must be as low as possible. As to the best form of boat to be used on any canal, and its relation to the wetted section of the canal, the author hopes that, as soon as the experiments of M. de Mas on this subject are published, the mathematical and theoretical side of the problem will be satisfactorily settled.

Mechanical Features of Electric Traction.*

Introductory.—Previous to discussing certain special mechanical features which enter into the design and construction of an electric traction system, a few figures may be quoted for showing the importance of the subject in general.

TABLE 1.—*Mileage of Tramways in America, and number of Cars, during Six Years,* 1890–95.

MILEAGE.

	1890.	1891.	1892.	1893.	1894.	1895.
Electric	2,523	4,061	5,939	7,466	9,008	12,583
Horse	5,400	5,302	4,460	3,497	2,243	1,232
Rope	510	591	646	657	662	599
Steam	604	642	620	566	614	519
Total miles ...	9,037	10,599	11,665	12,186	12,527	14,933

NUMBER OF CARS.

	1890.	1891.	1892.	1893.	1894.	1895.
Electric	5,592	8,892	13,115	18,233	24,849	36,121
Horse	21,970	21,798	19,315	16,845	11,507	5,420
Rope	3,795	4,372	3,971	4,805	4,673	4,871
Steam	751	815	998	616	639	2,957
Total cars ...	32,108	35,877	37,399	40,499	41,668	49,369

Table 1 shows the mileage of tramways in America for the six years 1890–5. It is seen that rope traction continued to extend up to 1894; since that time its importance has diminished. In San Francisco, Los Angeles, Minneapolis, Denver, St. Louis, Pittsburgh, Philadelphia, Baltimore, and other American cities, electric traction has been substituted in place of ropes.

Table 2 gives the electric tramway mileage in Europe at the end of last year, 1896. It will be seen that Great Britain is yet much behind Germany. This is especially remarkable, because the regulations of German local authorities are generally much the more severe. Electric trolley roads are now to be found in the oldest and handsomest of German cities.

TABLE 2.—*Mileage of Electric Tramways in Europe, and number of Cars, and Horse-power, at end of* 1896.

Country.	Miles of Tramway.	Number of Cars.	Horse-power.
Germany	618	1,545	13,810
France	67	180	4,200
Great Britain and Colonies	167	269	9,617
Austria and Hungary	120	265	5,060
Italy	50	149	2,460
Switzerland	30	83	1,570
Belgium	90	157	2,550
Russia	30	87	1,150
Other countries	30	50	111

Table 3 shows the great financial importance of tramways as compared with railways in America. The passenger traffic on the tramways is six times greater than that on the railways: and the ratio of working expenses to receipts is lower for the tramways than for the railways. The gross earnings of the tramways in the United States are approximately 50 per cent. of the passenger earnings of the railways, and 15 per cent. of the total earnings of the railways, whereas the tramway mileage is only about 6 per cent. of the railway mileage. A highly important fact is that tramway receipts are

TABLE 3.—*Comparison of Railways and Tramways in America and in England.*

—	Capital Expenditure.	Total Mileage.	Gross Receipts.	Total Expenses.	Ratio E to G.	Passengers Carried.
	£		G £	E £	per cent.	
AMERICA—						
Railways	2,334,200,000	240,000	219,000,000	154,000,000	70	544,000,000
Tramways ...	230,000,000	14,050	32,850,000	22,700,000	68	3,000,000,000
UNITED KINGDOM—						
Railways	880,000,000	20,000	77,025,000	40,100,000	52	775,200,000
Tramways ...	13,000,000	1,000	3,540,000	2,840,000	75	480,000,000

* Paper read at the Institution of Mechanical Engineers by Mr. PHILIP DAWSON.

found to be practically independent of good or bad trade, and not to depend on the prosperity of the country.

Tables 4, 5, and 6 have been compiled from the official reports of the Massachusetts Board of Railroad Commissioners. Massachusetts more closely resembles England in the habits of the people and in local conditions than any other State of the Union. Table 6 shows the rapid increase of passenger traffic and mileage. Table 4 shows the difference in cost of completely equipping tramways in small and large towns, varying from £7,000 to £20,000 per mile of single line. Table 5 shows that as passenger carriers tramways play a much more important part than railways. It is demonstrated, not only in America but also in England and on the Continent, that wherever an electric tramway runs parallel to a railway the former will secure practically all local traffic. It has been frequently urged that mechanical motive power on tramways is dangerous to the public safety. In America, where comparatively high speeds are allowed, the Railroad Commissioners report that the proportion of passengers and employés killed during the last two years of electric working appears to have been about the same as with the use of horse-power in 1883.

TABLE 4.—*Cost of Tramways in Small and Large Towns in Massachusetts.*

Per Mile of Single Line.	Springfield.	West End.
Construction and equipment	£4,939	£11,323
Other permanent property	£1,761	£7,959
Total cost	£6,701	£19,282
Capital investment	£6,197	£20,152
Passengers carried, total	10,163,011	166,862,298
" " per mile	190,517	648,563

TABLE 5.—*Passengers Carried on Tramways and on Railways.*

—		1895.	1896.
Worked by horses only	... miles	61·759	35·132
" " electricity only	... miles	1,002·756	1,241·383
" " horses and electricity ...	... miles	22·62	14·51
Total income	£	2,649,274	2,980,188
Dividend	per cent.	5·76	5·87
Passengers carried, total	...	259,794,308	292,358,943
" " by electricity	...	205,866,134	236,544,417
" " by railway	...	53,928,174	55,814,525
" " excess by electricity ...	...	151,937,960	180,729,892

For all practical purposes the present subject may be considered under the three headings of outside work, rolling stock, and power station.

Outside Work—Wires.—The overhead line of conductors may be supported either by brackets attached to poles or to houses, or by a span-wire stretched between poles or rosettes fixed to house-fronts. For the sake both of appearances and of smooth running the conducting wire should be strained as tight as is consistent with its tensile strength and with the minimum temperature which obtains in the locality. The best practice does not allow more than 2,000 lbs. strain on a No. 0 Brown and Sharpe (0·325 inch diameter) hard-drawn copper wire at the lowest temperature to which it will be exposed. With this limit the strain to be put on the wire when erected can be easily ascertained from tables. A rough but safe rule in this country, where rarely more than 20° F. of frost is to be expected, is a sag of 0·75 per cent. of the span at an average temperature of from 60° to 65°. The trolley wire should be of absolutely even quality, and supplied in lengths of slightly over half a mile. The joints should be silver-brazed in the copper ingot before it is rolled. The diameter of the wire should not be allowed to vary more than 0·0004 inch. The breaking strain of the wire should be at the rate of 56,000 lbs. or 25 tons per square inch. In span-wire construction it is necessary to determine both the height of the eye-bolts from which the span-wire is suspended, and also the sag. In Table 7 are given data of galvanised steel span-wires generally used.

TABLE 6.—*Growth of Massachusetts Tramways during Ten Years, 1887–96.*

—	1887.	1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.
Number of companies ...	44	46	46	48	55	61	60	68	75	83
Miles of main line ...	470·27	533·99	574·17	612·38	672·45	754·85	874·14	938·84	1077·99	1276·75
Miles equipped for horses.	470·27	533·99	523·65	451·52	383·42	258·55	163·06	103·87	61·80	25·13
Miles equipped for electricity.	—	—	50·52	160·86	289·03	496·30	711·08	824·97	1016·19	1241·62
Cost of construction £	3,524	3,384	3,236	3,467	3,584	3,904	5,358	5,349	4,797	4,679
Cost of equipment £	1,666	1,464	1,576	2,131	2,323	3,043	2,347	2,305	2,096	1,961
Capital investment £	6,534	6,431	6,781	7,651	8,178	9,230	10,673	10,592	9,820	9,278
Passengers carried ...	124,787,328	134,478,319	148,189,403	164,873,846	176,080,189	194,171,942	213,652,009	220,464,099	259,794,308	292,358,943
Car-miles run	20,625,846	23,244,767	24,259,491	26,516,937	27,670,166	29,678,036	34,507,292	36,722,978	43,655,560	53,613,685
Persons employed ...	5,222	5,531	6,302	6,246	6,449	7,185	8,070	7,451	8,048	9,130
Cars	2,633	2,588	2,942	3,247	3,494	3,679	4,040	4,058	4,428	4,913
Horses	11,874	11,391	11,817	11,241	10,640	6,734	3,531	2,014	1,436	878
Motors	—	—	—	—	—	—	3,013	3,906	4,704	5,958

TABLE 7.—*Galvanised Steel Span-Wires.*

—		Wire-Gauge.			
		No. 15.	No. 12.	No. 11.	No. 10.
Thickness of wire	... inch	0·070	0·110	0·120	0·135
Number of strands	...	7	7	7	7
Total approximate diameter	... inch	¼	$\frac{5}{16}$	⅜	$\frac{7}{16}$
Weight per hundred feet run ...	lbs.	10	21	29	36
Tensile strength absolute ...	lbs.	1,600	3,360	4,640	5,720

Poles.—Upon the amount of sag allowed for the span-wires depends the strain which the side poles must stand. Round curves these strains are often great, and tubular poles composed of ordinary pipes wedged together by liners are useless. In Table 8 are given certain data of standard poles specially designed for this work. All poles must be of such strength that when in position they will stand without permanent set the greatest side strains to which they may be subjected. Terminal poles and pull-off poles on curves should be the strongest. Ordinary side poles must stand a direct strain of at least 500 lbs. without deflecting more than 4 to 6 inches. Their strength must be sufficient to carry, besides the trolley wire itself, the additional weight when the wires are covered with ice and snow. The poles are always subject to vibration communicated from the trolley wire. It is of the utmost importance that joints should be well constructed: which renders it necessary that the several lengths of the pole should be sweated together. The joint is made by heating the outside pipe to a welding heat, slipping it over the inner pipe, and then passing the two together through special rollers. After completion, if a piece is cut from the joint of the two pipes they will be found solidly welded together, the joining line having entirely disappeared. This is known as the "S S S" joint, the abbreviation meaning solid, swaged, and sweated. The tubes used in making poles are all lap-welded, and the larger sizes are also riveted along the seam with countersunk rivets. The lengths of pipe are so put together that the seams of each consecutive length are 120° apart, when the poles are made in three lengths, as is generally the case. If joints are not so made the pole, instead of bending uniformly, after a short time gives at the joints. Poles constructed with S S S joints can be accurately calculated to stand any determined strain without exceeding a fixed temporary and permanent deflection. This is not possible with other joints, which always give trouble sooner or later.

TABLE 8.—*Standard Tubular Poles.*

Total Length of Pole.	Length and Outside Diameter of Three Component Pipes.			Total Weight.	Free from Permanent Set at
ft.	ft. ins.	ft. ins.	ft. ins.	lbs.	lbs.
29	$16\frac{1}{2}$ × 10	8 × 6	$7\frac{1}{4}$ × 7	1,503	4,500
30	17 × 10	$6\frac{1}{2}$ × 6	$7\frac{1}{4}$ × 7	1,552	4,400
31	17 × 10	$9\frac{1}{2}$ × 6	$7\frac{1}{2}$ × 7	1,593	4,200
$28\frac{1}{2}$	16 × 6	6 × 7	$7\frac{1}{4}$ × 6	1,193	3,400
$29\frac{1}{2}$	16 × 8	9 × 7	$7\frac{1}{4}$ × 6	1,224	3,200
30	17 × 8	$6\frac{1}{2}$ × 7	$7\frac{1}{4}$ × 6	1,259	3,150
$28\frac{1}{2}$	16 × 7	8 × 6	$7\frac{1}{4}$ × 5	769	2,000
$29\frac{1}{2}$	16 × 7	9 × 6	$7\frac{1}{4}$ × 5	991	2,000
30	17 × 7	$8\frac{1}{2}$ × 6	$7\frac{1}{4}$ × 5	998	1,800
$28\frac{1}{2}$	16 × 6	6 × 5	$7\frac{1}{4}$ × 4	689	1,200
$29\frac{1}{2}$	16 × 6	9 × 5	$7\frac{1}{4}$ × 4	613	1,000

For the standard poles used at Bristol and Dublin five sizes are required, all 31 feet long, and set in the ground to a depth of 6 feet. No. 1 has to stand a lateral strain of 350 lbs. applied at top, with maximum temporary deflection of 6 inches, and a strain of 700 lbs. with maximum permanent deflection of $\frac{1}{2}$ inch. For the four others the corresponding limits are:—

No. 1 ..	350 lbs. with 6 inches, and	700 lbs. with $\frac{1}{2}$ inch.		
No. 2 ..	500 ,, ,,	,, 1,000	,,	,,
No. 3 ..	700 ,, ,,	,, 1,200	,,	,,
No. 4 ..	1,000 ,, ,,	,, 1,700	,,	,,
No. 5 ..	2,000 ,, ,,	,, 2,600	,,	,,

The poles are required to be as nearly round as possible. A difference of $\frac{1}{4}$ inch between maximum and minimum diameter is all that is allowed. In order that they may all be as nearly uniform as possible, $\frac{1}{16}$ inch more or less than the prescribed dimensions is all that is allowed. The greatest distance out of the true that is allowed at the top of the pole is $\frac{1}{4}$ inch. Ten per cent. of each lot of poles are tested; should three poles fail to come up to the requirements, the right is reserved to reject the entire lot. The poles are dropped three times, butt foremost, from a height of 6 feet upon some solid substance, after which they must show no signs of telescoping or loosening in the joints.

Insulators.—Insulators must be mechanically strong, and the insulation protected by a metallic covering from external injury. Special insulators have been designed for every variety of service, samples of which were exhibited. For ordinary tramway service the wire is usually soldered into the gunmetal ears of the insulators; but the heavy "figure 8" wire, used for light railways and high-speed lines, is supported by mechanical clips. Occasionally an extra heavy round wire is used, which is then milled out by a portable tool at the points of support, in order to afford a proper grip for the mechanical cars.

Rolling Stock.—This can be subdivided into car-bodies, trucks, motors, and their accessories. The bodies possess no special features, except that all framing must be extra strong.

Trucks.—The supply of suitable trucks for both motor and trailer cars is of the utmost importance. The introduction of electric traction has revolutionised the construction of running gear. In former days, when horses and mules were the only motive power for street cars, it was considered quite sufficient to support the car body upon a single set of springs carried by the boxes, a simple bar being often the only connection between the two sets of wheels. The adoption of the electric power and of cars equipped with single or double motors added immensely to the weight carried by the axles, and rendered it necessary to adopt efficient methods for cushioning and suspending the motors over the axles, while maintaining a rigid connection between motor and axle. At first the motors were rigidly attached to the bottom of the floor of the car body. This construction did not prove a success, for both car floor and motor deteriorated rapidly, and access to the motors was also difficult.

(To be continued.)

NEW INVENTIONS.

Claiming particularly to apply directly or indirectly to Motor Vehicles, &c.

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*** *At the request of a number of subscribers we are pleased to announce that for the future we have arranged to more thoroughly cover the field of completed Patents referring to the Motor-Car Industry, by reproducing the latest Specifications and Diagrams.*

Patents Applied For.

Abbreviations: Impts., Improvements in; Relg., Relating to.

1697.
Dec. 1. 26,300. J. H. BUCKLEY. Impts. driving gear.
,, 2. 26,454. L. H. A. P. KEENE. Impts. in or additions to motors.
,, 3. 28,609. W. D. PRIESTMAN and S. PRIESTMAN, and T. WRIGHT. Impts. steering gear.
,, 3. 28,622. C. H. WHISLAY. Mechanically and self-propelled vehicles.
,, 6. 28,622. J. J. MCDANIEL. Construction of cycles, motor-cars, &c.
,, 7. 26,911. F. LAMPLOUGH. Impts. mechanically-propelled vehicles.
,, 7. 28,918. C. M. TURRELL and H. J. LAWSON. Impts. motor-vehicles.
,, 7. 28,932. P. J. GASNIER. Electric motor.
,, 7. 28,965. A. GROSSMAN. Impts. controllers for motors, &c.
,, 6. 28,973. W. J. GEORGE. Brake holder and locking apparatus.
,, 6. 29,012. E. B. IVATTS. Hand weather protector.
,, 8. 29,077. F. G. GRIFFITH. Improved multiple speed gear.
,, 9. 29,149. A. A. COMMON. Impts. steering apparatus.
,, 9. 29,167. A. GINNINO and E. CUENOD. Springs for vehicles.
,, 10. 29,230. W. L. ADAMS. Joints for cycles, motor-cars, &c.
,, 11. 29,316. E. J. WADE and ELECTRIC MOTIVE POWER CO. (LTD.). Control and regulation of electrically-propelled vehicles.
,, 11. 29,376. R. DOWIE and W. DOWIE. Impts. relg. motor-cars, &c.
,, 11. 29,404. G. C. MARKS (P. FAGEOT). Impts. speed gear.
,, 13. 29,422. W. H. MCNEIGHT. Impts. joints for frames.
,, 13. 29,450. J. REBBLA. Improved method of propelling.
,, 14. 29,511. R. WILLIAMS. Gear for propulsion of cycles, &c.
,, 14. 29,556. W. H. DENISON. Improved driving gear.
,, 14. 29,581. G. E. LANCELOTT and A. U. THOMAS. Impts. saddle pins.
,, 14. 29,582. J. W. YOUNG. Impts. joints for frames.
,, 15. 29,762. W. BAINES. Impts. relg. speed gear.
,, 15. 29,801. S. T. RICHARDSON and W. PRICE. Impts. driving gear.
,, 17. 29,906. S. T. RICHARDSON and W. PRICE. Joints for frames.
,, 17. 29,915. H. W. J. WILKINSON. Impts. motor-cars, &c.
,, 20. 30,114. A. BOUDEVILLE. Gas or oil motors.
,, 20. 30,135. A. L. FYFE. Impts. oil engines and electric motors.
,, 21. 30,216. W. WILLIAMS. Impts. relg. driving gear.
,, 21. 30,240. H. J. LAWSON and BRITISH MOTOR SYNDICATE (LTD.). Impts. relg. driving gear.
,, 21. 30,266. C. JOHNSTON. Motor-car.
,, 22. 30,365. G. DORE and H. I. BONISON. Impts. driving mechanism. (Date claimed, 10th July, 1897.)
,, 28. 30,567. H. W. PAYNE. Impts. pressure gauges for motor-vehicles.
,, 28. 30,612. C. J. H. GRADISHY. Mud-guards.
,, 29. 30,751. J. MOLAS. Impts. compressed-air motor-cars.
,, 30. 30,786. R. MAYNE. Impts. chain driving gear.
,, 31. 30,862. A. J. JOYNT. Impts. mud-guards.
,, 31. 30,920. S. E. BAGSHAW. Differential speed gear.

Specifications Published.

7,858. Bicycles or Vehicles Propelled by Oil, &c. Anthony George New, Palace Chambers, Westminster. April 14th, 1896.

The object of the present invention is to enable motor-cars to be constructed in a lighter manner than has hitherto been accomplished, whilst retaining all the advantages caused by a heavy machine with regard to momentum.

A represents the axle, whilst B, B, are two fly-wheels rigidly mounted thereon and connected by intermediate gear, C, C, to the driving wheel, D, of the cycle. The fly wheels, B, carry crank pins, B 1, to which the connecting rods of the explosion cylinders are coupled in the usual manner. The intermediate gear, C, C, may be arranged to suit various requirements; for example, as shown, when one of the straps, F, is tightened around the internally toothed drum, G, the cog, H, will cause the pinion, I, to be carried round at a slower speed than the axle, A, and when G 1 is held stationary the internal toothed wheel, Q, will cause the pinion, N, to travel around the cog-wheel, M, keyed on the boss of G 1. As the pinion, N, is mounted within the hub, D 3, the road-wheel, D, will thereby be caused to rotate.

To obtain a slower speed the drum, G 2, is held fast, and the train of gears, H, I, J, K, gearing with the internal teeth thereof, causes the road-wheel to rotate accordingly, the wheel, K, being mounted on the hub of the wheel, D, in a similar manner to N, before described.

To reverse the direction of rotation of the road-wheel the drum, G 3, is held by its straps, F, and two or more sets of pinions similar to N and O are mounted on rotating arms. These arms can be connected to the road-wheel in any suitable manner in order that it will rotate in the same direction as the said arms. The wheels, N and O, in this case being rotated around the shaft, A, A cog M is keyed on the tube, W, which also carries the pinion, I, cog M, cog J, and internally toothed wheel, Q, and also provides a bearing for other parts of the mechanism.

A driving wheel so constructed as to enclose a fly wheel within its walls is also described.

5,430. Hydraulic Steering Gear. Ernest John Clubbe and Alfred William Southey, 16, Elm Street, Gray's Inn Road, Middlesex. March 10th, 1896.

This invention relates to improvements in steering locomotive road carriages in which hydraulic pressure is used as the medium of transmitting power from the motor to the driving wheels.

The hydraulic engine comprises two double acting cylinders mounted on the main frame and whose piston rods are coupled to the axle by links, the two pistons acting together as one and moving in opposite directions, the opposite ends of the cylinders being coupled by pipes, so that the admission of water under pressure from the pump of the circulation system to the front end of the one cylinder and to the back end of the other cylinder and the exhaust of the water from the other ends of those cylinders and the locking of the water in both ends of both cylinders may be controlled by a balanced valve. This valve is of the piston type and its cylinder is connected with the said pipes, whilst other pipes are respectively connected to the pump delivery and admission. The position of the piston valve in its cylinder is controlled by a hand-operated circular cam concentric with the king-bolt and movable about it as a centre, this cam being engaged by the forked end of a lever turning with the swivelling under-carriage and connected to the valve rod. In order that the fluid may be locked in the cylinder to hold the piston immovable at the required position, the cam plate is formed of equal segments in different planes connected by a short inclined segment intermediate of the segments. The middle part of this intermediate segment corresponds to the position of the valve at which the water is locked in both ends of the cylinders, and the operation is such that by moving the cam through an arc of any required number of degrees, the pressure is admitted to opposite ends of the two cylinders and the swivelling under-carriage is turned about the king-bolt through an arc of corresponding extent, the swivelling motion ceasing when by the lever reaching the middle of the intermediate part of the cam the valve is moved to such position that the water is locked in the cylinders.

The steering wheels are mounted on short axles pivoted on vertical axes in the forked ends of the main axle tree, which would in practice generally require to be pivoted to swivel about a main king-bolt at the wheel, axles being formed by the short arms of elbow levers whose long arms are coupled by links to the opposite ends of a piston rod which extends through the opposite ends of the hydraulic cylinder mounted on the swivelling under-carriage (if any) so as to be always parallel to the axle tree in order that by the motion of the piston in its cylinder the levers will be moved about their fulcrums. The long arms of the said levers are, however, curved towards each other or otherwise formed so that the distance between their ends coupled to the piston rod is so much less than that between their fulcrums, that the steering wheels will be swivelled to slightly different extents, so that the wheels will run in approximately concentric curves. The two ends of the cylinder are connected by flexible pipes with the cylinder of the balanced piston valve whose cylinder is connected by flexible pipes with the delivery and admission of the pump working the hydraulic power transmission systems, the valve cylinder being mounted on a bar capable of sliding in guides on the under-carriage, said bar being coupled by links to the long arms of the wheel axle elbow levers.

5,393. Generation of Motive Power. Carlo Gnattari, 70, Milkwood Road, Herne Hill, S.E., and The Guattari Power Syndicate, Limited, 16, St. Helen's Place, London. March 10th, 1896.

This invention relates to an improved method of generating motive power from carbonic acid gas in combination with reagents, whereby the pressure required for motive purposes is generated in such a way that the objections incidental to the use of carbonic acid gas in the compressed or liquid form do not arise, the gas being, moreover, used over and over again repeatedly.

The carbonic acid gas is generated in the usual way at atmospheric pressure, washed, passed through alcohol, and supplied to a reservoir containing water, alcohol, and hydrochloric acid, wherein it becomes absorbed or dissolved. The liquid holding the gas in solution is pumped into a boiler fired in the usual way and provided with a sight-feed device through which Dutch liquid (ethene chloride) is supplied in regulated quantities to the boiler. By the reaction of the carbonic acid solution and of the Dutch liquid under heat a mixture of steam and gases at high pressure is flashed out, which is then passed through a reducing valve to the engine cylinders. The engine exhausts into a coil or other form of surface condenser which is cooled by a solution of ether and chloroform in water into which carbonic acid gas is injected from time to time whereby a refrigerating effect is produced corresponding to from −90° C. to −100° C. the condensed product being returned to the main reservoir for use over again in the boiler

11,341. Steering Mechanism of Motor Road Vehicles. Camille Alphonse Faure, 37, Avenue de la République, Paris. May 23rd, 1896.

The steering wheels are pivoted and constructed, or arranged in such a way as to reduce to a minimum the force necessary to turn them on the road, they being mounted and operated so that they are turned on the central bearing point of their periphery. They are each pivoted on a pin fixed to the end of the axle, a disc being mounted on the said pin, this disc being received in the hub of the wheel. The periphery of the disc and the interior of the hub preferably have corresponding grooves, and anti-friction balls mounted in the said grooves, so as to constitute ball bearings between the disc and hub. It is preferred to convey the steering motion to the said wheels by means of arms secured to the discs and connected by rods and levers to a pedal, or other operating device.

14,212. Explosion-engines. Charles Frederick Wood, 35, Hanby Terrace, Ordnance Road, Enfield Lock, Middlesex. June 26th, 1896.

This invention relates to improvements in explosion-engines, and more particularly has reference to that class of engines in which explosive charges of air and oil or gas are employed.

The cylinder is open at one end and closed at the other, and is fitted with sliding piston whose rod is coupled with a crank. The cylinder may be provided at its open end with a slotted extension piece, which engages with the crank pin, the slot being sufficiently long to allow the crank to perform its revolution freely and impart to the cylinder its oscillatory motion. The crank pin may be provided with a wearing block which is capable of sliding within the aforesaid slotted extension.

The said hollow piston may be provided with end covers, the outer one of which may be made removable and he formed with an eye for connecting the said piston to the pivot pin on the framing.

An electric sparking device may be employed for assisting in the vaporisation of the oil.

The exhaust is effected through a valve in the cylinder near its closed end, the said valve being opened by mechanical means as hereinafter explained. The oil or explosive mixture is admitted to the cylinder from the hollow piston through a valve in the piston end opening into the cylinder, the said valve being held in its closed position by means of a spring. The valve opens automatically by reason of the partial vacuum formed within the cylinder at each alternate outward stroke of the piston; thus the oil or explosive mixture passes from the hollow piston through this valve into the cylinder. Whilst this is taking place, a valve or valves on the outer end of the said piston open inward automatically, thereby letting in a fresh supply of oil or explosive mixture for the succeeding charge.

The aforesaid hollow piston may in some cases be used as a reservoir for the oil, which may be fed into the cylinder through a valve arranged at the piston end, and the supply of air to the cylinder may be drawn in at a point above the surface of the fluid, a partition being provided with an outlet or opening therein to allow the gas to ascend. By these means any gas arising from the oil is drawn with the air into the cylinder. The hollow piston may be utilised for both purposes at the same time, that is to say, one portion thereof may be used as a reservoir for the oil, and the remainder as a gas chamber.

For the purpose of firing the charge, two pairs of electrodes are employed, one in each pair being movable and the other rigid. One is arranged in the cylinder and the other upon the end of the hollow piston in such a manner that the two make contact just at the finish of the inward stroke, and break contact to produce the sparks at the commencement of the outward stroke of the piston, thus igniting the charge and driving the piston outward.

The second pair of electrodes is arranged in the hollow piston, and preferably at the rear end thereof. One electrode is rigid whilst the other is movable through a stuffing-box (or other device) to enable contact between the electrodes to be made and broken. Electric sparks are thus produced. The movable electrode may be actuated in any suitable manner; for instance, by coming against the reciprocating piston or cylinder. Contact between the electrodes may be broken by the same means or by a spring surrounding the movable electrode. The sparking of both pairs of electrodes may be effected at the same time, or not, as desired.

9,199. Valves and Valve Gear of Gas or Internal Combustion Motor Engines. George McGhee, Mountblue Engineering Works, Mountblue, Glasgow. May 1st, 1896.

This invention relates to improvements in gas motor engines having motor cylinders working on the four-stroke cycle, and the object of my improvements are to simplify the valve gear and make the engine silent and more efficient in action by dispensing with tapped or clack valves and using piston valves in series.

According to this invention as applied to an engine having two or more sets of double cylinders mounted tandem together, there may be one valve case comprising the inlet for two cylinders and also the exhaust for another two motor cylinders, in which said case are two inlets, two ignition and two exhaust ports controlled by piston valves. Another valve case similarly organised serves as the exhaust and inlet respectively for the aforesaid two sets of double cylinders thus two valve cases serving four motor cylinders, the valve rods being reciprocated from a transverse valve shaft driven by two to one gear. Each said valve case would have located near its centre one air or motor mixture supply inlet port, on both sides of which is a motor cylinder inlet port, each controlled by a set of two piston valves on valve-rod. Again, nearer each end of the case is located a motor cylinder exhaust port, one for each of the other two motor cylinders, which with another exhaust port near each of both ends of case is controlled by its respective valve on both ends of valve-rod or spindle. The ignition ports may be located near the exhaust ports and controlled by exhaust valves.

In lieu of foregoing there may be two valve cases to each cylinder, one case for motor mixture inlet, and the other case for exhaust, each said valve cases having respectively an inlet or exhaust port controlled by a piston valve and a cylinder port. The ignition port may be arranged on either valve case, but preferably on mixture inlet case. Modifications for vertical engines are described.

THE following is a List of Specifications recently published, and obtainable at the Patent Office, 25, Southampton Buildings, London, W.C., at the uniform charge of 8*d*. per copy. Owing to the enormous pressure upon our columns it has been found impossible to deal in any other form with the accumulation of patents now being taken out in connection with automobilism. As far as possible, a selection for special mention is made by the Editor from the more prominent inventions:—

Applied for during 1896.

19,861. L. E. FRAIPONT, Paris. Apparatus for vaporising petroleum, &c.
14,959. MERRITT and NAISMITH, London. Internal combustion engines.
17,059. W. P. W. WEATHERILL, Manchester. Wheels.
18,783. H. AUSTIN, Birmingham. Mechanical road vehicles.
19,014. CLOUGH, ILLINGWORTH, and BUSH. Speed mechanism.
12,688. E. J. PENNINGTON, London. Self-propelled vehicles.
23,110. TANGYE and JOHNSON, Stafford. Gas and oil-engine.
28,160. SLEAT, SKELTON, and HORSLEY, London. Driving gear.
22,412. WELLINGTON, ALLAM, and DRUMMONDS, London. Reversing gear.
15,461. E. H. PREW, York. Brake, distance record, and speed indicator.
13,604. H. H. LAKE, London. Traction-engines for towing.
16,969. E. J. PENNINGTON, London. Steering.
13,241. J. R. RICKARD, London. Variable speed gear.
13,559A. W. H. KNIGHT, America. Motor-vehicles.
10,465. E. FESSARD, Paris. Automotor carriages.
14,776. J. BJORNSTAD, Erith, Kent. Valves.
13,216. F. E. WALKER, Newbury, Berks. Propulsion and braking.
13,864. H. AUDIN, Paris. Gas or petroleum engines.
14,375. GOWLLAND, London. Acetylene gas for motors.
6,718. F. O. PRINCE, London. Internal combustion engines.
14,769. E. J. PENNINGTON, London. Motor-cycles.
18,520. W. H. DUNKLEY, Birmingham. Motor-carriages.
18,551. CLUBBE, &c., London. Supporting engines on motor-carriages.
17,221. GAUTIER and WEHRLE, Seine. Motor-vehicles.
16,348. D. G. GORDON, London. Ignition apparatus.
15,267. J. F. STILWELL, Dover. Gas, vapour, oil, &c., engines.
15,127. A. G. MELHUISH, London. Speed and power gear.
7,543. D. BEST, Canada. Petroleum-engines.
26,302. F. W. GREENGRASS, Epsom. Self-propelling road vehicles.
20,584. W. LATTEY, Warwick. Propelling and brake.
16,512. P. E. SINGER, London. Internal combustion engines.
16,815. H. J. LAWSON, London. Motor-propelled vehicles.
19,136. A. GRELET, Puteaux, France. Explosion motor.
19,207. CLUBBE, &c, London. Speed mechanism, &c.
19,211. F. O. PRINCE and C. E. MONKHOUSE, London. Internal combustion engines.
21,749. SUSSMANN ELECTRIC LAMP COMPANY, &c., London. Material for battery plates.
19,774. A. C. KREBS, Paris. Mechanical vehicles.
15,777. C. THERYO, Paris. Electric motor-vehicle wheels.
15,618. POWELL and MOORE, London. Driving apparatus.
13,576. C. T. CROWDEN, Nottingham. Self-propelled road vehicles.
16,630. A. BEETZ, Paris. Rotary explosion engines.
18,077. A. SLATER, Gloucester. Motor road-cars.
23,492. MONIN and PEROT, Paris. Gas and petroleum motors.
24,941. L. KRIEGER, Paris. Self-propelled vehicles.
28,419. J. I. THORNYCROFT, &c, Chiswick. Friction clutches.
17,270. ROOTS and VENABLES, London. Petrocars.
18,831. J. STEPHENS, Gloucester. Oil-engines.
13,981. E. J. PENNINGTON, London. Road traction.
18,585. ARROL and JOHNSON, Glasgow. Oil or gas motors.
16,463. BAINES and NORRIS, London. Motor-vehicles.
16,447. C. DAVIS, Gloucester. Self-propelled vehicles.
13,786. WILKINSON and SELLERS, Sheffield. Mechanical road vehicles.
13,784. WILKINSON and SELLERS, Sheffield. Steam motors.
11,881. W. J. PITT, Weymouth. Rotary engine.
12,942. THORP and MARSH, Manchester. Acetylene gas combustion apparatus.
12,041. W. R. SMITH, London. Road motor-cars.
11,342. C. A. FAURE, Paris. Motor road-vehicles.
11,347. WISEMAN and HOLROYD, Luton. Hydro-carbon motors.
22,820. H. CARMONT, Kingston. Under-frames and driving appliances.
26,976. C. M. JOHNSON, London. Motor-vehicles.
30,026. CORDINGLEY and SMITH, Carshalton. Oil-motors.
26,233. ALLEN and BARKER, Staines. Oil and gas engines.
28,527. MACKENZIE and CARLING, Middlesbrough-on-Tees. Gas, oil, steam, &c., motor engines.
27,184. W. E. SIMPSON, Nottingham. Motor-driven vehicles.
30,075. A MARSDEN, Leyland. Oil or liquid hydro-carbon motors.
26,546. SANDOW and ADAMSON, London. Motor-cars for electric advertising.
28,053. CLARKSON and CAPEL, London. Steam-engines.
28,407. GRIFFIN and GIBSON, Coventry. Self-propelled road vehicles.
23,142. J. W. PETAVEL, Sheffield. Oil or gas engine.
23,825. BELCHER and NIBLETT, Beeston. Motor-vehicles.
25,226. POWELL and MOORE, London. Apparatus for driving by liquids.
27,539. CAPEL and CLARKSON, London. Atmospheric condensers.
27,568. C. M. JOHNSON, London. Oil and gas motors.
28,896. J. LEWIS, Emsworth. Driving gear.
25,412. SIMPSON, BODMAN, and SIMPSON, Manchester. Motor-driven vehicles.
25,052. J. BIRTWISLE, Manchester. Steering, braking, &c.
24,980. J. G. A. KITCHEN, Manchester. Steam-engines.
27,089. A. B. BLACKBURN, Wolverhampton. Motor-cars.
27,535. E. H. PAYNE, Cricklewood. Hydro-carbon motors.
27,540. CAPEL and CLARKSON, London. Steam boiler furnaces.
27,602. H. C. L. HOLDEN, Woolwich. Internal combustion-engines.
28,979. ROSER and MAZURIER, Seine. Gas or petroleum motors.
22,922. BURBEY and HUTTON, London. Motor-cars.
24,457. PRIESTMAN, Kingston-upon-Hull. Igniting device.
25,558. W. ARNOLD, East Peckham. Water jacket improvements.
27,610. WILKINSON and TAYLOR, Wigan. Steam boilers.
22,609. A. J. BOULT, London. Driving mechanism.
25,720. G. O. HOLLOWAY, Birmingham. Road motor-cars.
21,274. W. J. MUNDEN, London. Motor-vehicles.
21,675. C. M. JOHNSON, London. Motor-carriages.
23,802. J. O. O'BRIEN, Manchester. Autocars.
24,311. J. T. DAWES, Flint. Internal combustion engines.
29,907. BRADLEY, POPP, and WART, Birmingham. Frames.
20,161. E. J. PENNINGTON, Coventry. Self-propelled vehicles.
20,166. CLARKSON and CAPEL, London. Oil, &c., burners.
20,513. J. VAUGHAN-SHERRIN, Ramsgate. Electro-motors.
22,369. J. MACKINTOSH, Lochee, Forfar. Fluid-pressure motors.
22,453. W. A. MARTIN, London. Driving gear.
24,793. C. CRASTIN, London. Vaporising oil.
24,805. F. W. LANCHESTER, Worcester. Ignition.
24,905. T. W. NAYLOR, Hereford. Vaporisers.
25,345. SIEMENS, BROS., and CO, London. Electrical motors.
26,292. BAINES and NORRIS, London. Lubricators.
21,307. W. J. PERRETT, Romford. Motor-cars.
21,697. F. W. LANCHESTER, Worcester. Power-propelled vehicles.
23,997. V. LACASSE, Antwerp. Horseless carriage.
24,731. H. G. WILSON, London. Petroleum-engines.
18,829. F. W. LANCHESTER, Worcester. Ignition.
20,655. J. WILKINSON, Worcester. Gas, oil, &c., engines.
18,823. J. G. GLOVER, London. Propulsion.
22,871. SIMPSON, BODMAN, and SIMPSON, Manchester. Steam generators.

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CONTENTS.

THE DIESEL OIL-MOTOR.

EVER since the days of Watt the efforts of engineers have been directed to improving the efficiency of the motor, whether this was actuated by steam or gas. It cannot be said that the improvement effected has been great. Certainly, in design, material, &c., modern steam and gas motors leave little to be desired, but the fact remains that in the most modern and very best steam motors the heat efficiency is but some 13 per cent., and this drops as low as 5 per cent. in small condensing steam plants. In gas or oil engines the efficiency may be as high as 25 per cent., but more often it does not exceed 17 per cent. There is thus plenty of room for improvement; but even supposing that a maximum could be obtained in practice, not more than 30 per cent. of the heat given to a steam-engine could theoretically be turned into work.

Steam, contrary to the ideas which generally obtain, is a very indifferent source of power. In generating it in the boiler there is a loss of from 20 to 30 per cent.; its theoretical efficiency is low, while its nature is such that it condenses quickly with the slightest fall of temperature. Coal or oil gas are much superior to steam as sources of power, but hitherto, owing to the methods of combustion employed, it has not been possible to obtain very satisfactory results. To Dr. Otto belongs the credit of having perfected the accepted type of gas-engine, while to Herr Daimler belongs the credit of having adapted this motor for automobile purposes, and another German—Herr Diesel—enjoys the proud distinction of having effected the greatest improvement in the efficiency of heat motors since these were first invented. He has, in fact, obtained in his motor an efficiency three times that of the best steam-engine, and half as much again as that of the best gas-engine. The Diesel motor is a remarkable and unique instance of synthetic reasoning. Starting with—and this is where so many inventors and would-be improvers fail—an accurate knowledge of the physics, or perhaps we should say the thermodynamics, of his subject, he has turned his constructive reasoning into mechanical effect.

The Diesel motor has also merits which the ordinary gas or oil motor lacks. It, in short, comes nearer the ideal motor than any other. It has been exhaustively tested and examined by the greatest engineering authorities in France and Germany. One of our distinguished engineers, Mr. Bryan Donkin, M.I.C.E., has also examined it, and it is from an article contributed by him to our contemporary *The Engineer*, and also to one contributed by M. Hospitalier in *La Locomotion Automobile*, that we are indebted for the following particulars:—

New Theory of the Process of Combustion.—The chief points forming the groundwork of the new method, as proposed by Herr Diesel, are the following:—In every process of combustion a distinction must be carefully drawn between the temperature of ignition and the temperature of combustion. The first is practically constant, and depends only on the physical properties of the combustible. The higher the pressure, the lower this temperature of ignition. The temperature of combustion, on the other hand, is variable—always much higher than that of ignition, and depends on many conditions, but chiefly on the quantity of air supplied. Hitherto the temperature of combustion has been produced after ignition, by and during the process of combustion itself. Starting from theory, Herr Diesel has evolved a new method of what he calls "rational combustion," for which four conditions are essential:—

(1) The temperature of combustion should not be produced by and during combustion, but before and independently of it, entirely by the mechanical compression of air. This apparently contradictory idea, which involves a complete reversal of our present notions of combustion, is really grounded on the Carnot process.

(2) It is essential that the air be compressed adiabatically only, and not at first isothermally, as required by the perfect process. In this way it is possible to raise the air to the temperature of combustion by pressures much lower than those required in the perfect Carnot cycle—say, from 30 to 50 atmospheres only. It is by reason of this departure from the pure theoretical cycle, in which pressures of from 100 to 200 atmospheres, and more, are required, that it

becomes possible to carry out the method of combustion at all. An impossible is replaced by a practical working cycle.

(3) The air being thus already raised by adiabatic compression to the temperature of combustion, the combustible must be injected into it by degrees in such a way that the heat developed by gradual combustion is converted into work as it is produced, by reason of the corresponding expansion of the air and gases driving out the piston. If this be done, combustion will produce only a very slight, if any, rise in temperature.

(4) The fourth condition also contradicts our present theories. It has hitherto been held that the excess of air for combustion should be reduced within the smallest limits. With Herr Diesel's method, on the contrary, a large excess of air is required, but this surplus quantity is carefully regulated, and the amount previously determined for each kind of combustible.

Twelve Horse-Power Experimental Engine.—The vertical single-acting single-cylinder inverted engine first made resembled a gas-engine in construction and design. The piston was above, acting downward in the usual way through a connecting-rod on to the crank. An auxiliary, or valve-shaft, driven from the crank-shaft by means of conical wheels carried two cams opening respectively the oil and air valves, which were held on their seats by springs. The working circle in this and the succeeding engines is as follows:—

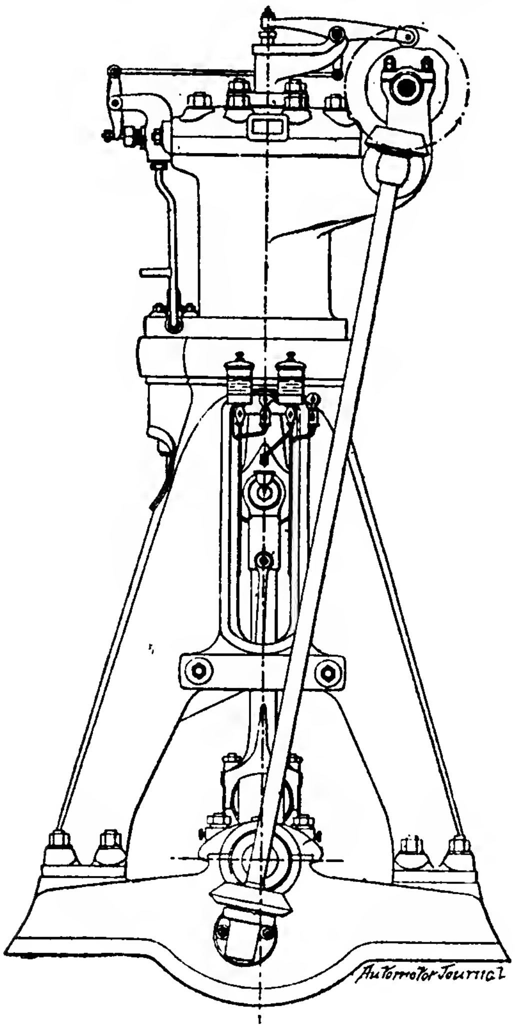


Fig. 1.

(1) The piston, driven down by the momentum of the fly-wheel, draws in atmospheric air through a valve at the top. (2) The piston rises, the air valve closes, and compression takes place till the air is at a sufficiently high pressure to attain the temperature necessary to produce combustion. Both temperature and pressure are regulated by the stroke of the piston, or the size of the clearance space. (3) Piston descends (motor stroke), oil admitted and injected into the air at high pressure from a small oil pump, the stroke of which is

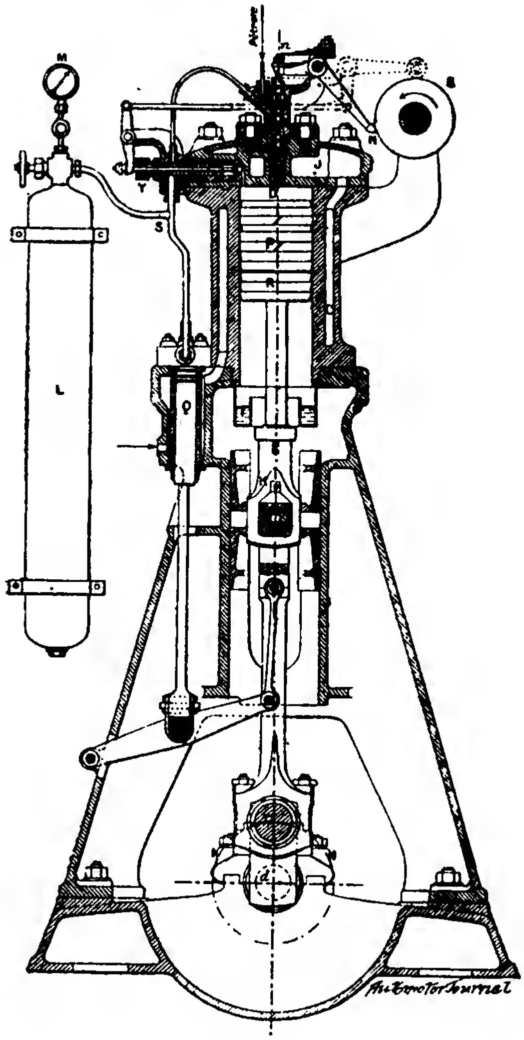


Fig. 2.

regulated by three different cams on the auxiliary shaft, giving a cut off at 2 per cent., 5 per cent., or 10 per cent. of the stroke. Thus gradual combustion is obtained after cut-off, and the air expands till the piston reaches the lower dead point. (4) Piston rises, exhaust valve opens, and air and gases of combustion are discharged to atmosphere; the cycle then recommences. The engine is started by connecting it to a receiver of compressed air, which is filled by the motor itself while running. There is no light, or ignition burner, and combustion is spontaneous.

Water Jacket.—The new motor was worked at first without a cooling jacket, but it was afterwards found desirable to add one. The water jacket is not, however, a necessary evil, as some think, but is required theoretically to carry off part of the heat, and in Herr Diesel's opinion all efforts to diminish greatly the losses of heat under this head are futile. There is only one right way, according to him, to secure this object, namely, to choose such a process of combustion that more heat than at present is absorbed in doing work; then, even on theoretical grounds, there will be less to carry off. As the new method required high pressures, temperatures, and speeds, the lines of existing engines could not serve as models, and almost every detail was the result of long and patient study, extending over two years. At the end of that time a second engine of the same size, embodying various improvements, was constructed, which, although far from perfect, gave surprisingly good results, and ran for months with oil and with lighting gas, to furnish power for part of the Augsburg Maschinen-Fabrik. As the result of these different trials, a new 20 H.P. petroleum engine was made, and tests on it were begun in the early part of 1897.

Twenty Horse-Power Experimental Engine.—This latest engine is shown in Figs. 1, 2, and 3. Fig. 1 is a general elevation; while Figs. 2 and 3 are sectional elevations; Fig. 4 is a plan of the cylinder head. As will be seen, it is vertical, inverted, single cylinder, single acting, and similar in external construction to an ordinary oil-motor. C is the cylinder. The piston, P, acts downwards through connecting-rod, *b*, on to the crank, c, below. The valve-shaft, W, driven by bevel wheels from the crank-shaft, carries several cams opening

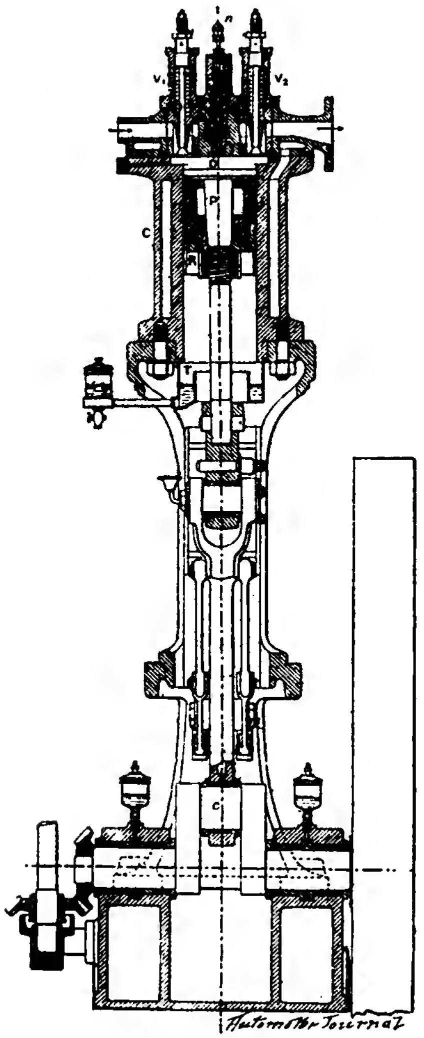


Fig. 3.

respectively the oil valve, *n*, the air valve, V_1, and the exhaust valve, V_2—Fig. 3. Another cam works the valve, V, for starting. A small vertical air pump, Q, also water-jacketed, and driven from the connecting rod by levers, X and *z*, forces air under pressure into the receiver, L, at the left hand side of Fig. 2. By means of the branch pipe, S, from L, the same pressure, which is much above that in the motor cylinder, is maintained in the injection nozzle, D, to which the petroleum passes through the small central needle valve, *n*. By varying the pressure in the receiver, and the stroke of the air pump, the admission of oil can be accelerated or retarded, and the progress of combustion thus regulated.

Tests.—Experiments were made on this new 20 H.P. engine in February, 1897, by representatives of the Krupp, Sulzer, and Deutz firms, and by Professors Schröter, Gutermuth, Sauvage, and others. Most of the trials lasted several days, and the engine was put to the test in every possible way. These experiments confirm Herr Diesel's statement that the efficiency of his engine is higher than that of other motors. The boiler efficiency is equal to unity, there being none. The theoretical possible heat efficiency varies from 50 per cent. to 70 per cent., and is about twice as high as is possible in the best steam-engines, and half as much again as in internal combustion motors. This in part explains the superiority of the new engine, especially when made compound as described. The indicated efficiency, or the percentage of heat actually turned into indicated work, is 70 per cent. to 80 per cent. of the maximum theoretical possible efficiency, while the mechanical efficiency is 71 per cent. to 75 per cent. Perhaps one of the most important characteristics of the engine is its small dimensions, as compared with other explosion motors, being much less in size for the same speed and power. The mean available pressure is also higher, the area of work, as shown by the indicator diagrams, is larger, and hence the cylinder dimensions less. It was at first thought that the very high pressures of air would necessitate heavy connecting rods, levers, and crank-shaft, but it is now found that these can be lighter than usual.

The performance of the engine is regulated by the cut-off, that is, the period during which oil is admitted, and it responds quickly to the governor. No explosions are missed, and this is an advantage as compared with internal combustion motors, one of the chief drawbacks of which is their irregularity in running. The engine is always ready for work, and no dirt or grease collects on the internal surfaces, because combustion is complete. No arrangement for ignition, either electrical or by flame or hot tube, is required, nor is there any vaporiser or pulveriser. Unlike the steam-engine, it gives practically the same results, whether made large or small, and, therefore, no object is gained by centralising the power, nor need it all be supplied for

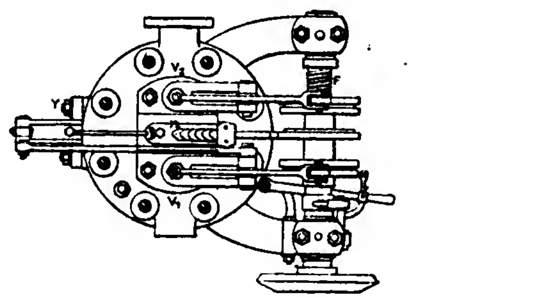


Fig. 4.

many purposes from one engine, with the consequent disadvantages of long and expensive shafting. Of course, the chief recommendation of the Diesel motor is its low consumption of oil, which is only ½ lb. per B.H.P. hour, under normal working conditions.

Experiments have already been made with petroleum and lighting gas, and the Augsburg Maschinen-Fabrik are testing the motor with ordinary hard coal, and are now constructing a 150 H.P. compound experimental engine, with generator for driving it with cheap or power gas. The oil trials made by Professors Schröter and Gutermuth showed a heat efficiency per I.H.P. of 34 per cent. to 35 per cent., or 50 per cent. more than is obtained in gas-engines when working at maximum power. Further, the engine is new, and capable of greater development. If power gas from a generator be used, there is of necessity a loss of heat in the generator, which only converts about 80 per cent. of the heat in the coal into gas; but improvements in this direction may be expected, especially if the gas be compressed to 40 or 60 atmospheres. The latest experiments with the 20-H.P. engine show a consumption of 0·47 lb. oil per B.H.P. hour. Herr Diesel's views are confirmed by Professor Schröter, who considers that the theoretical principles on which the engine is constructed have been justified by the result. In most new inventions engines have first been built and their theory deduced afterwards; with this engine the contrary course has been successfully followed.

Professor Schröter's Trials on a 20 H.P. Diesel Oil-Engine.—The engine constructed by the Maschinen Fabrik-Augsburg was tested by Professor Schröter under the following heads:—Indicated and brake H.P., consumption of petroleum, quantity of cooling jacket water, and heat imparted to it, and temperature of the exhaust gases. Arrangements were also made to determine the chemical composition of the exhaust gases and heating value and composition

N 3

of the petroleum, and the results checked in the Technische Hoch Schule at Munich. Both the motor cylinder, in which the ordinary four-cycle was carried out, and the single-acting air pump were indicated. The piston diameter in the motor cylinder was 9·8 inches and stroke 15·7 inches; diameter of the air-pump piston 2·7 inches, stroke 7·8 inches. The indicator springs were previously carefully tested, and the mean values obtained were taken. The scale adopted was 1 millimetre per atmosphere. The efficiency was assumed to be the difference in indicated work shown by the motor cylinder and air-pump indicator diagram. There were five trials in all, two at full, two at half-power, and a fifth while running empty. Each lasted one hour. Fig. 5 gives an indicator diagram taken during a full-power trial; Fig. 6 an indicator diagram from the air-pump or negative work. During the two experiments at full power the revolutions per minute were respectively 171 and 154: the governor was fixed during each trial, and no variations in speed were allowed. It was shifted for each fresh experiment. The mean pressure in the motor cylinder was 7·4 atmospheres, 108 lbs. per square inch;

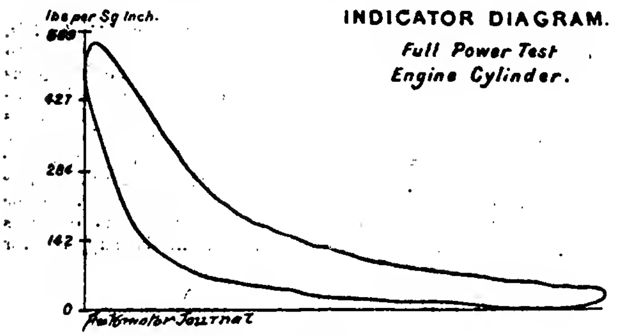


Fig. 5.

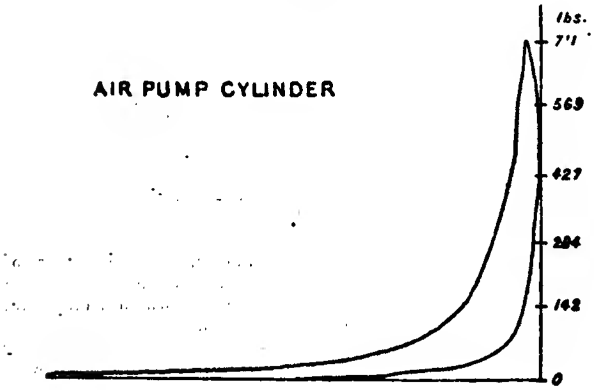


Fig. 6.

I.H.P. 26·5 and 23·6 respectively—deducting the air-pump I.H.P. This difference in power in the two cases was due to the different speeds. A brake was applied, and gave for the first trial 19·8 B.H.P., and for the second 17·8 B.H.P., or a mean mechanical efficiency of 75 per cent. Professor Schröter remarks that "all his co-workers were surprised at the simplicity of the engine, and the ease with which it was started," by connecting it to the receiver, where the pressure was always 40 atmospheres. He considers that "it ran so quietly and steadily that it was difficult for an outsider to realise the forces brought into play." No difficulty was found in preventing leakage from the receiver.

Consumption of Oil, Heat, Value, &c.—The petroleum was taken from a carefully-gauged can, duly weighed before and after each test, and the consumption found to be 0·54 lb. and 0·52 lb. per B.H.P. and 0·40 lb. and 0·39 lb. per I.H.P. per hour respectively for the two full-power trials. For the two trials at half-power, namely, at 9·5 B.H.P. and 9·8 B.H.P., the consumption was 0·61 lb. per B.H.P. hour. These figures show that even now, in its earlier experimental stage, the engine is ahead of other oil-motors, and while running at ordinary speed with normal full load gives a consumption in round numbers of ½ lb. oil per B.H.P. hour. It should be noted that the relatively increased consumption at half-power is only 15 per cent. The temperatures of the exhaust gases were taken behind the exhaust valve, those of the cooling water into and out of the jacket. The quantity of water was measured from time to time by observing the length of time required to fill a large tank, and the temperatures being simultaneously read off, the heat carried off in the cooling water jacket was thus approximately determined. The density of the petroleum used was repeatedly taken from both the feeding can and the supply tank, and was found to be about 0·80 when reduced to normal temperature. The mean composition of the oil was 85·13 per cent. C., 14·21 per cent. H., and 0·66 per cent. O.

Heat Balance (Full-Power Trials).

	I.	II.
Heat turned into indicated work..	33·7 per cent.	34·7 per cent.
„ lost to cooling water.. ..	39·0 „	40·3 „
„ dissipated in other ways ..	27·3 „	25·0 „
Total	100·0 „	100·0 „
Actual heat turned into work on the brake	25·2 „	26·2 „

FORBES' LIQUID FUEL REGULATOR.

Sir Charles S. Forbes, Bart., of Castle Newe, Strathdon, Aberdeenshire, has recently patented a regulator for regulating the supply of liquid fuel to a furnace, which possesses some novel and interesting features. The apparatus is constructed as follows:—A cylinder formed from brass or other suitable metal is carefully bored and fitted at one end with a gland or stuffing box, and at the other with a screwed plug. A piston rod passes through a well fitting piston which occupies the lower part of cylinder and above the piston, and pressing upon it is a spiral spring, the upper end of which presses upon the screwed plug. The piston rod passes through the screwed plug at its upper end and is threaded and fitted with a milled headed nut, the lower end passes through a stuffing box and is fitted with a coupling. Ports are formed in the cylinder by means of screwed connecting pieces cast with it. One of the ports opens beneath the piston and is coupled by means of a union with the steam boiler, the other port is above the piston and serves to convey any steam that may leak past it to the chimney, or a condenser when employed. The foot of the cylinder is screwed, and to this is fitted a distance piece which serves to carry the oil cock.

This cock consists of a casting in which is a valve and an inlet and outlet port, one of these ports is connected by piping to the oil tank, or other supply, the other to the jet or burners. The valve is mounted upon a piston rod which passes through a stuffing box at either end, the lower end of this piston rod being screwed or threaded and fitted with an adjusting nut whereby the valve may be so regulated as to prevent the flow of oil to the burners being entirely stopped.

The upper end of piston rod is secured to the coupling of regulator. The *modus operandi* is as follows:—The combined regulator and cock being mounted up in any convenient position by means of a bracket, generally cast in one piece with the cylinder, connection is made with the steam boiler and the oil supply and burners. Steam now enters beneath the piston which is forced upwards against the spring, the tension of which is regulated by means of the screwed plug, until the piston remains stationary at the desired boiler pressure, and the valve in the cock admits sufficient oil to the burners. If now a less demand of steam is made on the boiler and the pressure rises the piston will force up the spring and diminish the oil supply. On the other hand, should the boiler pressure fall, the spring will force down the piston and admit a larger supply of oil to the burners. By means of the adjusting nut threaded on the spindle passing through the cock the valve is prevented when desired from entirely closing. In some cases the adjusting nut may be dispensed with, the regulation of the oil valve being effected by the coupling suitably modified.

Referring to the accompanying drawings, Fig. 1 is a part sectional view on line A B, Fig. 2; Fig. 2 is a plan; Fig. 3, modification of plan; Figs. 4 and 5, modification of oil valve adjustment; Fig. 6, modification of piston rod packing; Fig. 7, modification of jointing.

In the drawings, 1 is the cylinder which may be formed of brass or other suitable metal. This is carefully bored out and fitted at the top end witb a plug or stuffing box, 2, threaded as at 3, or it may be adjustably secured by studs or bolts and nuts, 4, *see* Fig. 3. Tbe base of tbe cylinder is fitted witb a screwed plug or gland, 2^a, in packed with rings, 11, as shown, is employed, serves by means of tbe nut, 12, threaded on the rod to securely hold the same. The piston rod after passing through the glands, 2, 2^a, is threaded into tbe adjusting wbeel or nut, 13, which is recessed as at 13^a, on its underside.

Forbes' Liquid Fuel Regulator.

which holes, 5, are drilled so as to enable it to be adjusted by means of a key. A piston-rod, 6, formed from any suitable metal, is turned, threaded as at 3, and pinned as at 7, to the coupling, 8. A shoulder, 9, is formed on the rod, and when the particular type of piston, 10, Surrounding tbe piston rod is a spring, 14, this spring presses upon the piston, 10, and the underside of stuffing box screwed plug or gland, 2, its tension being regulated by screwing the same up or down. Ports, 16, 15^a, are formed by means of the nose or connecting pieces, 16, screwed as at 3. The pipe conveying steam from the boiler is connected by a union or like means with the port, 15, which opens beneath the piston, any waste steam passing the piston being conveyed to the chimney or condenser when such is employed by the port, 15^a. The foot of cylinder, 1, is screwed as at 3, and by this means carries the distance piece, 17, the end of which is similarly threaded and supports the oil-cock, 18. This cock is usually cast from gunmetal or brass and has an inlet port, 15^b, and outlet port, 15^c, cored or formed in the branches which are threaded at their ends for connecting up the oil feed and discharge pipes. A valve, 19, is mounted on a turned spindle, 20, formed from some suitable metal, and is secured in position by the nut, 12. This spindle passes through the stuffing box, 2^1, and is secured by adjusting nuts, 12^1, to the coupling, 8. The lower end passes through the screwed cap, 21, and gland, 2^{11}, a lock-nut, 12^1, being threaded on the screw end of spindle, 20.

The regulating device may be attached to the boiler or elsewhere by flanged seating, 22.

The operation of the apparatus is as follows:—The ports, 15, 15^a, are connected by suitable piping with the boiler and condenser or chimney, the flow of steam to port, 15, being regulated by a cock. The ports, 15^b, 15^c, are connected to the oil tank and burners, a cock being placed between the oil tank and port, 15^b, to cut off the supply of oil when the apparatus is out of use. The spring, 14, is now regulated as nearly as possible to the boiler pressure by turning the adjustable screwed plug or gland, 2, until the maximum supply of oil required is attained, the adjusting wheel, 13, being then run down to the face of the gland to prevent this supply being exceeded. Should the boiler pressure increase the piston will be forced up and the supply of oil reduced or entirely stopped. Since, however, oil-burners tend to blow out in rough weather if the supply of oil be suddenly diminished the small regulating nut, 12^1, may be employed, by screwing this up the valve can be so regulated as never to cut off the supply of oil entirely.

Fig. 6 shows a modification of a piston which has given good results. The rings, 11, shown in Fig. 1, are dispensed with, and a cupleather, 11^a, employed. It is found that the water which collects beneath the leather suffices to effectually protect it from the direct action of the steam, moreover, it is more convenient for small-sized regulators and keeps steam tight with the minimum of friction.

Figs. 4 and 5 show in part elevation and section a modified form of adjustment which may in some cases replace that shown in Fig. 1. The upper end of spindle, 20, passes through the coupling, 8, which is formed with a milled edge, 23, and turns loose on the end of piston rod, 6, supported by the collar and pin, 24. It can be locked in any position by the nuts, 12.

Three claims are made. The number of the patent is 28,279, of 1896.

SOME DIFFICULTIES OF MOTOR-VEHICLE CONSTRUCTION.

(*Contributed.*)

THE introduction of a new principle or a new machine is always looked upon by different sections of the public with different degrees of interest, and when the adoption of such a new principle is at all likely to make any sweeping alteration in any particular method of our everyday life, the distrust with which it is met by the one section is not more intense than the enthusiasm with which it is hailed by the other. But as distrust and enthusiasm are both in a great measure the outcome of ignorance—distrust, through an underrating of the value of an invention or innovation, and enthusiasm through an overrating of it—it will be the policy of the wise man to steer a middle course, and to become acquainted with the difficulties connected with a new project, and how they are to be overcome, before coming to any decision as to its era-making probabilities.

To get some idea of these difficulties it is necessary to note the more general methods by which it is proposed to apply mechanical power to the propulsion of road-vehicles. Broadly speaking, there are three sources of power which may be employed, viz., electricity, steam, and gas. In view of the difficulties and disadvantages attending the use of electric energy and steam power, many engineers think that the most satisfactory solution of the problem of mechanical traction on roads is to be found in the use of oil or vapour as a source of power, and it is, therefore, to the difficulties to be found in the application of oil to the moving of road-vehicles that our attention will be directed.

The use of inflammable air for obtaining motion has been experimented with since the year 1791, when one of the first patents for gas or vapour engines was granted, and since that period the science of gas-engine construction has rapidly advanced.

Without going into the theory and practice of oil-engines, and the application of such engines to road-vehicles, it will be necessary to point out those problems and difficulties which it would seem are the most essential to solve and overcome, and which up to the present have been the most serious obstacles to the production of a perfect road-vehicle—that is, one which shall most satisfactorily fulfil the requirements of such a vehicle; and it will be well, before going further, to determine exactly what such requirements are.

The first essential of a motor-vehicle is that it shall be as simple as possible in construction, so that it may be handled by the inexperienced in mechanical matters easily and surely. It must be capable of exerting without any difficulty the maximum power which will be required in propelling it under the most adverse conditions of load, distance, speed, and nature of road which it will ever be likely to encounter. It must be easy to regulate, both as to power, speed, and direction, and such regulation must be accomplished with absolute precision.

Another condition, and one which is of the greatest importance if the motor-vehicle is to compete successfully with animal traction, is that the cost of energy and maintenance shall be as low as possible. Many of these requirements have already been fulfilled in vehicles at present in use, though not in an altogether satisfactory manner. An oil or gas engine, to give out the best results and to show a maximum of economy in working, must be run at a constant speed, or as nearly constant as possible. On the other hand, a road-vehicle must be capable of constantly changing its rate of speed; so that it becomes impracticable to directly couple an oil-engine on to a vehicle, and an intermediate system of gearing must be employed.

Another reason for this intermediate gearing between engine and work is that, although the vehicle must be constantly stopped and sometimes reversed, the motor must continue running, and that in one direction only. To start an oil-engine requires the application of manual power, which it would be inconvenient to apply at every stopping and starting of the vehicle. To reverse such an engine, even were reversing mechanism easily applied, would also involve stopping and the consequent manual effort of starting.

It is in the arrangement of the system of gearing that our first great difficulty lies. The problem of varying the speed of revolution of a shaft driven from another shaft running at a constant speed is one, however, which has not yet been solved in a way to make its application at all practical. In the application of such a mechanism to motor-cars it must be remembered that it is necessary to accomplish the change while running, and also in a manner which will give *any* speed, not one of three or four *fixed* speeds. This then is Problem No. 1. The arrangements at present in use for accomplishing this object are complicated; they generally involve excessive friction, in some cases seriously affecting the economical transmission of power between the engine and the vehicle driving-wheels. They are also in nearly all cases confined in their action to a series of three or four pre-determined speeds, and in that particular do not give to the vehicle on which they are applied that ready regulation which is essential in the crowded traffic of our streets.

The next difficulty arises from the governing of the engine. The governing of an oil-engine presents difficulties which are not found in the gas-engine, and these difficulties vary considerably with the various methods of vaporising the oil or spraying it. It is in engines in which the system of heating and spraying the oil in order to mix it with the air charge and so form an explosive mixture is employed that the difficulty of governing the engine is mostly felt. This is also the case in those engines in which the oil is injected into the cylinder and vaporised by the heat of the cylinder walls and enclosed hot air. In the first case the heated exhaust is used to heat the vaporiser, and if the plan used in the gas-engine were employed, that is of cutting off the supply and allowing no explosion to take place until the speed is reduced, the vaporiser would cool to such an extent as to stop its action altogether.

As at present arranged, governing is only effected by either reducing the oil supply or by cutting it off and keeping the hot exhaust in the cylinder and allowing it to be alternately compressed and expanded by the piston. In the first of these methods the economy is very little, the engine using nearly as much oil when running light as with full load. In the alternate method, the vaporiser, in spite of the imprisoned exhaust. rapidly loses heat, and the explosions will be unable to be resumed if the cut-off lasts for any length of time. In the second method, in which oil is injected into the cylinder and there vaporised, similar difficulties arise.

Yet another type of engine is the one in which the oil is vaporised in a vessel separate from the cylinder, and the difficulty of governing is not in this case so great, the ordinary method of governing as applied to gas-engines being generally employed with good results. But even such a method when compared with the governing of a steam-engine, with its beautiful system of cut-off and expansion, is crude and requires greatly improving upon. This, then, is Problem No. 2.

The next difficulty arises in the cooling of the engine cylinder; in engines using heavy compressions and high temperatures it is very necessary to keep all the working parts as cool as possible in order to prevent overheating of bearing and scoring of cylinders. This has been accomplished in many instances by casting numerous ribs of iron round the outside of the cylinder, giving a large surface for the radiation of heat from the cylinder. This plan is, however, not always effective, and where an engine is running constantly on heavy loads the working parts in this arrangement are likely to become considerably overheated.

Another method has been to cast a water jacket round the cylinder and use a water circulation from a tank, often taking it through the tubes of which the frames of the vehicle are constructed, and so getting a larger radiating surface.

Neither of these methods are altogether satisfactory. The first is open to the objection that in order to allow a free circulation of cool air to reach the extended ribs of the cylinder the engine must be exposed to dust, dirt, and weather. The latter method is objectionable on account of the weight of the circulation water, the necessity of constantly replacing it by cool water on long runs, and the great liability to leakage at the joints owing to the straining of the vehicle frame. It is also very liable to set up internal corrosion, and thus materially weaken the frame construction. Problem No. 3, therefore, is to devise some simple method of cooling the cylinder and working parts of the engine without more than is absolutely necessary increasing the weight or inconveniencing the attendant by want of constant attention.

The next difficulty arises in connection with the exhaust, which, unless restrained, is noisy, and gives off offensive smells. Various kinds of silencers have been devised, some attended with great success; but it is probable that in most cases they produce some back-pressure, which is to be avoided, and in all cases they fail to get rid of the smell. So that Problem No. 4 is to devise an efficient silencer, which shall produce no back-pressure on the engine, and shall at the same time, by condensation or otherwise, remove the odours of the burnt or partially-burnt gas.

These problems have been for a considerable time engaging the attention of engineers, and have in some few cases been partially overcome. But there still remains a great field for improvement, and they have only been pointed out with a view to showing the direction in which inventive labour must be turned, and as demonstrating to the uninitiated the difficulties which have yet to be overcome.

To judge the motor-vehicle by its present standard of perfection or imperfection would be obviously unfair: it can only be regarded as an indication of the progress which is being made. That so much has been accomplished is greatly to the credit of those who have the work in hand, and gives every encouragement to look forward to the ultimate perfection of this class of vehicle. That its introduction in a thoroughly practicable form will solve to a great extent the increasingly difficult problem of street traffic in large towns, by giving better control and limiting the ground space occupied by each vehicle in a crowded thoroughfare, must be universally acknowledged. That it will contribute in a great measure to the more healthy and sanitary condition of our streets is also apparent.

The substitution, however, will not take place in a day, but it is sure to come. The struggle between conservatism on the one hand, and radical improvement on the other, can have but one ultimate result, and as the stage-coach of years ago has been supplanted by the railway of to-day, so the horse-propelled vehicle of to-day must in the near future give way to the improved motor-vehicle; and the more rapidly the difficulties indicated are overcome, and the different problems satisfactorily solved, the sooner will the reform be completed.

BROWN'S OIL-FIRED STEAM AUTOMOTOR.

MR. W. H. BROWN, of Beechcroft, Devizes, sends us, in reply to our request, the following description and illustration of what seems to us to be an exceedingly well-designed and useful steam vehicle. He writes:—

"Referring to your favour to hand, I am pleased to give you what particulars I can that I think will be of interest to you. I should have been pleased to have sent you the working drawings, but I only have them complete as far as the engine and boiler go. The car body gearing and wheels were made from dimensioned hand sketches. The general arrangement of the car you can see by the photo. It is a four-wheeler, and steers with the front pair, which work in forks, with a spiral spring on the top. This arrangement I am going to alter and use the jointed-axle principle, as it is a much better and stiffer job and admits of better springs being used. The front wheels are 2 feet diameter and the back ones are 3 feet diameter, and are the drivers. The car body is like an ordinary governess car, capable of seating four comfortably, two each side—three might be crowded in.

"The advantages of this form of car are that the passengers are together and can talk, and the driver gets a good view in both directions; in fact, it is as easy to run backwards as forwards. This feature I have found most useful in narrow roads and lanes where there is not room to turn round.

"The engine is a double-cylindered one, with cylinders 2¼ inches in the bore and 3-inch stroke, and are geared four to one and ten to one respectively for the fast and slow speeds, and run about 400 revs. per minute for 12 miles an hour. It is fitted with an ordinary link motion for reversing. Under the engine is a 25-gallon tank, which is equal to 15 miles about on a fairly level road. I have a length of hose pipe and an ordinary steam water-lifter for filling the tank. The differential gear is on the intermediate shaft. The chains are Brampton's block chain, which gives every satisfaction in use. I have two band brakes on the driving-wheels. The boiler is an ordinary vertical one fired with petroleum, and is the only weak part in the whole machine. I have tried several burners without success, so eventually I tried coal, to see if it was the fault of the boiler or not. With coal I had difficulty in keeping the steam down.

"I am now making a new boiler with about 50 per cent. more heating surface, which I hope will give better results. I carry about four gallons of oil in the tank I am burning from, and have two two-gallon tins besides as a reserve, so I am not likely to get stalled for want of oil. Can you give me any particulars about oil firing, also the amount of oil which should be burned per I.H.P. per hour? From my experience a great deal more heating surface is necessary when using oil than when burning coal. Is this the usual case? I find I have plenty of power on my car; I have been up some very steep hills, and it has never shown any sign of stopping. I usually carry about 160 lbs. of steam per square inch in the boiler, but sometimes it rises while running downhill. The only way I have been able to keep steam when burning oil has been by reducing the speed of the car to about eight miles per hour, and of course that is nothing like fast enough. I have taken your valuable paper for some months now, and have just bought a copy of your POCKET-BOOK, which I find very useful.

"And now, Mr. Editor, I think I have told you everything; if not, I shall be pleased to answer any questions you may ask me. Wishing you and 'our sport' a prosperous new year,

"I am, yours faithfully,
"W. H. BROWN."

[We need hardly say that we are obliged for our correspondent's good opinion, and especially as this arises from the information we supply our readers. As regards oil firing we should say that the difficulty consists in effectively utilising the heating surface; this points to an insufficient volume of flame. Much depends upon the type and number of burners. A good deal of necessarily condensed information will be found in the AUTOMOTOR POCKET-BOOK, but it will be useful to consult "Hodgetts on Liquid Fuel" (Spon). As regards heating surface, the number of square feet per I.H.P. for vertical boilers is given with considerable accuracy by the formula—$H.S. = \frac{22}{\sqrt[3]{P}}$, where P is the boiler pressure. Some information on this head will be found in the paper recently read before the S.P.T.A. by the Editor, and which is reprinted in the present number. As a general rule, a liberal amount of heating surface should be provided in all cases.—ED.]

LES POIDS LOURDS.

Report of the Commission—III.

IN our last article we analysed the performances of the vehicles included in the first classification, viz., those of the Scotte, De Dion, and Panhard types, which are intended to act as passenger and goods omnibuses. We now proceed to discuss the qualifications of those vehicles which possess different characteristics from those before mentioned. Those are the De Dion et Bouton; Pauline, No. 13; the steam passenger train on the Scotte system, No. 3; and the petroleum automotor, or *camion*, by Dietrich and Co., No. 8.

We shall describe each fully, as in the previous articles. The first is the Pauline, of MM. De Dion et Bouton; this is a steam bogie motor, known officially as No. 13. We give an illustration of this vehicle on p. 169.

As will be seen, it really is an articulated six-wheeled bogie van, capable of carrying 35 passengers. On the level the speed attained is 8·7 miles per hour, and this is not sensibly reduced even on steep gradients. This vehicle costs 26,500 francs, of which the tractor costs 17,500 francs. This latter is fitted with boiler and mechanism of the usual De Dion type, the only difference being that these are larger, and, as before said, the motor gives off 35 H.P. The brake is not unlike similar vehicles much patronised by the London workingman or mechanic for "beanos" and other purposes. We hope sincerely to see ere long vehicles of the De Dion et Bouton type on the roads leading to Epping Forest, the Welsh Harp, Epsom, and other places of holiday resort. When we see such a vehicle steaming, say, through Oxford Street, and its approach heralded by the sweet strains of a cornet or concertina accompanied by the beery voices of the excursionists, giving a wholly gratuitous and not altogether desirable rendering of the latest music hall songs, we shall be able to say that automobilism has at length found a secure foothold in the hearts of the British public. At present we take our pleasure sadly in the familiar four-horse brake, driven invariably by a man who will persist in wearing a white hat—why, it is difficult to say.

To resume. The proportion of the "useful weight," *i.e.*, weight of cargo and for passengers to the dead weight in working order, *i.e.*, tractor-bogie and brake, is ·337, while the proportion of the "useful weight" to total weight is ·252.

The following are the general particulars:—

Length over all	21·32 feet.
Breadth „	6·56 „
Height of deck	4·92 „
Length of tractor	12·46 „

(No other particulars of weights, &c., are given.)

According to the constructors the consumption of coke and water for a speed of 8·7 miles per hour is—coke, 14·2 lbs. per mile, or 3·3 lbs. per H.P. hour; water, 57 pints = 7·12 gallons per mile, or 12·3 pints = 1·54 gallons per H.P. hour. The quantity of coke and water carried suffices for a run of 16 miles.

It may be mentioned that while making Journey C during the trials the low-pressure cylinder fractured, and the remaining portion of the journey was accomplished with the high-pressure cylinder.

The following is the cost of working, &c.:—

Price of vehicle, 26,500 francs.

	Francs.
Interest 6 per cent.	5·30
Amortisation, maintenance, repairs, &c., 15%	13·25
Driver, stoker, and conductor	16·00
Firing	1·42
Oil waste, &c.	5·70
	41·67
Plus 10 per cent.	4·16
Total daily expenses	45·83

The variable expenses and working cost for a daily journey of 66 miles are as under:—

Working cost per passenger-mile, with baggage and 220 lbs. of goods—

With ¼ load	·108 franc.
„ ¾ „	·055 „
„ full load	·037 „

Working cost per passenger-mile, without baggage—

With ¼ load	·077 franc.
„ ¾ load	·040 „
„ full load	·027 „

From these figures it will be seen that the vehicle is exceedingly economical.

The next vehicle in this series is the Scotte steam passenger train, No. 3 (*see* p. 169). This consists of a steam tractor and a passenger car.

On the tractor is space for 11 passengers, while on the car is accommodation for 15; there is also space for baggage or goods. According to the maker this train can travel on a good road at 7½ miles per hour, while on steep gradients this is reduced to 3¾ miles per hour. The total price of the train is 26,000 francs, of which the tractor costs 22,000 francs.

Dimensions, Weights, &c.

Total length of train		34·44 feet.
„ breadth „		5·70 „
Length of tractor		17·71 „
„ car		15·58 „
Weight of tractor empty	13,156 lbs.	= 5·87 tons
„ on fore wheels		9,570 lbs.
„ on rear wheels		3,586 „

In working order:—

Water	1,490 lbs.	
Coke	264 „	
Three hands	462 „	
Sundries	88 „	
Weight on fore wheels	11,660 lbs.	= 6·87 tons.
„ rear wheels	3,740 „	
Useful weight	5,500 „	= 2·45 tons.
Total weight on fore wheels	14,300 „	
„ rear wheels	6,600 „	
Grand total weight	20,900 „	= 9·33 tons.

The proportion of useful weight to dead weight is 0·357, and the proportion of useful weight to total weight is 0·263.

Cost of Working, &c.

Price of train, 26,000 francs.

	Francs.
Interest 6 per cent.	5·20
Amortisation, repairs, &c., 15 per cent.	13·00
Driver, stoker, and conductor	16·00
Firing	1·35
Oil waste, &c.	3·50
	39·05
Ten per cent.	3·90
Fixed daily expenses	42·95

DE DION ET BOUTON TRACTOR.

SCOTTE STEAM PASSENGER TRAIN.

SCOTTE GOODS TRAIN.

Variable Expenses with Load and Working Cost.

Working cost per passenger-mile, with baggage and 220 lbs. goods :—

With ¼ load	·113 franc.
„ ¾ load	·058 „
„ full load	·040 „

Working cost per passenger-mile, without baggage :—

With ¼ load	·09 franc.
„ ¾ load	·042 „
„ full load	·030 „

This system is also very economical in working, and for outlying districts sparsely inhabited it is eminently suitable. It, however, requires very good roads.

The third vehicle in this series is the Dietrich Petroleum Lorry, No. 8. This lorry has been designed to carry a load of 2,640 lbs. at a speed of 6·2 miles per hour on the flat and 2½ miles per hour on steep grades. According to the builders, the useful weight may be as much as 3,300 lbs. on the flat and on good roads. The price of the vehicle is 6,000 francs.

In the second classification is comprised those vehicles intended for goods traffic. These included a *camion, Anglicé* lorry, by De Dietrich et Cie., actuated by petrol, and a Scotte automotor hauling a lorry. These two latter we shall proceed to describe.

The former vehicle is composed essentially of a metallic framework, resting on springs supported by the axles. Below the frame, and between the front wheels, which are used for steering, is placed the petroleum motor, developing 6·5 H.P. on the brake. Above is the seat for the driver, who has all the levers for driving and changing speed, &c., immediately under his hand. The transmitting gear is fixed under the frame, between the rear wheels. The load is supported almost entirely by the driving wheels. The body of the vehicle is very low down, in order to facilitate loading. Under the seat are placed three reservoirs, containing 123 pints of water, 55 pints of spirit of 710° specific gravity, and 9 pints of oil. The wheel base is 6·56 feet. The width of the vehicle is 4·85 feet, and the length 10·75 feet. The motor, of 6½ H.P., is of the type invented by Amédée Bollée, of Le Mans, and is fired by incandescent tubes. There are two horizontal cylinders with water jackets, and the vaporised water escapes as a visible exhaust. A float and a valve keep the water in the jacket at a constant level. The water enters the jacket by force of gravity, without the use of a pump. By this arrangement the motor does not become over-heated. The engine, crank, and piston-rods are enclosed in a case bolted on to the under-frame. The engine runs at 660 revs. a minute, and there is an impulse at every revolution. A governor is also provided. The crank-shaft carries a pulley on which runs a belt half its width. This belt passes over another pulley of the same diameter at the rear of the vehicle parallel to the crank-shaft, and also carries a loose pulley. This belt, which runs at a uniform speed, is employed to ~~put the~~ motor in and out of gear. The belt is of rubber, and runs at about 33 feet per second. It undergoes a tractive effort of 106 lbs., and this, after running about 2,500 miles, lengthens it by ·78 inch, but once the belt is tightened, by means of special bolts, there is no more trouble from this cause. The variable speed gear is situated at the rear, and is composed of two parallel shafts running on to each other by spur wheels, which allow of speeds being attained of 2·5, 4·3, 7·5, and 10 miles per hour, and a reversed speed of 2·5 miles. The shaft at the rear carries the differential gear and a band brake. At its extremities it is connected by bevelled rods with the driving wheels, to which are fixed toothed wheels for this purpose, and, as the rods are jointed, they readily yield to the movements of the springs, and the effort on the driving wheels is fairly constant. The whole of the gear is protected in a rudimentary fashion from the dust by means of a case of sheet iron, which may be easily removed when it is necessary to inspect or lubricate the gear. All the levers are arranged compactly under the hands of the driver, and the mechanism is so devised that the motor is automatically thrown out of gear when the brake is applied or the speed changed. Besides the brake band there is a powerful brake on the tyres, which is operated by hand. The principal parts are made of hardened steel, and the bearings are of phosphor-bronze. They are all made to template. According to the builders, the consumption of petroleum spirit of 700 to 710° is about 1¾ pints for 2½ miles, and this is also about the amount of water consumed. Enough supplies can, therefore, be carried for a run of 80 miles. The commercial speed ~~was found to~~ be from 5 to 5½ miles per hour.

Dimensions, Weights, &c.

Length	10·4 feet.
Breadth	4·8 „
Wheel base	6·5 „
Weight empty	2,486 lbs.
Driver	154 „
Water	154 „
Petrol	43 „
Cargo	2,040 „
Weight in working order on fore wheels	1,540 „
„ „ rear „	3,960 „
Total weight	5,500 „

Ratio of cargo to dead weight. ·92, and to total weight, ·48.

Daily Working Expenses, &c.

	Francs.
Interest, amortisation, &c.	2·0
One driver	8·0
Oil waste, &c.	3·0
Add 10 per cent.	1·3
Total daily expenses	14·3

Variable working expenses, and calculated for daily journey of 56 miles. Working cost per ton-mile :—

At ¼ load	·96 franc.
„ ¾ load	·51 „
„ full load	·37 „

The Scotte goods train, No. 2 (*see* p. 169), consists of a Scotte tractor hauling a lorry. This train can carry 4·1 tons in all, 5,500 lbs. being on the tractor and 3,740 lbs. on the lorry. These weights were those carried during the trials, but in actual work they can be much increased.

Dimensions, Weights, &c.

Total length of tractor	15·29 feet.
Length for goods	7·54 „
„ of lorry	14·43 „
Height of deck	3·77 „

As regards the machinery of the tractor, this is practically the same as in the other Scotte vehicles.

Tractor.

Weight, empty, on fore wheels	4,620 lbs.	
„ „ on rear „	4,972 „	
Total weight, empty	9,592 „	=4·3 tons (nearly).
Water	1,892 „	
Coke	264 „	
Conductor and stoker	308 „	
Stores, tools, &c.	528 „	
Cargo	5,500 „	
Total weight on fore wheels	5,478 „	
„ on rear „	12,606 „	
Total weight	18,084 „	=8·073 tons.

Lorry.

Weight, empty, on fore wheels	2,090 lbs.	
„ „ on rear „	1,782 „	
Total weight, empty	3,872 „	=1·7 tons.*
Conductor	154 „	
Cargo	3,740 „	=1·66 tons.
Total weight on fore wheels	3,476 „	
„ on rear „	3,806 „	
Total weight	7,766 „	=3·5 tons (nearly).
Total weight of tractor and lorry, empty		6 tons.
„ of cargo in lorry, full		4·1 „
Total weight of loaded train		11·5 „

* Under the Locomotives on Highways Act we are limited to 1 ton only for weight of lorry.—ED.

Daily Expenses, Independent of Cargo.

	Francs.
Interest, amortisation, repairs, &c.	16·80
Three hands	16·00
Fuel, oil, coke, waste, &c.	4·85
Add 10 per cent.	3·76
Total daily expenses	41·41

Variable Expenses and Working Cost per Ton-Mile.

With ¼ load	·94 franc.
„ ¾ load	·48 „
„ full load..	·33 „

Data for Ascertaining Working Cost.

—	De Dion et Bouton, No. 13.	Scotte No. 8, Passenger.	Scotte No. 2, Goods.
Price	26,500 frs.	26,000 frs.	24,000 frs.
H.P. of motor	35	15	16
Commercial speed, miles per hour.	6·5	6·0	3·69
Cargo carried, U	5,500 lbs.	5,500 lbs.	9,240 lbs.
Dead weight in working order, Pm.	16,302 „	15,400 „	16,610 „
Total weight at starting = U + Pm.	21,802 „	20,900 „	25,850 „
Mean dead weight = P^1m	15,576 „	14,330 „	15,532 „
Mean total weight, P^1t = U + P^1m.	21,076 „	20,073 „	24,772 „
Mean dead weight, per H.P.	6,028 „	12,518 „	15,752 „
Adhesive weight loaded, Pa.	13,312 „	8,536 „	12,606 „
Ratio $\frac{Pa}{Pt}$	·61 „	·40 „	·48 „
Ratio $\frac{U}{P^1m}$	·26 „	·27 „	·37 „
Consumpt of coke per ton-mile, mean total weight.	·6 „	·85 „	·85 „
Consumpt of coke per ton-mile, cargo.	2·3 „	3·0 „	2·3 „
Weight of water evaporated per lb., coke.	5·5 „	2·5 „	3·5 „
Consumpt of water per ton-mile, cargo.	28 „	72 „	28·3 „

(*To be concluded.*)

Not an Enthusiast for Automobilism.—The Brighton magistrates were applied to recently by a visitor from London who objected to motor-cars. He stated that he was an invalid, and had come down to Brighton with his horses for the benefit of the change. But wherever he went he seemed to be pursued by motor-cars. One of them the other day so frightened his horses that they bolted and did considerable damage to the carriage. He wished to know whether he could sue the owners of the car for the damage. The stipendiary magistrate told the applicant that he was afraid he could not do so unless the driver of the car had been negligent in some way or other. The chief constable pointed out that if a horse was restive at the approach of a motor-car the driver of the horse had merely to hold up his hand to compel the car to stop until the horse had passed; if the driver of the car failed to stop he rendered himself liable to prosecution. But why should an invalid of all persons drive a horse or be driven in a horse-drawn vehicle? Is not this a risk that one wilfully undertakes?

TRACTION ON HIGHWAYS.

By Sir DAVID SALOMONS, Bart.

A YEAR or more has passed since I published some facts and figures concerning the power which should be carried by self-propelled road carriages. The final result of my opinion—based upon experiments made by others as well as by myself, taken in conjunction with the legal limit of speed for such carriages in this country, and taking into account all hills which are likely to be encountered, namely, inclinations up to 10 per cent.—was that 12 H.P. per ton is the necessary power to be carried.

Great objection was taken to those figures at the time, especially by those who had their "own axes to grind," and who were trying to induce the public to believe that 4 H.P. was sufficient for all practical purposes. Even some scientific journals contended that we ought to be thankful for small mercies, and that if we can get along without horses mankind ought to be content, when meeting a hill, to advance at a crawling pace.

The French, who have taken the lead to the present day in horseless traffic, have at last come round to the opinion that 10 H.P. per ton is about the right thing, but they are pleased to get in more power when it can be done conveniently.

The object of this short article is to show that the figures I gave previously were not simply mythical, and for the purpose of showing the method of calculating it is my intention to use the decimal system, being so much more convenient than the English method.

The French *tonne* is practically the same as the English ton, being only a few pounds lighter. The French horse-power, 75 kilogram-metre-seconds, differs inappreciably from the English horse-power. A kilogram equals 2¼ lbs. For the purpose of making the calculations simple, friction will be entirely disregarded, and taken into account at the end.

From the well-known formula it can be shown that if a weight of one *tonne* rests upon a frictionless plane inclined at a given percentage to the horizontal, the force acting parallel to such plane, to keep the weight from slipping down the plane, will be equal to 10 times the percentage of inclination in kilograms.

Thus, on a 5 per cent. inclination, 50 kilos. would be the force to be applied to keep the *tonne* from sliding downwards, and on a 10 per cent. hill 100 kilos., and so on.

Now, we will assume motion, *i.e.*, that the *tonne* is going to move up the incline: 75 kilogrammetre-seconds acting for one hour would raise 75 kilograms 3·6 kilometres. Consequently, 13·33 H.P. would be necessary to raise one *tonne* 3·6 kilometres against gravity.

If we now take the speed of one *tonne* up a plane, inclined at 5 per cent., at the rate of 20 kilometres per hour, and for a distance of 20 kilometres along the plane, the weight will have risen one kilometre against gravity. Consequently, the horse-power developed will be equal to $\frac{13·33}{3·6}$, *i.e.*, approximately 3·7 H.P. If the inclination is 10 per cent. the horse-power will be doubled, *i.e.*, 7·4; and so on in proportion for all inclinations.

The English speed of 12 miles per hour is about equivalent to 19 kilometres per hour, *i.e.*, from any result obtained about one-twentieth of the power should be deducted when dealing with the English maximum speed.

It now only remains to add something for friction. This generally varies from 25 to 100 per cent., and 50 per cent. is a very reasonable figure for the use of carriage constructors. It is rare that hills are to be found of greater inclination than 10 per cent., except in a few districts, and then only for short distances.

If, therefore, it is desired to run a carriage with its load weighing 1 ton at 12 miles per hour, at all times and upon all hills up to 10 per cent., as the horse-power necessary without friction is 7·4, it becomes with friction 11·1 H.P.; consequently, it will be seen that my proposal to employ 12 H.P. was not wide of the mark, and that the French proposal to use 10 H.P. is very near my estimate. The object I had in view in giving 1 H.P. more was to allow an advantage in the case of rough roads, and to cope with steeper inclinations which might be met with. If the hills are badly paved, or in a rough condition, considerably more than 12 H.P. is necessary, as the friction may rise to at least 100 per cent., in which event it will be observed that 15 H.P., or even more, may be necessary.

[While the foregoing investigation and the deduction therefrom are perfectly correct, we may point out that the same result can be arrived at in a much more simple and more accurate manner. Our distinguished correspondent has confined himself to one weight at one speed with an indefinite frictional resistance. Let us consider the power necessary to propel a vehicle of any given weight at any given speed, up or down any inclination, against any given resistance. We have given the following formula in the AUTOMOTOR POCKET-BOOK (p. 79), and, as will be seen elsewhere, we stated it quite recently before the S.P.T.A. We give the matter this repeated publicity, as it is really astonishing to find how crude and incorrect are the opinions prevailing as to the power required to propel vehicles. Really it is not a question of opinion but one of physical law confirmed by actual fact and measurement:—

Let W be the weight of vehicle in tons;
V " speed in miles per hour;
r " resistance in lbs. per ton of vehicle;
α " angle of grade; and
H.P. " horse-power required (actual);

then—

$$\text{H.P.} = (r \cos \alpha \pm 2240 \sin \alpha)\ \text{W.V.}/375.$$

Thus, to propel a vehicle weighing 1 ton at 12 miles per hour up a 5 per cent. grade ($\alpha = 2° 52'$) against a resistance of 50 lbs. per ton, will require 5·18 H.P., or, allowing 20 per cent. for internal friction in engine, &c., 6·2 I.H.P. For a 10 per cent. grade ($\alpha = 5° 43'$) $8\frac{3}{4}$ actual or $10\frac{1}{2}$ I.H.P. would be required. A resistance of 50 lbs. is an average value. On badly-maintained roads the resistance may be twice this, while on asphalte paving it will not exceed 20 lbs.—ED.]

LIVERPOOL MOTOR AND CYCLE SHOW.

THE following is the report of the judge, Professor Hele Shaw:—

"I beg to report that I have carefully examined the various motor-cars and motor-cycles at the show, not only within the building, but by trials on the streets. I have pleasure in stating that, whereas last year there was no motor-car which worked satisfactorily, this year there are no less than nine capable of fulfilling the requirements of public traffic, while all of those which took part in the street trials completed their runs in the crowded streets in an entirely satisfactory manner. I unhesitatingly commend the award of the gold medal to the Daimler Motor-Car Company (Limited), of Coventry, who have supplied the motor, together with the frame, wheels, and gearing of most motor-cars shown, and also various bodies of some of the best finished cars.

"I further recommend the award of the silver medal to Messrs. J. Holdsworth and Company, of Liverpool, exhibiting the Victoria motor-carriage. The award of the bronze medal I recommend to Mr. A. W. Goodall, of Blackpool, for the excellence of his work and fittings of the body of the motor-car wagonette which he has attached to a Daimler motor-carriage.

"Coming to the motor cycles, I recommend the gold medal to the Beeston Cycle Company (Limited), Coventry, who exhibit, as last year, a motor-tricycle of the De Dion type. This motor-cycle has been considerably improved by the substitution of the flame ignition in the place of an electric battery, and I was able to make personal trial of this in the crowded streets. I found ignition by this means entirely satisfactory, and the tricycle itself an admirable one in every respect. One of these machines, I am informed, ran from Rhyl to Liverpool in two hours and ten minutes."

The Gulzow-Fiedler Cell.—We understand that the active material employed in this cell is a mixture of minium and litharge with acetate of potassium.

A Well-Merited Distinction.—Among those whom the Queen delighted to honour on the occasion of the New Year was Mr. Jas. Dredge, one of the editors of *Engineering*, who has been given a C.M.G. Although this distinction is conferred for services rendered in connection with the Brussels Exhibition, most persons conversant with engineering literature will agree that it might have well been bestowed for services rendered to the engineering profession. Mr. Dredge is not only a most distinguished technical journalist, but he is the author of several standard works on the higher branches of the profession. We cordially congratulate Mr. Dredge.

CLARKSON & CAPEL'S NON-LUMINOUS AND SILENT-FLAME LIQUID FUEL BURNER.

MESSRS. CLARKSON AND CAPEL, two engineers who have devoted considerable attention to the subject of liquid fuel, have invented a burner which, if it does all that is claimed for it, will be of exceeding value. As is well known, one of the principal objections to the use of liquid fuel for automobiles is the noise made by the issuing gas. The object of Messrs. Clarkson and Capel has been the production of non-luminous and silent flame from liquid hydro-carbons, particularly what are commonly known as ordinary paraffin or lamp oil, as opposed to the more volatile hydrocarbons. The oils which they propose to utilise are those having a specific gravity of not less than 0·8, and a flash point of not less than 73° Fahr.

In carrying out this invention a vaporiser is employed consisting of a hollow vessel with an oil supply and a vapour exit. In connection with the oil supply is an air vessel for the purpose of regulating the supply, the fluctuations and back pressure, and if desired a number of wires may be employed arranged longitudinally in the supply pipe for the purpose of further regulating the rate of travel of the oil. The oil may be heated before it reaches the vaporiser, and where the flame is used for generating steam, a convenient way of doing this is to carry the oil-supply pipe through the steam boiler.

The exit pipe from the vaporiser delivers the vapour of a mixing chamber in connection with the burner, which may be situated beneath the vaporiser; the jet nozzle from the vaporiser delivers into the open end of a pipe or entrance to the mixing chamber, so that atmospheric air is drawn into the mixing chamber together with the vapour and a mixture is produced therein having a sufficient proportion of atmospheric air to produce a non-luminous flame when burnt in the burner. In the mixing chamber, and preferably near the top, is a gauze or similar partition through which the mixture has to pass to the burner, a suitable form of which consists of a series of alternate troughs and burner slits. A further supply of air is obtained by deflecting plates, which throw the air which is supplied to the burner outside the mixing chamber on to the flame, and particularly to the troughs, so as to give a full supply. The entrance of the air and vapour into the mixing chamber may be through a tube either wholly contained in the mixing chamber or partly extending outside it. The burner may consist of a cast-iron or other grid arranged as already explained in alternate troughs and burner slits. The grid may also be made hollow and form the vaporiser. The mixing chamber may be protected or lagged with any suitable non-conducting material, or it may be jacketed and heated air supplied to the space.

The mixing chamber is heated; in ordinary work by the heat of the flame, but for starting purposes the following arrangement may be employed:—Two gas blow-pipes are fixed, one directing its flame on to the vaporiser, and the other directly into the mixing chamber. These blow-pipes are arranged in the following manner:—A small vessel is provided for each and supplied with oil sufficient to last until the burner is properly started, but as it is desirable that the flame directed into the mixing chamber should be cut off before that directed to the vaporiser, the supply of oil to the blow-pipe for the mixing chamber is preferably less than that to the vaporiser. This may be easily effected by having a primary vessel with a partition dividing it into two unequal sized receptacles, each communicating by a separate pipe with its respective blow-pipe vessel, taps being used when necessary. The jet of air for the blow-pipe may be provided by a hand-bellows, fan, or the like.

To start the burner, all that is required is to turn on the supply of oil for the blow-pipe, charge the blow-pipe receptacles, ignite them and apply the blast, and as soon as the mixing chamber flame goes out, the supply of oil to the vaporiser may be admitted, and the rest is automatic. A taper needle regulator may be employed for the supply from the vaporiser to the mixing chamber, the needle being preferably applied to the nozzle from its open end, and being loosely carried in the arm or equivalent by which it is adjusted in the nozzle. The blow-pipe flame, previously described as heating the interior of the mixing chamber, may, if desired, be applied to the exterior of that chamber.

A modified form of vaporiser would consist of a main tube, to which the oil would be supplied, and a suitable number of branches from which the vapour would be taken. In the accompanying drawings, Fig. 1 is an elevation partly in section of the apparatus; Fig. 2 is a plan of the mixing chamber; Fig. 3 is a plan of a modified construction of burner grid; Fig. 4 is a section on the line

4—4 of Fig. 3. The fuel is led from a suitable storage tank by a pipe, A, into a cylindrical casing, B, which constitutes the vaporiser. The vapour from the latter is conducted through a pipe, C, to a jet nozzle, D, whence it passes in a stream into the flared end, E^1, of a tube, E, which projects into the box or casing, F, forming the mixing chamber.

FIG. 1.

The top of the mixing chamber is closed by a gauze, or perforated metal partition, G, above which is arranged a burner grid, H, hereafter to be more particularly described. The bottom of the chamber is sloped away from that side into which the tube, E, projects, so that any vapour which may condense within the tube, E, or chamber, F, will drain down to one end of the latter, whence it may conveniently be conveyed away by a syphon tube, J, leading into a cap, J^1. In order to regulate the supply of fuel, and prevent fluctuations and back pressure, an air chamber, A^1, is placed in communication with the pipe, A, which conducts the fuel to the vaporiser. If the burner is employed for heating a steam generator, this pipe, A, may be led through such generator in order to heat the fuel previous to its introduction into the vaporiser. The latter, as shown in Fig. 1, is formed as a hollow cylinder, B, the fuel being introduced at the lower part of one end, as at B^1, while the vapour is conducted away from the upper part of the other end, as at B^2, this arrangement obviating the risk of any unvaporised fuel passing to the jet nozzle, D. The jet nozzle, D, comprises a cylindrical casing, one end of which is closed by a plug, D^1, while the other end, in which is the orifice, is formed conical, as at D^2. In the orifice lies the tapered end of a regulating needle, K, the other end of which is carried loosely upon the end of a lever arm, L, adjustably secured by a clamp, L^1, upon a pivoted tubular or other rod, M. By rotation of the rod, M, by suitable means, the end of the needle, K, is introduced more or less into the orifice of the jet nozzle, D, and the flow of vapour therefrom controlled as required.

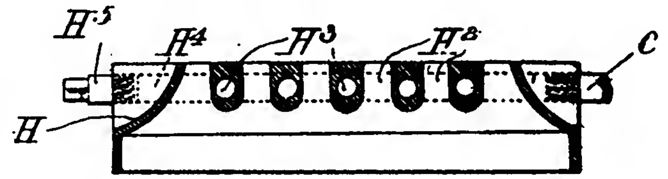
The tube, E, with flared end, E^1, into which the vapour from the nozzle streams, may be formed cylindrical, or of oval or other cross section, and may project for a portion of its length on the outside of the mixing chamber, F, as shown in Fig. 1, but, if preferred, the whole tube, E, E^1, may lie within the chamber, F, the flared end, E^1, being flush with the side of the chamber.

Where the bottom of the chamber, F, is sloped away towards the point where the syphon tube, H, is situated, as shown in Fig. 1, the tube, E, is constructed at its inner end so that the vapour condensed therein may drain down towards the same point. This may be accomplished by either slightly enlarging the tube, E, from the flared end, E^1, inwards or by cutting a sloping groove or channel longitudinally along its interior, or by merely inclining the tube towards the drainage point.

The burner grid, H, in the form shown in Figs. 1 and 2, is constructed as a plate of conveniently rectangular shape so as to fit

longitudinal passages, H^4. The latter run through the grid from end to end, one end of each being closed by a plug, H^5, while to their other ends at H^6 are connected the pipes A and C for introducing the fuel and leading away the vapour respectively. The arrangement of the plugs, H^5, and connections, H^6, to the tubes, A and C, is such that the hydrocarbon to be

FIG. 4.



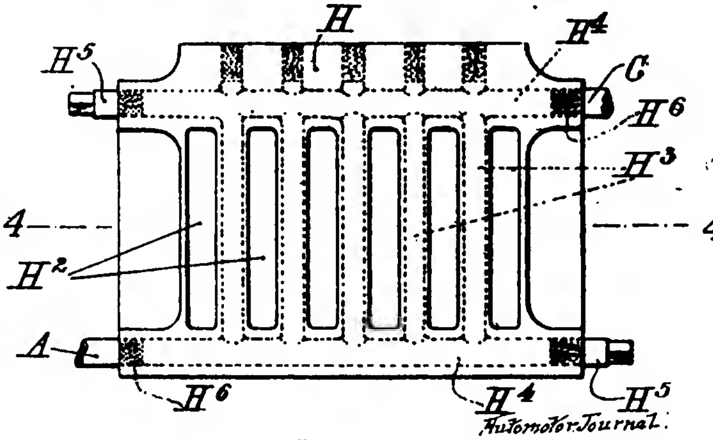


FIG. 3.

vaporised is led in at, and the vapour led away from, diagonally opposite points of the rectangular hollow grid, H.

As a means for obtaining a preliminary heating of the vaporiser, B, and also the mixing chamber, F, the following blow-pipe device may be employed:—A fuel receptacle, N, of suitable size and conveniently located is divided into unequal parts by a partition, N¹. A tube, O, leading from each of these parts terminates in a box, P, containing an asbestos or other suitable form of wick. A blow-pipe, Q, is so situated in relation to each wick box, P, that the current of air from it will direct the flame from the hydrocarbon with which the wicks are saturated on to the vaporiser, B, and mixing chamber, F, respectively.

By reason of the difference in size of the two compartments of the receptacle, N (the smaller compartment being in communication with the wick box, P, for heating the mixing chamber, F, while the larger compartment is connected to that for heating the vaporiser, B), the preliminary heating of the mixing chamber will be stopped before that of the vaporiser ceases, owing to the supply of fuel for the former being less than that for the latter. The object of this arrangement is to obviate risk of the vapour being ignited as it issues from the nozzle, D. By employing a syphon tube, such as H, or some similar device which will maintain the drainage opening from the mixing chamber, F, always closed, the escape of vapour from the chamber is prevented.

Ten claims are made, and the number of the Specification is 1,794 of 1897.

THE AUTOMOBILE FIASCO.

UNDER this headline, *Engineering*, in its issue of 21st ult., publishes the following letter from a Mr. Evacustes A. Phipson, of Selly Oak, Birmingham:—

"Sir,—As modern mechanical talent does not seem equal to the task of designing perfectly satisfactory horseless vehicles, although having at disposal all the marvellous scientific inventions of the nineteenth century, it might do worse than take lessons from the experiments of three generations ago, when steam-carriages ran successfully on many of our roads, and were only prevented from becoming universal by the rapid rise of railways, the introduction of which, unfortunately for the former industry, happened at just about the same time.

"My grandfather, Joseph Phipson, constructed at Birmingham, about the year 1825, from the designs of an ingenious American named Church, a steam-coach which ran on several occasions between Birmingham and Coventry, sometimes attaining a speed of 30 miles an hour, while Tangye Brothers manufactured an elegant car, called the "Cornubia," which travelled regularly at the rate of 20 miles an hour. It is surprising, indeed, that this firm does not again start in the manufacture of automobiles, for which its previous experience should pre-eminently fit it, the only explanation apparently being that the business is now so large that the venerable heads of the establishment fear to venture upon any further extension. This is much to be regretted, not only because to them is justly due the honour of perfecting their own invention, but also because, should the motor industry, like that of the bicycle, find its seat in Coventry, the effect will be, on the one hand, still further to depress the already none too prosperous trade of South Staffordshire, and, on the other, to finally extinguish the picturesque and old-world flavour which still attaches to the recently so beautiful and romantic city of Coventry."

We beg to make some observations upon this. The reason why our contemporary speaks, even in headlines, of an automobile fiasco is, we suppose, because the prophecies and promises of those who a little more than a year ago "found automobilism," and promptly boomed it in the approved manner, have not been fulfilled. Taken in this sense we do not object to people speaking of the automobile fiasco. Coming to Mr. Evacustes A. Phipson's letter, which is easily answered, this gentleman may rest assured that modern mechanical talent is quite capable of making perfectly satisfactory automobile vehicles, and that without taking any lessons from previous practice; indeed, in many things this latter would have to be carefully departed from. Mr. Phipson is apparently oblivious of the fact that up to some 15 months back automobilism on roads, save with heavy slow-moving traction-engines, was illegal. Hence the later school of engineers, as represented by Messrs. Yarrow, Thompson, and others, had no incentive to proceed beyond preliminary or experimental automotors, but those that they did build were vastly superior to anything which had preceded them; they were, in fact, distinct and large advances upon the then existing practice.

Since the Locomotives on Highways Act has been passed the progress has been if not rapid at any rate substantial; the oil-motor has been successfully applied for purely commercial purposes of automobilism, and we now get within the compass of a lady's travelling trunk an 8 or 10 H.P. motor, while within the compass of a hat box we can put a 1¼ H.P. motor. In the Lifu steam-van we have a most marked advance upon anything in Church's or Tangye's vehicles. If water-tube boilers, very high and superheated steam, liquid fuel, and compound engines be not progress, we should like to know what is. We have, too, in less than a year from the passing of the Act electrical cabs running in London; surely there has been progress, and surely our engineers are equal to the task of designing perfectly satisfactory horseless vehicles. If Mr. Phipson is disappointed because there are no heavy automotor vehicles, he must remember that the Act discourages this class of vehicle, while outside the large towns the roads are much too soft to enable heavy vehicles, weighing fully loaded some 10 to 12 tons, to traverse them at a paying speed. There is also the uncertainty as to whether the local authority would not endeavour to prohibit such vehicles. Without discussing the matter further it will be allowed that, considering the prejudice and legal disability which have encompassed, and still does encompass, automobilism, and remembering that the latter disability has only been lessened a little more than a year, the progress made on the whole is not unsatisfactory. It must also not be forgotten that in everything affecting public requirements we move slowly. It has taken our wooden municipalities some 10 years to make up their minds about electric traction. A system or device may be invented in Great Britain, but its application will be in the United States, France, or Germany years before we begin to dimly perceive that there is anything in it.

WARWICKSHIRE MAGISTRATES AND THE LOCAL GOVERNMENT BOARD.

A FEW months ago we drew attention to the exceedingly unjudicial attitude adopted by some of the Warwickshire magistrates in dealing with automotor vehicles. These magistrates—persons dressed in a little brief authority—actually had the impudence lately to address a letter to the Local Government Board requesting that body to order that all automotor vehicles should be numbered and registered. A more improper and impudent request it would be difficult to imagine. Who on earth are these persons, and who appointed them? The fact that it is possible that such illiberal and unjudicial persons can be appointed at all is one of the best reasons for the total abolition of that vicious and feudal system which entrusts the appointment of county magistrates to lord lieutenants.

County magistrates are often ignorant, narrow minded, but wealthy. They have no more, or rather less, legal knowledge than a London policeman. *Truth* has for years exposed the ignorance and intolerance of these county bumbles. Only quite recently the Lord Chief Justice had to animadvert very strongly on the methods of some county magistrates. Needless to say these persons are, with few exceptions, rabid Tories of the most pronounced type—not that they are to be blamed on this account, but because their Toryism takes the form of a blind and Chinese-like conservatism. They are bitterly hostile to change, and to those who differ with their political or religious opinions. It was this blind and jealous conservatism on the part of the county magistracy that made the roads impossible to Gurney's steam coaches, and for 60 years succeeded in rendering automobilism illegal. This same illiberal spirit still, as we see, survives, and we have the Warwickshire magistrates every bit as ignorant and as conceited as Justice Shallow, who, by the way, also was a Warwickshire man, endeavouring by all means to hinder the progress of the new industry. It is a scandal that the power to make recommendations to the Local Government Board should be entrusted to such men.

We are, however, glad to say that the attempt made by these persons has so far utterly failed; the Local Government Board curtly refused to sanction or issue any such regulation. This incident, however, shows the great necessity for Automobile Clubs, not only for the purpose of carefully safeguarding the interests of automobilists when they have the misfortune to appear before such persons as these Warwickshire justices, but also to see that the Local Government Board does not make any alteration in the regulations without the consent of automobolists.

HORSE-DRAWN CABS v. ELECTRIC CABS.

THE actual expenses of operating vehicles are very difficult to obtain in this country, both the costermonger and the railway director displaying a suspicious reticence when asked for information, which is not a little amusing. Our French contemporary, *La France Automobile*, has, however, succeeded in obtaining such information as is applicable to Paris, and we reproduce it here as being an eminently instructive comparison. Moreover, we think that the prices do not differ greatly from those ruling in London:—

Daily Cost of a Horse and Cab.

	Francs.
General expenses	0·53
Financial expenses	0·30
Tickets (cabman's)	0·01
Apprenticeship and sundries	0·05
Provident fund	0·07
Fire insurance	0·02
Lighting of carriages and depôts	0·11
Heating " "	0·02
Water	0·03
Syndicate expenses	0·05
Accidents and damage	0·35
Rent of depôts	1·05
Depôt staff and employés	0·99
Rates and taxes	2·26
Food, shoeing, and wear and tear of horses	6·65
Renewing and wear and tear of rolling stock	2·74
Wear and tear of property	0·21
12*s.* 4*d.* =	15·44

Daily Cost of an Electric Cab,

the number of carriages being equal in the two cases.

	Francs.
General expenses	0·17
Financial expenses	0·08
Tickets (cabman's)	0·01
Apprenticeship and sundries	0·05
Provident fund	0·04
Fire insurance	0·01
Lighting of carriages and depôts	0·05
Heating " "	0·01
Water	0·06
Syndicate expenses	0·05
Accidents and damage	0·24
Rent of depôts	0·35
Depôt staff and employés	0·50
Rates and taxes	1·50
Electrical energy and accumulators	2·20
Renewing and wear and tear of stock	2·74
Wear and tear of property	1·07
7*s.* 4*d.* =	9·13

Allowing for an under-estimate there is still a large balance in favour of the electrical cab.

A Cyclometer.—We hear that the cyclometer of M. Foureau, of 54, Rue de Chabrol, Paris, gives great satisfaction, being simple in construction and accurate in working. Such an indicator should command a ready sale. We may say that we are having one of these machines tested for motor-cars, and shall describe it in a future issue.

Low-Test Petroleum.—At its meeting on February 1st, the London County Council, without discussion, passed the following motion:—"That in view of the dangerous nature of low-flash petroleum oils sold in London, and the numerous fatal and other accidents that occur through the use of such oils in lamps, it be referred to the Public Control Committee to further investigate the causes of such accidents with a view to representations being submitted to Parliament as to the desirability of raising the flash-point fixed by the Petroleum Acts."

SPREADING THE LIGHT.

WE are glad to observe from time to time evidences that the idea of automobilism is slowly permeating the public through the medium of the newspapers, but what is surprising is that the daily paper, usually so conspicuous for its dense ignorance on matters mechanical, is at length perceiving that it is now necessary to write with some show of knowledge on such things. As an example, we reprint an intelligent article from the *Standard* on Mr. Worby Beaumont's paper read before the Society of Engineers (published elsewhore). Says our contemporary:—

The Presidential Address given before the Society of Engineers by Mr. Beaumont, on February 7th, contained some very suggestive reflections. At no distant date he expects to witness considerable changes in our street and road traffic. Notwithstanding all that can be done by railways and tramways, we are reminded that there are millions of passengers and tons of goods, year by year, waiting to be provided with better means of transit. Scattered over the country we have a hundred thousand miles of roads, with gradients costing, in the aggregate, enormous sums of money in providing animal power to surmount them, and which it is complained put the most effective stop on the cheapening of transit of goods between railway stations and the outlying villages and agricultural districts. There appear to be certain very undesirable limits to the distributing capacity of railways, and it has become evident that the common high road must again receive the attention which was given to it under Telford and others in the early part of this century. Mr. Beaumont estimates that road improvement throughout Great Britain would effect a saving in the cost of keeping and working horses to the extent of three and three-quarter millions sterling per annum. On this basis it is calculated that a hundred millions of "national capital" could be expended by engineers to the great advantage of the public. Where the money is to come from is a difficult problem. But it is to be hoped that something will be done. The drawback seems to consist in the fact that the benefit will fall on individuals who cannot very readily be made to bear the cost. It is perfectly certain that our railways need to be supplemented, so as to put them in proper communication with the outlying localities. We observe that Mr. Beaumont has faith in motor-cars, while he looks upon tramways as nuisances in the towns, though desirable upon the open highways. Concerning the metropolitan traffic, a visit to many of the London tramway and omnibus centres and starting-places is said to show that a density of traffic is being rapidly reached which it will be impossible to cope with, "if the streets are to be anything more than lines of free railways on which the driver of every car and omnibus and coal wagon is traffic manager." This latter function, we apprehend, rests rather with the police, but their labours will grow heavier unless the motor-car comes to their relief by partially superseding horses, and rendering unnecessary the transport of their fodder, although even this seems to offer but a slight and passing remedy, so long as population increases. Deep underground railways will, no doubt, effect much good; but, at the same time, they will develop a street traffic of their own. More suburban service railways are described as inevitable, and this involves the question of getting to and from the metropolitan stations. Engineers may study the subject, and capitalists may find the money; but, after all that can be done, we shall expect to find the streets of London generally crowded and occasionally congested.

Traction Data.—The following data relating to traction was given by Mr. E. Whythe-Smith, at the Institute of Electrical Engineers, on the discussion of Mr. Epstein's paper. He had made experiments to get the average pull on ordinary roads in the worst condition. Some of the results, expressed in pounds per ton in three different conditions of weather, are:—

Asphalte	22	23	22
Wood	22	31	36
Macadam (good)	52	50	49
Macadam	60	51	50
Macadam (soft)	97	51	52

P

LAW REPORTS.

The Ward Electrical Car Company.

Under the winding-up order recently made against this Company, the statutory meetings of the creditors and shareholders were held on January 26th before the Assistant-Receiver, at the Board of Trade offices, Carey Street. The Chairman said the facts relating to the case were somewhat peculiar. The Company was registered in October, 1888, with a capital of £300,000, and was apparently promoted by Mr. Ward in conjunction with a Colonel McMurdo, with a view to the acquisition of certain inventions relating to electricity and belonging to Mr. Ward; also to carrying on the business of electrical engineers. The whole of the capital—except the signatories' shares—was issued to Mr. Ward in return for his inventions, and he was also to act as managing director at £1,000 a year, payable only out of profits, or until the formation of a subsidiary company. The whole of the shares having been issued to the vendor, the Company had no working capital; but Mr. Ward entered into an agreement with Colonel McMurdo for the sale to the latter of 22,500 shares for £10,000, payable as to £1,000 to Mr. Ward and £9,000 to the Company. Colonel McMurdo died in May, 1889, having paid £4,362 on account. Mr. Ward then entered into an agreement with the receiver of his estate, under which 20,000 shares were to be returned to him, and he was to provide the Company with £5,000 for working capital. Mr. Ward further undertook to pay the Company's liabilities until December, 1890. The money received by the Company was used in developing the patents, but apparently without any definite results, and the only property acquired was stated to be a small amount of plant that had been seized by the landlord for rent and an omnibus which had been seized under a judgment. The directors in April, 1896, authorised Mr. Ward to sell the whole undertaking to a new Company for £35,000, payable as to £5,000 in cash and the remainder in shares. That scheme was not carried through, but subsequently Mr. Ward and a Mr. Marshall floated the London Electrical Omnibus Company (Limited) to acquire other inventions belonging to the former gentleman. The purchase price was £20,000 cash and £80,000 in shares, and was to be divided between the two promoters. Under the agreement with the first Company it was provided that all inventions and improvements thereon sold to that Company should become its property. The inventions sold to the second Company were stated to be improvements on the original inventions; so that a question of title would doubtless arise between the two Companies. Mr. Ward had stated his intention of handing over his shares in the new Company for the benefit of the old Company, and Mr. Marshall was now bankrupt in the London Court. The directors in August, 1892, resolved to issue debentures to a certain firm, and although there had been no actual issue, a claim to some of the Company's property had been maintained with success. The original patents had apparently lapsed, with the result that the only asset belonging to this Company was its interest in the London Electrical Omnibus Company (Limited). Accounts had been prepared showing unsecured debts of £863, fully-secured debts £2,435, and assets £1 9*s.* 1*d.* Mr. Ward intimated that he desired to present the shareholders with shares in the London Electrical Omnibus Company (Limited), which was now in a position to make a considerable profit by running electrical omnibuses. He had no doubt but that the old shareholders would consent to such an arrangement, as the shares would be of considerable value. The matter was left in the hands of the Official Receiver to be dealt with in the usual manner.

Rosser Cycle and Brake Company.—On January 15th Mr. Justice Romer heard the petition of the Rosser Cycle and Vehicle Brake Company (Limited), as represented by Mr. Romer, Q.C., for a reduction of capital from £50,000 to £10,000. The ground of the petition was that there had been a loss of £35,000, which was not represented by available assets. His Lordship sanctioned the reduction.

Brown v. I.E.S. Accumulator Company.—This case came before Mr. Justice Romer on the 5th inst., on a motion for judgment as a short cause in default of defence. The Company was incorporated in 1895 for the purpose of carrying on business as manufacturers of electrical batteries, and the plaintiff was the holder of debentures in respect of which the Company had made default. A Company named New and Mayne were also made defendants, they being interested in the taking of the accounts. Mr. Justice Romer made the usual order in a debenture-holder's action.

Estimates of Speed.—At the Justice of Peace Court at Hamilton, on January 24th, William Muir, motor-car driver, was charged with having, on December 21st, driven his motor-car at more than a reasonable speed during the darkness. Andrew Arbuckle, flesher, Blantyre, was on the night libelled driving a flock of sheep along the Glasgow Road at Blantyre, when the motor-car driven by the accused came up. He shouted to the driver, but he did not think he heard him, owing to the noise of the car. A number of sheep were injured. Various estimates were given as to the speed at which the car was going, one witness stating that it was going like an express train, another at between 20 and 30 miles an hour, and another at a "terrible" rate. On the other hand, it was stated that the rate of speed was not more than five miles an hour. The justices found the charge not proven.

Heavy Fines by the Warwickshire Magistrates.—At the Kenilworth Divisional Sessions (Milverton), on February 1st, Albert Thornbill Davis, of Coventry, was charged, under the Light Locomotives Act, with driving an autocar without proper lights attached, on the 22nd ult., at Kenilworth. The defendant had one light in the centre of the car, but none at the back. There was also another charge of obstructing the traffic by leaving the same car in a public thoroughfare and without proper attendance. The defendant was fined £2 and costs for the first case, the magistrates considering it a very dangerous practice to drive autocars without the lights placed in a proper place. The second case was dismissed. Some time after the case was over, Mr. Maddocks, solicitor (Coventry), appeared with the defendant, and asked the magistrates if they would reopen the case. He explained that he and the defendant had started to drive there on an autocar, but unfortunately the wind was rather high, and prevented them from arriving in time. They had allowed themselves plenty of time. He said the wind sometimes blew the light out. He thought they would reduce the fine if the facts of the case were better known. The application was not granted.

The Regulation of Street Traffic.—At Manchester on February 3rd, John Wilkerson, in the employ of the Theatre Royal Company, was summoned before the city justices for a breach of the local bye-law as to vehicles. On January 18th he was driving a motor-car, which is used for advertising the Theatre Royal pantomime, up Bridge Street, and, according to the evidence of a constable, he crossed into Deansgate on the wrong side, running the risk of an accident. The solicitor to the Theatre Royal Company explained that the defendant, finding that his foot-brake was out of order and that he could not apply the hand-brake without taking his eyes off the traffic, saw a chance of running safely into Deansgate by going inside the point where the officer was stationed. Thinking it wiser to break the rules of traffic rather than go on and risk the chance of an accident he did so, but pulled up as soon as he got safely into Deansgate. The defendant was an experienced driver, having for eight months before coming to Manchester been engaged in driving motor-cars in London. The justices, in consideration of this being the first case of the kind, imposed a penalty of 2*s.* 6*d.* and costs only.

No it Won't.—In a recent issue the *Globe* says:—"A motor-cab ran away in Fleet Street on Sunday, January 23rd, and hurt nobody; but next day the *Daily Telegraph* had a characteristic leader on the perils of the motor-cab. Yesterday a horse ran away and killed a man at King's Cross. Will the *Daily Telegraph* now oblige us with a leader in which the perils of horse traffic are discovered amid beds of flowery epithets?"

REVIEWS OF BOOKS.

The Engineering Magazine for February is not as interesting as it is usually. It contains, however, some good matter. Mr. Dugald Clerk discusses the economy and efficiency of the large gas-engine, and points out the difficulties in effecting proper scavenging of the cylinders. He is, however, sanguine that the present difficulties will soon be surmounted. Already an actual efficiency of more than 30 per cent. has been obtained from a Crossley gas-engine. Mr. Clerk thinks that in ten years' time we shall have gas-engines of 1,000 H.P.

Mr. James McKechnie, the engineering manager at the Vickers Company's Works at Barrow, contributes his third article on shipbuilding, and, needless to say, this is instructive, but more so from the economical than from the technical point of view.

We have said a good deal of late about the London County Council Fire Brigade and its obsolete equipment and inferior organisation. Here we have a capital descriptive and well illustrated article by Mr. Hugh Bonner on the equipment and organisation of a city fire department. The description refers to the New York fire service. We learn that the New York fire-engines have a capacity of from 350 to 1,100 gallons per minute. We have in London lots of old-fashioned crocks that spurt feebly 200 gallons per minute at their best, and but one engine that can deliver more than 500 gallons. The New York fire floats are also superior to ours. There are three boats with capacities of 2,500, 3,500, and 13,000 gallons per minute, and use hose ranging from 2½ to 6 inches diameter. Water towers and chemical fire-engines are largely employed. After reading this interesting article we certainly think that Colonel Rotton, the chairman of the London County Council Fire Brigade, cannot substantiate his extraordinary statement, to the effect that we have the best fire service in the world. We cordially recommend the article to the notice of all interested in the prevention and fighting of fires. There are other articles, but of less interest.

ELECTRICAL INSTALLATION RULES.—The Liverpool, London, and Globe Insurance Company have issued a small handbook containing their rules for electric lighting or power plant. Since the well-known "Phœnix" rules of some years ago, electrical pressures and apparatus have changed considerably, and house lighting is now effected by currents of a much higher voltage than was formerly the case. It has always been a characteristic of electrical work that it rather lends itself to flimsy construction, the stresses being electrical and not mechanical. In the early days of the industry much inferior work in wiring was to be seen, and the wireman was anything but a skilled mechanic. Leads were run in casings indifferently around fireplaces and in wash-houses, the same insulation being deemed suitable for a very damp place as for a very dry one. Such things, too, as ceiling roses, switches, and fuzes were of the cheapest and most trashy description, and as a consequence of this flimsy construction many fires occurred. Thanks, however, to the leading fire insurance companies, a considerable improvement has been effected. The Liverpool, London, and Globe Insurance Company have been foremost in this direction. Their rules have been drawn up by some of the leading electrical engineers, and we do not see that they can be much criticised. To us they seem to possess the great merit of fairness; they impose no onerous conditions, and only stipulate for good and faithful workmanship. They, in fact, embody the points of a good specification, and users of electricity would do well to insist upon contractors adhering to these rules whether they (the users) insure or not.

CATALOGUES.

MESSRS. THOS. CORBETT send us an illustrated catalogue of their agricultural machines. This well-known Shrewsbury firm has a very high reputation for keeping up to date and for excellence of manufacture. When it is remembered that they have obtained no less than 700 first prizes in various competitions, it will be evident that the firm has something to boast of. The catalogue is, of course, more interesting to the farmer. We would suggest to Messrs. Corbett that they would find automobile spring carts and wagons for farmers and country gentlemen a remunerative manufacture.

THE PANHARD "No. 6."

THE Hon. C. S. Rolls writes :—

As promised, I send you account of run I had by road from London to Wales towards the end of December last.

As you are aware, the carriage which I used on this occasion was the Panhard et Levassor, "No. 6," the winner of the Paris-Marseilles (1,070 miles) Race, fitted with an 8 H.P. Daimler-Phœnix 4-cylinder motor. I have modified the body somewhat and other details in this carriage, having now a wagonette body convertible into a phaeton.

Start was made from Knightsbridge at 8.22 a.m. on December 22nd with three persons and baggage on board, in a slight fog and hard frost, the route taking us through Hounslow and Slough.

At Maidenhead the first dismount was required, as I found it advisable to detach the ground "sprag" from the frame of car and take it inside, it having been doubled up by its failure to bite the ground immediately it was requisitioned to use when going up a hill, catching a little later with a jerk; after 25 minutes' delay here we proceeded through Twyford to Reading, where we spent about 40 minutes oiling over and renewing water supply at fire station; the next "watering place" was Hungerford, after which we covered several miles of the extremely undulating Wiltshire Downs, passed through Swindon without stopping, and arrived at that night's destination—viz., Purton—at 5.4 p.m., where we stayed with some friends. Distance for the day, 88½ miles. On the second day we left at noon, taking for 10 miles or so three extra passengers, our load on board (six persons, baggage, petrol, tools, and parts) being quite equivalent to eight people; the engines, however, took but little notice of this weight, running almost continuously on fourth gear. Beyond Cirencester trouble with heated pump bearing caused slight delay; dismantled, oiled, replaced, proceeded. I made good use of five brakes when descending Birdlip Hill (Cotswolds), being a mile of sharply-curved steepness; and an hour's rest was taken at Gloucester, during which we took in water and oiled selves and car. Took Ross and Monmouth in the evening, stopped for few minutes beyond Monmouth to resin the clutch, and arrived at The Hendre 7.57 p.m., the car and its occupants being white with frost. Average speed of running during the two days was 11 miles per hour.

It will be noted that water was only taken in twice on the first day and once on the second, although very mountainous work was done on the second day. Total distance, 150 miles.

Permit me to congratulate you heartily on your '98 AUTOMOTOR POCKET-BOOK, which I consider is a marvellous shilling's-worth.

PROPOSED EXHIBITION OF MOTOR-VEHICLES.

AT the annual meeting of the Tunbridge Wells Agricultural Society an important discussion took place as to a sum of £200, the proceeds of a motor-car exhibition at Tunbridge Wells, organised by Sir David Salomons, and for which the society lent the use of their own ground. This sum Sir David had promised to spend in prizes for a motor-car exhibition, and when approached a year ago he replied that the time had not arrived when the money could be profitably devoted to the purpose, and owing to company-mongering the progress of the industry had been greatly retarded. When satisfactory arrangements could be made he should have great pleasure in arranging a prize list. Lord Arthur Cecil said the question was whether the time had not arrived when they should again approach Sir David and ask him whether the exhibition could be held this year, and Mr. Austen remarked that the Royal Society were offering similar prizes this year. Mr. Machean doubted whether they should have room for anything of the sort. Mr. Austen suggested that they might have a three days' show and devote the third day to a motor-car exhibition. Mr. Williamson said as they lent the ground they ought to have more control over the money. The chairman said that no doubt Sir David would meet them in his own good time, and until then he did not see how they could discuss the matter. Mr. Pane said there was a question whether their ground was suitable. Major Simpson said he believed that Sir David was still of opinion that the time had not yet arrived for holding an exhibition. It was decided to refer the matter to the committee to again approach Sir David, and the meeting terminated.

NOTICES.

Contributions and articles likely to prove of interest to our readers will receive due attention, but in all cases the name and address of the writer must be given, not necessarily for publication.

All matter intended for publication should reach us not later than the 10th of each month, and be addressed to THE EDITOR OF "THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL," 62, *St. Martin's Lane, London, W.C. Stamped envelope must be sent if the manuscript is required to be returned. The Journal is published the middle of each month.*

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When any difficulty is experienced in procuring the Journal from local newsvendors, intending subscribers can obtain each issue direct from the Publishing Office, by forwarding remittance of 7s. for 12 months' subscription, post free (or at the rate of 7d. per copy).

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The Automotor and Horseless Vehicle Journal.

A RECORD AND REVIEW OF APPLIED AUTOMATIC LOCOMOTION.

FEBRUARY 15th, 1898.

DIARY OF FORTHCOMING EVENTS.

Notices to be included under this heading should reach the Office not later than the 12th of each month.

[*For full programme and proceedings of the Self-Propelled Traffic Association, see p.* 189.]

1898.	
Feb. 18 to 26..	Manchester Cycle Show.
March 6 and 7	Marseilles and Nice Race (organised by *La France Automobile*).
March 7 ..	Automobile Club of Great Britain. Second House Dinner at 7.30. To be followed by a discussion on "The Bearing of Past Invention on Future Motor-Car Design."
March 10 ..	Nice—Puget—Theuiers Motor-Cycle Race.
April 24 ..	Paris Motocycle Critérium.
May 2, 9, 16, 23	Society of Arts Cantor Lectures—"Electric Traction," by Prof. Carus Wilson.
May 24 ..	Self-Propelled Traffic Association (Liverpool Centre) Heavy Vehicle Trials.
May 25 ..	"Concours de Fiacres," Paris. Organised by the Automobile Club of France.
June 10 to 25..	Motor-Vehicle Exhibition, Paris. Automobile Club of France. Sections—(*a*) Automotor vehicles which have given proof of their practical efficiency; (*b*) Industries connected with automobilism; (*c*) Motors adapted for automotors; (*d*) Vehicles adapted for automotors.
June 8.. ..	Concours of the Automobile Club Belge.
July 3 to 11 ..	Race from Paris to Amsterdam, under the auspices of the Automobile Club of France.
1899	Race from Paris to St. Petersburg, under the auspices of the Automobile Club of France.
1900	Paris International Exhibition — Great Display of Automotor-Vehicles and Allied Trades.

ANSWERS TO CORRESPONDENTS.

H. P. Fernald (Cheltenham).—Apply to Messrs. Toward, Newcastle-on-Tyne; and to the Liquid Fuel Company, of Cowes, Isle of Wight; also to Messrs. Coulthard and Co., of Preston. Each of these firms can supply your requirements.

L. (New Forest).—(*a*) For steam—Liquid Fuel Engineering Company, East Cowes, Isle of Wight; Lancashire Steam-Motor Company, Leyland, Lancs.; Atkinson and Philipson, 27, Pilgrim Street, Newcastle-on-Tyne. (*b*) Electricity—Elieson Lamina Accumulator Company (Limited), 4, Greenland Place, Camden Town, N.W.; Carl Oppermann, 2, Wynyatt Street, Clerkenwell, E.C.

G. H. E. W. (Rugby).—We have forwarded your letter to Messrs. Bolling and Lowe as desired. The address is 2, Laurence Pountney Hill, E.C.

J. B. (Rudgwick).—The address is Hunter and Co., Eastdown Works, Lewisham.

J. Garner (Burnley).—Book sent as desired. We hope to give fuller details later on in regard to the motor you mention, which, as you say, looks to us like a good thing. The address is given above.

H. C. (Dukinfield).—We have a few copies of Vol. I still left, bound complete, one guinea net. The rest of the back numbers can be supplied you at 7*d.* per copy, post free.

THE LOCOMOTIVES ON HIGHWAYS ACT.

The more we see of the practical working of this Act, the more convinced are we of its need for amendment, and this opinion is, we know, shared by automobilists throughout the country. That it should have been necessary at all to pass such a measure is by no means flattering to our national vanity. We are so accustomed to speak of ourselves as a "practical people" and to extol our truly British virtue of "common sense," as though no other people in the world possessed either practical knowledge of things or common sense. We have enjoyed a long period of profound peace for the last 80 years. France, Germany, Austria, and Russia have during that time been torn and ravaged with either wars or revolutions, and yet those who have gone into the question will tell us that the science and practice of mechanics is more advanced in Germany and France than in this country. The Iron and Steel Commission that visited Germany in order to report upon that industry came back with some really startling information. Not many months ago a deputation from Manchester also visited Germany while labouring under the truly insular idea that *they* had nothing to learn about machinery and that Manchester was the natural home of high-class work. This deputation went, and returned, literally, sadder and wiser men; they reported that Germany had nothing to learn from England as regards machinery. As our columns bear witness, we report whatever progress is being made in automobilism, but we have to confess that the more substantial advances in the subject are mainly of German or French origin.

On the Continent automobilism is encouraged by the State and by public opinion—not for any academic idea but for the truly practical reason that it means cheap transport, and so it happens that we are flooded with cheap foreign goods, and we suffer this gladly because we are *not* a practical people, and so we cling to the horse, although the horseless vehicle has been in existence for nearly a century in a fairly perfected form. We pass an Act which is the wonder and surprise of every educated foreigner. In this precious measure we have carefully and conscientiously made the way of the automobilist needlessly hard. We lose sight entirely of the many advantages to be derived from cheap transport, but provide ample facilities whereby local authorities can, if so minded, greatly prejudice the use of motor-vehicles. While we have taken very good care that motor-vehicles shall fulfil certain prescribed conditions, we have omitted to require that local authorities shall maintain their roads in such repair as to permit them to be used by automobilists.

At present each little commune does that which is right in its own eyes, and hence, except in the larger towns, the roads are almost left to repair themselves. Of course, local authorities will protest vigorously against anything which tends to increase their rates, but once they see—and it is so difficult to make them see—that the improvement in the roads will mean more trade, we feel convinced that an improvement would be effected. We think that the Self-Propelled Traffic Association and the Automobile Club might well take up this matter. A serious anomaly, in our mind, is that very great power is given to the Local Government Board as regards the motor-vehicles, but they have no authority as regards the roads nor over ordinary vehicles. Since no vehicle is of use unless it is worked on a suitable road, and since there must be some central authority, it would seem more logical to place all vehicles and all roads under one supreme authority. We doubt, however, that local bodies will ever consent to any diminution of their control over their roads.

The principle adopted in the Act, of placing large legislative powers—because, after all, this is what they amount to—in the hands of the Local Government Board is open to very grave objection. The Act is practically a permission to the Local Government Board to make what regulations that body thinks fit. Theoretically the Local Government Board is, of course, like all governing bodies, amenable to Parliament; practically it is an *imperium in imperio*, and, like the War Office, follows out its own line of policy independent of the House of Commons. The public, in fact, can exercise but little control over it.

It seems to us that any amendment of the Act should be in the direction of strictly limiting the powers of the Local Government Board to matters of administration. It does not seem advisable that a departmental body should have the power of making regulations which may have the effect of placing automotor vehicles at a disadvantage as compared with ordinary ones. All that we can ask for is a fair field and no favour. No privileges are sought for by automobilists, but, on the other hand, it is not just that there should be any discrimination against them. That local authorities are, in some cases, not indisposed to adopt an unjudicial attitude is shown by the attempt on the part of the Warwickshire authorities to impose a regulation upon automobilists at once unjust and impolitic. Certainly the attempt failed, but what guarantee have we that similar attempts may not be more successful?

The Act should also cast upon local bodies the duty of maintaining the roads in a condition suitable for heavy traction. A specified degree of hardness should be decided upon, that is, the roads should be capable of carrying a weight of not less than 5 tons per square foot. In other respects, too, the Act requires amendment, but we shall deal with other points in due course.

OBSERVATIONS ON THE ENGINEERS' STRIKE.

At length, after a seven months' contest, the disastrous strike and lock-out in the engineering industry has terminated in the only way possible, by the total defeat of the employés. As is well known, this strike arose out of the demand by the hands for a 48-hours' week. This was flatly refused by the employers, who were not sorry of the opportunity afforded them of settling, once for all, many other differences. The hands, as represented by their trades union, the Amalgamated Society of Engineers, had for a long time past been gradually encroaching upon what most people consider the natural and necessary rights of the employers. The men had limited the number of apprentices; they fixed the output of machines; they inaugurated a system of levelling down, whereby the best workman had to work only as well as the most indifferent or lazy. They also interfered in the management, and endeavoured in every way to prevent the employment of non-union labour, while strictly conserving what they considered to be the rights of their so-called skilled labour. In short, the policy of the men was to take all control out of the masters' hands, and run the shops on Socialistic principles—admirable in every way from the men's point of view, but distinctly disadvantageous from that of the masters. As stated, these encroachments culminated in the demand for a 48-hours' week with 54 hours' pay. Of course, there was no lack of soft-minded persons, ranging from bishops downwards, who wished to arbitrate on these grotesque and impossible demands. The result we all know.

This strike has involved some 70,000 so-called skilled mechanics. It has cost them, their families, other unions, and the working class generally not less than £4,680,000, while the employers have lost no less than £5,696,000. The total loss is £10,376,000. We say loss. If, as we suspect, this strike will produce federations of employers, and so ensure industrial peace, then this £10,000,000 is a cheap price to pay. In any case this strike must have very far-reaching consequences. The defeat of one of the most powerful and wealthy trades unions in the world in a fair and square fight marks, in our opinion, the commencement of the decadence of militant Socialistic trades unionism as a national force, and no one sensible of the modern conditions of this country's supremacy in the markets of the world will for one moment regret that this should be so. As is well known, the Amalgamated Society of Engineers made an attempt to put into practice doctrines which, good in themselves, *quâ* doctrines, are as yet impossible of realisation in the present state of our society. Human nature being what it is, and not, as we gather, appreciably changing through the centuries, is not yet capable of assimilating the Sermon on the Mount or the more later teachings of Compte and Marx. So long as—and we think this will obtain for a very, very long time yet—profit is the incentive of the employer, he will require and insist upon having full and supreme control over his business. The arcadian state of things desired by the Amalgamated Society of Engineers and others would be possible no doubt if there was no trade competition, no international competition, no danger in losing a market, no particular necessity of creating one, no danger of foreign aggression or war, and, therefore, no risk of famine. Who would not like to live in the comfortable knowledge that a good living can be assured with but little mental toil or anxiety, but that after the day's work of eight hours one could spend the remainder in intellectual pursuits, in visiting municipal museums, the municipal music-halls, or participating in municipal cricket and football matches, and even witnessing municipal horse races, conducted, of course, under strictly moral conditions?

No one will, we think, blame any body of men—whether these be so-called "working men" or men who live by mental toil—for endeavouring to get all they can for their labour. Unfortunately we cannot—at least, at present—compel any person to be an employer, and we also have the other humiliating fact that the employer is a selfish person greedy for profit; but we do not know that his greed is one bit more mischievous or blindly selfish than that of the typical working man. If the former wants the maximum of profit, the latter exhibits an equally selfish but perfectly natural desire to obtain the maximum of wages or its equivalent. If the prices of work and wages do not enable the greedy, selfish employer to make a living, and put by something in the savings bank for his old age—or, at least, to contribute regularly to, say, an employers' sick and burial club—he also goes on strike and shuts up the shop. In short, unenlightened selfishness in the disguise of humane Socialism was the cause of the late strike. It was not because of this, however, that the strike failed. The public at large would, with its usual sham humanity, have witnessed the decline of the engineering or any trade with pleasure, or at least equanimity, so long as the "toilers" or the "masses" had "opportunities for intellectual recreation and improvement," *pace* the *Daily Chronicle* and other papers after that kind. What prolonged the strike and eventually determined the event was the trades unionism of the employers. Many will remember the anæmic and amœbic state of the employers some 10 years ago, especially of those engaged in the shipping industry. The seamen formed a powerful and autocratic trades union; the shipowners formed the Shipping Federation, with what results we all know. Where is the "Amalgamated Union of Seamen and Firemen" now? Why, tenanting a few back rooms in a back street of the remote East End of London; its funds have gone, its prestige also, its leaders are discredited, and the seamen, to a man nearly, are in the Shipping Federation benefit scheme. The seamen's trades union is utterly and hopelessly broken, never to exist again as before. Similarly we have had the engineers' trades union bringing into existence and opposing the most powerful trades union of employers the world has ever seen. The Employers' Federation controlled, and does still, no small portion of the wealth of the country. Its leaders are educated and intellectual men; its resources and influence are almost illimitable. How, then, can any body of manual workers, for the most part individually of small intellectual calibre and of equally small means, think to maintain a successful contest with such a body? The attempt has been made, and has ended, as was foreseen and as could not otherwise happen, in the most complete defeat of the Amalgamated Society of Engineers. This union is in a similar predicament to the Seamen's Union. Its funds are exhausted, its influence gone, and its leaders discredited.

The strike was marked by some curious features. There were, of course, the usual attempts to "arbitrate," when really there was nothing upon which to arbitrate. There is a precious and typical piece of modern legislation providing for arbitration and conciliation—an utterly absurd and, as the event has proved, useless measure. Mr. Ritchie, the President of the Board of Trade, essayed to "arbitrate and conciliate," but, after a futile attempt, wisely withdrew to foreign parts and hedged discreetly in his utterances. It was curious, too, and not a little amusing, to note the behaviour of public men during the strike. If ever there was a time when the people concerned wanted a leader who would stand forth undismayed, and tell those misguided engineers that their action was foolish and was bound to result disastrously, it was during this strike. No one appeared. A few public men uttered some platitudinous drivel, such as: "they deplored the present lamentable dispute," or piously wished "that wiser counsels would prevail," and so on; others carefully kept out of the way and sent subscriptions—they feared for their popularity, and with reason. There will be many changes among these M.P.'s at the next general election. The attitude of the Press was no less curious. A few papers, such as the *Times*, *Standard*, and some others, took a decided and firm line from the first, and did much to convince the men of the utterly hopeless nature of their demands. The best service was, however, rendered by our contemporary, *Engineering*, which in a series of well written and masterly essays, reviewed the whole progress of modern trades unionism and the effect of the latter upon our productive capabilities. We trust that these valuable papers will be reprinted and circulated wherever working men congregate. The banal attitude of the *Daily Telegraph* needs little remark. The pandering of that journal to "the man in the street" is too well known to require comment. The *Daily Chronicle*, as all can imagine, especially distinguished itself. In the early days of the strike the *Daily Chronicle* prophesied a speedy success for the men, and prepared to celebrate the event in pæans of joy. The sacred banner of "labor" (*sic*) was duly wagged, and copious streams of diluted Socialistic ink and twaddle flowed from the pens of the staff. As matters progressed, the *Daily Chronicle* became suspicious, then doubtful, then frankly pessimistic, and, finally, it indulged in hysterical wails of despair for the cause of "labor," and had to confess that it had again wrongly gauged popular feeling. In the provinces, where working men take some interest in local politics and seem to exercise more political power than do those of London, and where newspaper competition is very keen, the newspapers, as a rule, maintained an attitude of what they are fond of terming "judicial reserve"—not a manly, not an exalted attitude to adopt, but, under the circumstances, an eminently prudent one. Many newspapers and many members of Parliament will, we think, have to seriously reconsider their politics. As one consequence of this strike, opinions on industrial questions range themselves into two distinct groups, clearly demarcated. Every candidate for public office in future—from a beadle to a guardian and from a member of a School Board to a Cabinet Minister—will have to declare whether he believes in the principles underlying and governing the Employers' Federation or those of Modern Trades Unionism, also somewhat euphoniously called Collectivism, or Progressive Legislation on Industrial Subjects. The one means free trade and the right to conduct one's own business in one's own way, and also the right of an employer and an employé to make what bargain they please as regards hours and price of work; the other means a crude and reactionary form of protection and restriction of output, and is an insidious form of tyranny both to employers and employed. Those who have, whether capital, brains, or handicraft are required to share the control of what they have with those who have not or who have but little. There can be no compromise in these conflicting principles. As is well-known, a prominent employer lately hedged on this matter and so lost his election to a North country seat. If one of the effects of the strike is to clear the air on these matters much good will result. This is essentially the age of compromise, not only in politics, but in the principles which underlie them. Not a few thoughtful people see in this love of compromise-in-everything-policy a decadence in our national spirit. Be that as it may. That it is possible to compromise on such conflicting principles as mentioned seems to us impossible. Parliament will no doubt essay the task, but the faith in the merits of Parliament is diminishing rapidly. As the Bishop of London is reported to have said lately: "It took 700 years to produce our Parliament, and what could be more deplorable than that which we now behold?" An opinion which we cordially endorse.

In one special respect this strike has been unusually interesting and instructive, in that it indicates an advance in civilisation. In the Middle Ages such a dispute spread over such a wide area would have resulted in civil war. In the early part of the present century it would have meant riots and the destruction of property. The military would have been requisitioned to keep order, and, as has been the case on more than one occasion, the streets of many of our provincial towns would have been like small battle-fields. The late strike — foolish and fatuous as it was, and entailing as it did much suffering—was conducted by the workers with a moderation and obedience to the law which cannot be too highly commended. Cases of violence and intimidation were very few. Such good conduct was the admiration and envy of all civilised governments. Even he of the "mailed fist" was impressed. Costly as has been this strike, it has taught the working man some useful and needed lessons, one of the most important being that every man in a really free country has a natural right to learn any trade, and to get his living by the pursuit of any trade, and to sell his labour for any price he cares to accept. Lastly, in all callings, no matter what, the natural law holds, "the tools to him that can handle them." G. H. L.

TREMENDOUS EXCITEMENT IN FLEET STREET.

A FEW evenings back an electric cab was proceeding down Fleet Street with a fare when, owing to a defect in the rear axle, the cab came to a standstill and it was found impossible to move it. It was placed alongside the pavement at Shoe Lane, the fare alighted, and the driver went for assistance. This trivial accident soon became noised abroad. The newspaper offices belched forth a crowd of fervid and curious journalists, who surrounded the cab and began forthwith to take copious notes. The cab being an automotor-vehicle seemingly excited the feelings of these journalists to a startling degree; many were overcome (with "Scotch"), and others manifested considerable emotion. War correspondents at last found something, so they thought, worth describing. A stranger attracted by the excited and surging crowd asked a scribe what was the matter, the scribe replied: "A motor-car has broken down and we are all very much shocked, because accidents never occur to horse-drawn vehicles." The news of the mishap had caused a big crowd to assemble, and the police had to take extra precautions. In order that a full, true, and descriptive account of this terrible mishap should be transmitted with the least delay to the ends of the earth, a telegram was sent to the Postmaster-General, who gave permission to run a temporary wire from the Strand Post Office to the private bar of a well-known "hotel" near Wine Office Court—much resorted to by journalists. On the bar of this "hotel" a Morse sounder and transmitter were fixed. Special correspondents of the *Daily Mail*, the *Morning*, and other papers after that kind, distinguished for their unfailing integrity and veracity, kept watch and watch near the scene of this awful cab disaster, retiring at intervals to the before-mentioned "hotel" to report to the man in charge of the wire, who bore a striking resemblance to the chief reporter of the "Daily Gusher," a paper well known for its sensationalism, and also to obtain spirituous stimulus to enable them to withstand the awful mental strain. Nothing, however, occurred, and next morning the cab was quietly repaired and taken away. In the meantime some really thrilling descriptions were being set up by the compositors. So important did the *Daily Telegraph* consider the affair that, not content with a harrowing and mendacious account, they actually had a leading article on it. The leader bears evident signs of having been written under very great emotion. The writer's mental excitement must have been terrible. It was no doubt the electrical cab that caused it. He and the other scribes who so distinguished themselves on that fatal night have our deepest sympathy, and we trust that electrical cabs will never again be the cause of such an amount of exaggeration and nonsense. A few days before this accident occurred, a horse attached to a trolley in a street at Newcastle took fright and ran away. It collided with a tram-car; one girl was killed on the spot, and four persons injured, and yet not one of the daily papers supply a really thrilling description of the accident; neither does the *Daily Telegraph* give a leading article about it.

Referring to this trivial cab accident, the *Electrical Review* says: —"The daily Press would seem to be short of matter just now judging by the amount of attention given to the mishap with an electric cab in Fleet Street. It is not altogether the right thing to prejudice the general public against these vehicles before they have had a fair trial, but this seems a very likely result of some of the high-falutin and imaginative accounts which have been printed regarding what is officially termed the skidding of the hind wheels. The only damage to the vehicle seems to be the straining of one of these wheels, and the following day the cab was working as usual. The daily sensationalist made it appear that the cab was smashed to pieces, and half of Fleet Street ploughed up."

THE THAMES PASSENGER AUTOMOBILES.

In the Automotor for November we discussed the existing river service and pointed out its deficiencies. We also made several suggestions for the design of new vessels for this service. We now learn that many of these suggestions are being adopted in three new vessels for the Thames river traffic now being built by the Thames Iron and Shipbuilding Company, at Blackwall, and these vessels are each 120 feet long, and are now in an advanced stage of completion; they are being fitted with water-tube boilers. Elaborate accommodation has been provided for passengers, and the scheme of construction followed will allow of passengers being able to use the entire upper deck, a large section of which in the old boats has been taken up by the boilers and engine-room skylight. It is understood that electricity will be used for lighting purposes. The boats will have a speed considerably in advance of those that carried on the service in previous years.

COMPARISON BETWEEN HORSE-KEEP AND MOTOR-KEEP.

M. D. Creuzan, President de l'Automobile Bordelais, writing to *La France Automobile*, makes the following interesting comparison:—

Daily Keep of Two Horses.

	Francs.
Food, hay, &c.	5·0
Litter	1·0
Smith	0·30
Harness	0·50
Rent of stable	0·50
Veterinary, &c.; repairs to carriage, stable, and harness	1·15
Total	8·45

Daily Cost of an Automotor Vehicle.

Daily journey, 30 miles.

	Francs.
6 litres petrol	2·10
Oil waste, &c.	0·15
Repairs	1·00
Use of rubber tyres, &c.	1·25
Total	4·50

Daily saving by using an automotor, 3·55 francs.

If the reader will turn back to the Automotor for October, and read up the article on "Kelvin's Law of Economy," and apply the above figures or others to any given case, a most instructive and accurate conclusion will be reached, viz., that *it is always much cheaper to use an automotor vehicle.*

NOTES OF THE MONTH.

The Church Army is endeavouring to raise a sum of £400 wherewith to purchase an automotor vehicle for use in country districts.

The Hackney Vestry has deferred for six months the further consideration of the proposal to consider the advisability of adopting carts and vans driven by electrical or other automatic motors.

On January 21st, Mr. William Angus, J.P., of Newcastle-on-Tyne, was elected president, and Mr. Andrew W. Barr, secretary, of the Institute of British Carriage Manufacturers for the ensuing year.

The Watt Memorial Lecture, given at Greenock on the anniversary of the great engineer's birth, will this year be delivered by Professor Thorpe. The subject will be "James Watt and the Discovery of the Composition of Water."

The motor vehicle is becoming a favourite mode of conveyance with members of "the Profession." La Belle Magicienne Company have two in which Mdlle. Patrice and her suite travel from town to town, and so prevent the poor railway directors from earning a few pounds.

It is said that some American capitalists have been so impressed with the utility and success of automotor vehicles for postal work that they have formed a Company, called the Motor-Wagon Company, with a capital of 5,000,000 francs, to construct postal automotor vehicles.

The Essex County Council have passed a resolution strongly in favour of the construction of a light railway for Ongar, Dunmow, and Yeldham. The proposed line will be 27 miles in length, and will serve a purely agricultural district which is greatly in need of railway facilities.

From the *Madras Standard* we learn that a motor-car has arrived in Allahabad, and achieves a high speed, and appears to run smoothly, and is a comfortable carriage. Babu Veru Madhava Das, who is exhibiting it to the public, is, it is stated, trying to introduce motor-cars into that country.

The production of aluminium in the United States in 1897 amounted to 2,000 short tons, or 4,000,000 lbs., against 1,300,000 lbs. in 1896. This was entirely the production of the Pittsburgh Reduction Company, which continues to control the manufacture of this metal in the United States.

In a recent issue, *Country Life* says:—"Motor-cars and bicycles have played havoc with the price of certain classes of horses, such as light hackneys and roadsters, but Shires seem to keep up their price well. There appears to be a constant demand for heavy draught horses, at good and remunerative prices."

During 1897, exclusive of warships, 591 vessels of 952,486 tons gross—viz., 545 steamers of 924,382 tons, and 46 sailing vessels of 28,104 tons—have been launched in the United Kingdom. The warships launched at both Government and private yards amount to 48, of 95,465 tons displacement. The total output of the United Kingdom for the year has, therefore, been 639 vessels of 1,047,951 tons, a decrease of 207,000 tons as compared with 1896.

THE record life for a tramway rope is believed to have been attained by a special crucible steel rope made by Messrs. George Craddock and Co. It worked for 90 weeks and two days, or 111,712 cable miles, on the Bourke Street line of the Melbourne Tramway and Omnibus Company. The total length is 18,000 feet, and its circumference 3⅝ inches.

ABOUT 5,086 tons of horseshoes were exported from Norway in 1896, as against 5,319 tons in 1895, almost the entire quantity being from Christiania. Great Britain and France, where shoes are used not only for horses, but also for donkeys and oxen employed as beasts of burden, divided almost the whole exportation between them in about equal quantities.

IN the shops of the Russian Locomotive Company in Charkow the first locomotive has recently been finished, a fact which may be of some interest, because the said firm is the first of its kind in Russia that is working almost exclusively with Russian capital, has been built and is managed by Russian engineers, and has among its workmen and employés not a single foreigner. The Company is reported to have got the supply of 488 locomotives for the Russian State Railways, to be delivered within the next six years.

A NEW use for sawdust has been discovered, in that it can be employed in the manufacture of calcium carbide, the chief source of acetylene gas, under the process patented by Professor Wilson, of St. Catherine's, Ontario. By this process, says an American contemporary, all refuse from saw-mills can be rapidly converted into carbon. This is powdered and mixed in equal quantity with limestone, and the mixture then subjected for ten hours to an electrical current strong enough to boil iron. The result is calcium carbide. The mass is broken into small lumps, and in that form is shipped to consumers.

THE materials required to make a London and North Western locomotive have recently been totalled up, and the quantities of each work out as follows :—Coals, 57½ tons ; steel scrap, 28 tons ; pig iron, 24 tons ; Swedish iron, 6½ tons ; copper, 5 tons ; coke, 4½ tons ; spiegel, 2¾ tons ; cast-iron scrap, 1½ tons ; limestone, 18 cwt. ; tin, 4¾ cwt. ; manganese iron, 1 cwt. ; red ore, 1 cwt. ; lead, 83 lbs. ; zinc, 76 lbs. ; phosphor bronze, 70 lbs. ; chrome, 30 lbs. ; aluminium, 13 lbs. ; antimony, 4 lbs. Although the component materials weigh in round figures about 140 tons, the finished locomotive only scales about 45 tons.

SAYS the *Midland Daily Telegraph* :—" I learn that the Local Government Board, being appealed to by the County Council of Warwick with regard to autocars, reject the idea that they should be registered and numbered, as this requirement would have a tendency to seriously interfere with the motor-car industry." Bravo, L.G.B. A new industry which, owing to its extreme youth, is essentially timid and shy, does not want hampering about with all manner of restrictions, or it will give us the go-by. Autocars are subject to quite sufficient drawbacks already. There is no need to quite frighten and harass them off the road."

AN important step is being taken to establish a service of motor-cars in the West of Scotland. A Company is being formed, the object of which is to provide motor-car service and hiring establishments in Scotland and elsewhere. The Company have ordered 12 cars as a commencement, and to start them in regular brake service in such popular watering-places as Dunoon, Rothesay, Largs, Millport, and other suitable districts. The cars will each carry about eight persons. It is intended to establish runs of about four miles each way, the journey being performed within an hour. The North of Scotland is also moving in the matter, The Links and Parks Committee of the Aberdeen Town Council have recently received a letter from Messrs. Stirling (Limited), Hamilton, offering to provide a service of motor-cars from the centre of the city to the bathing-station at the sea-beach, on condition that the Town Council guaranteed that they would not start any other service for at least five years. The committee were not prepared to give such a guarantee, but indicated their willingness to allow the Company every facility for running cars, and a shed at the beach for the storage of the vehicles.

CONTINENTAL NOTES.

AT the works of M. Thomas 100 vehicles are being constructed.

MM. TH. CAMBIER ET CIE. are at present constructing 50 motor-vehicles.

THE firm of M. E. Delahaye has been converted into a company under the title of Delahaye et Cie.

THE Company working the Krieger patents for electrical motor-vehicles has a capital of 4,000,000 francs.

THE Société des Ateliers Germain has acquired from Madame Levassor the patents of the Daimler "Phœnix" motor, and has commenced operations at Monceau sur Sambre.

IN order to lessen or avoid the smell given off by automotors using petrol, M. Chevalet proposes to affix a kind of scrubber to the exhaust. According to experiments, considerable success has been achieved.

IN order to avoid the disagreeable smell given off by acetylene lamps, a writer in *La France Automobile* recommends placing a few drops of turpentine essence (essence de térébenthine) in the lamp; this is said to effectually destroy the objectionable odour.

THE death is announced from Paris, at the age of 71, of M. Ernest Bazin, the inventor of the roller boat, which was described in our columns last May. We predicted failure for this vessel, and our anticipations were realised. M. Bazin was also the inventor of the electric submarine lamp, and a number of mining improvements.

THE Commissioners of the Paris 1890 Exhibition have classed cycles and automobiles with horse-drawn carriages. An absurd thing to do, and about as sensible as classing an Egyptian chariot with an express locomotive. Naturally this stupid mistake has excited intense disgust among automobilists, who threaten to recede from participating in the Exhibition.

A DEPUTATION from the Automobile Club of France has been officially invited to attend the heavy motor-vehicle trials to be held in Liverpool in May next, and the whole of the members of the French Club have also been asked to be present at a banquet which will be given at Liverpool, in honour of the visit of the French automobolists, by Sir David Salomons and the committee of the Liverpool Centre of the Self-Propelled Traffic Association.

IT is said that a powerful French company has addressed a simultaneous request to the Governments of France, Belgium, and Holland for powers to establish a system of electric traction along the navigable highways of the three countries, so as to form an international network extending from the Rhine, through Holland, and as far as Marseilles through the Eastern departments of France, making use, for the purpose, of the navigable highways of the three countries. It is stated that the Banque de Paris et des Pays Bas is interested in the enterprise.

DOINGS OF PUBLIC COMPANIES.

The Manufacture of Motor-Cars.—In *re* Bradbury and Co. (Limited), Oldham.—On the 7th inst., in the Lancashire Chancery Court, a petition was made by Mr. Maberly and Mr. Tweedale, on behalf of Messrs. Bradbury and Co. (Limited), bassinette manufacturers, Oldham, to have the articles of association amended to enable the Company to extend their business to the manufacture of bicycles, motor-cars, &c. The Vice-Chancellor allowed the petition.

The Electric Metal Working Syndicate (Limited).—We are informed that Messrs. Scott, Anderson, and Beit, of Royal Insurance Buildings, Sheffield, have been appointed sole agents for the Voltex process of electric welding, brazing, &c., for the following counties:—Yorkshire (south of a line through Whitby, Northallerton, and Richmond to Kirkby Stephen), together with the entire counties of Lancashire, Nottingham, Derbyshire, Staffordshire, Cheshire, Worcestershire, and Warwickshire.

A Vast Engineering Concern.—The United Ordnance and Engineering Company (Limited) has lately been formed. It is practically a combination of the Fairfield Shipbuilding Company, of the Clyde; Messrs. Easton, Anderson, and Goolden, of Erith; Chas. Cammell and Co, of Sheffield; and Messrs. Schneider et Cie., of Creusôt; the latter world-renowned firm has lately undertaken the manufacture of the well-known Canét ordnance. Messrs. Frith, the well-known steel makers, are also in it. In short, this is probably one of the most powerful and influential commercial concerns in the country. The Armstrong-Whitworth "combine," as the Americans would say, comes first, then the Vickers and Maxim firm, and now the Ordnance and Engineering Company. Each of these firms can undertake the construction of a first-class battleship, including guns and armour, without going outside. On the board of the latter Company we notice the names of Professor Elgar, the designer of the Cunard "Lucania" and "Campania," Mr. Chas. Cammell, the "steel man," and Mr. K. Baynes; while wealth, at any rate, is ensured by Mr. McCalmont, the millionaire. Admiral Nicholson, the late Naval Commander-in-Chief at the Nore, also sits on the board. It is perfectly well known that one of the by no means least important influences which have led to the formation of this and other powerful combinations in mechanical industry has been the necessity of meeting the modern form of aggressive trades unionism. These Companies, with their vast resources and influence, could maintain their positions when, as individual employers, they might be ruined. That the public believe in such combinations as tending to preserve industrial peace is shown by their eagerness to become shareholders.

Hastings Cycle and Motor-Car Company.

The shareholders in this Company met at an adjourned meeting last month. Alderman Glenister, who presided, explained that at the previous meeting a committee of inquiry was appointed to look into the state of the Company, and the first business of that meeting was to receive their report.

Mr. St. John said that the investigations were not quite complete. A firm of valuers had been engaged to carry out an independent valuation which had not yet been completed, and until it was finished it was impossible to make a report. He moved that the meeting stand adjourned for 14 days.

The extremely vague report of the Company's "consulting engineers" can hardly inspire confidence.

London Electrical Cab Company.

On January 25th an issue was announced by the London Electrical Cab Company (Limited) of the balance of 86,388 £1 shares at a premium of 2*s*. 6*d*. per share. Of the total share capital of £150,000, 63,612 shares have already been issued, and the prospectus states that, by arrangement with the vendors, the proceeds of two-thirds of the shares already issued were retained for working capital, and the balance of one-third only was paid to the vendors on account of the agreed purchase price, namely £50,000. The proceeds of this issue are to be similarly dealt with, so that the working capital will continue to be two-thirds of the total share capital issued. The Company was formed in November, 1896, and it is stated that although the outlay up to date includes the cost of altering and adapting the buildings in Juxon Street, Lambeth; fitting up the same with electrical plant, machinery, &c.; also all preliminary expenses and the cost of the cabs now on the streets, and parts of further cabs, the Company still have at their bankers nearly half the working capital received. It is pointed out that a much larger number of cabs might have been placed upon the streets within the same period, but in the interests of the Company it was decided to first practically test a smaller number, and that it is with the object of still further increasing the number of the Company's vehicles that this issue is made.

We think it would have been only fair to the shareholders to have given some of the working figures of the last few months, together with a report showing how the accumulators and the Lundell motor have stood the strain required of them.

A Great Horseless Carriage Problem.

The *nominal* market value of Great Horseless Carriage Company's £10 shares is at present 2*s*. 6*d*. Under the reconstruction scheme now going on this 2*s*. 6*d*. will therefore secure:—

Six Motor Manufacturing Company's £1 shares, 17*s*. paid;
Four British Motor Syndicate Preferred £1 shares, 17*s*. paid; and
£1 British Motor Syndicate Debenture.

Find the real value of each class of *security*—save the mark—taking into consideration the liability of 30*s*. accompanying the half-crown investment.

New Issue.

The Electric and General Investment Company (Limited) offered on February 8th for subscription, on behalf of the British Electric Traction Company (Limited), 10,000 six per cent. cumulative preference shares of £10 each of the latter Company at £12 10*s*. per share. The British Electric Traction Company was formed in 1896 to acquire the business of the British Electric Traction (Pioneer) Company, and to develop electric traction in the United Kingdom and elsewhere, and is now engaged in furthering its objects in connection with a number of tramways and light railways in various parts of the kingdom. The authorised capital of the Company is £600,000, divided into 30,000 preference and 30,000 ordinary shares of £10 each. The whole of the ordinary shares have been subscribed and paid up in full, and the present is the first issue of preference shares.

New Companies Registered.

[Under this heading we give a full list of new Companies registered which take power to make, deal, or become interested in any manner in automotor vehicles.]

	Capital.
Abel Morrall, Ld. (Studley and Redditch)	£50,000
Austen's Patent Wheel-Making Machine, Ld.	75,000
Brayton Oil-Motor Co., Ld.	100,000
Co-operative Cycle Manufacturing Co., Ld.	10,000
Cycles, Ld.	10,000
Delacroix Motor Syndicate, Ld.	60,000
Edward Preston and Sons, Ld. (21, Whittall Street, Birmingham)	50,000
Endurance Motor Co., Ld. (18, Hertford Street, Coventry)	1,000
Hoffmann Manufacturing Co., Ld.	100,000
Home and Colonial Cycle Supply Co., Ld.	5,000
Langdon Davies Electric-Motor Co., Ld.	70,000
Madeloic Motor-Carriage Co., Ld. (Scotch Co.)	25,000
Maxim Autocar Syndicate, Ld.	5,000
Motor-Carriage Supply Co., Ld.	12,000
Motor Manufacturing Co., Ld.	300,000
New Raleigh Cycle Co. (Spain), Ld...	100,000
New Rock Cycle Manufacturing Co., Ld. (Sheffield) ..	10,000
Northern Counties Electric and Motor Co., Ld.	10,000
Pneumatic Hub Syndicate, Ld. (Scotch Co.)	12,000
Saxton and Davies, Ld.	10,000
Speed Indicator Co., Ld.	10,000
Wolverhampton Tyre Syndicate, Ld.	1,000

CORRESPONDENCE.

*** *We do not hold ourselves responsible for opinions expressed by our Correspondents.*

*** *The name and address of the writer (not necessarily for publication)* MUST *in all cases accompany letters intended for insertion or containing queries.*

ELECTRICAL ROAD TRACTION.

To the Editor of The Automotor and Horseless Vehicle Journal.

Sir,—The electrical cab appears to be a complete success, and very great credit is due to Mr. Bersoy and others, but the fact must not be overlooked that circumstances have been favourable to it. They have mainly been tried on the smooth thoroughfares of London, and there has been no snow to contend with. On country roads, which often vary from bad to worse, and where ultimately an enormous development in electrical traction will take place, the jolting and straining of machinery and serious waste of tractive power caused by road inequalities and obstacles will have to be considered; and what is now to the motor-car enthusiast comparatively trivial, will be of financial importance when our great road traction companies are formed. To overcome these difficulties no springs can ever compete with large pneumatic tyres, or with pneumatic wheels. The pneumatic tyres hitherto tried for heavy motor-cars have had too restricted an air space, and also required a dangerously high air pressure, which nullified their power of absorbing road obstacles. No doubt, if they are made very large they may appear ugly at first, but the public soon grow accustomed to novelty in form; the appearance of the pneumatic cycle tyre was against it when it was first introduced, but now a cycle looks strange without one. With respect to pneumatic wheels, Mr. Radcliffe Ward and other electrical engineers have proved that, as now made, they can carry the heaviest weights at the same air-pressure as an ordinary cycle tyre.—Yours truly, "Progress."

January 22nd, 1898.

[We are obliged for the sensible remarks contained in the above letter. We must point out, however, that the London electrical cabs are not designed for other than very good roads. So far they are very efficient. For ordinary roads, under such conditions as mentioned by our correspondent, they would hardly answer, as the power would soon exhaust the storage. As regards tyres of the pneumatic type, these are, after all, but an indifferent contrivance. Much can be done in perfecting spring suspension.—Ed.]

INQUIRY FOR STEAM TRACTOR.

To the Editor of The Automotor and Horseless Vehicle Journal.

Sir,—I would be very glad if you could inform me where to buy a horseless motor to drive a small tramcar a distance of 11 miles daily. It may be by electricity, oil, or gas. The car is to carry 10 passengers. There is on the line a gradient of $1\frac{1}{4}$ per cent.

Please send the prices and catalogues of the motor for 1, 2, 3, and 4 H.P.—I remain, yours truly, O. Cavour,

Resident Engineer of the Leopoldina Railway.

[Makers of motors will no doubt notice the above.—Ed.]

INSTRUCTION IN DRIVING STEAM TRACTORS.

To the Editor of The Automotor and Horseless Vehicle Journal.

Sir,—Having been a reader of your Journal from No. 1, and being interested in road locomotion, I should like to learn to drive a steam motor wagon, such as the one illustrated in the December number of your Journal, or any similar one. Could you kindly tell me how I could learn? I am at present steering traction engine.

Wishing your paper and efforts every success,—I am, yours faithfully, E. J. Walter.

Corton Denham, Sherborne, Dorset.

[We would suggest that you place yourself in communication with makers of steam tractors, and offer your services; there is really little to learn.—Ed.]

THE PRICE OF THE DAIMLER MOTOR.

To the Editor of The Automotor and Horseless Vehicle Journal.

Sir,—I shall be obliged if you will give me the names and addresses of different concerns who use the Daimler motors in their auto-cars. I am contemplating buying a car, and am of opinion that the Daimler are most practicable; and the only question is, who can supply it cheapest, as the price, as far as my experience teaches me, is their chief drawback. Your attention in correspondents' column, or by post, will oblige,—Yours truly, Edgar Wrightson.

The Nine Elms, Hinckley, Birmingham.

January 5th, 1898.

[We really have no such information at our disposal. We should say that if the Daimler Company's price is too high, it is hardly likely that the price asked by their licensees would be lower.—Ed.]

PHOTOGRAPHS AND PICTURES OF AUTOMOTOR VEHICLES.

À Monsieur le Redacteur Automotor and Horseless Vehicle Journal.

Monsieur,—Je suis chargé par le Comité de l'Automobile Club de France de réunir les photographies et gravures de toutes les voitures automobiles.

Cette collection remontera aux modèles les plus anciens et sera continuée au fur et a mesure des perfectionnements de cette industrie.

Je viens donc vous prier de bien vouloir contribuer à enrichir ces intéressantes recherches, en me faisant parvenir une ou plusieurs photographies ou gravures non collées de chaque type de ces voitures, format 13 × 18 au moins, papier platine de préférence, en mettant au dos votre nom, l'année de la construction et la force du moteur.

Ces documents seront classés par année et collés dans des albums déposés à la bibliothèque de l'Automobile Club. Certains modèles anciens et particulièrement curieux pourront être encadrés, mais pour le moment je ne m'occuperai que des albums.

J'espère, monsieur, que nous aurons le plaisir de recevoir votre collection.

Je vous serai reconnaissant de me faire savoir le plus tôt possible si je puis compter sur ces précieux documents que vous pourrez me faire parvenir à mon domicile, 7, Rue de Greffulhe ou au Cercle.

Si vous possédez en outre des photographies représentant les voitures à l'arrivée des courses, les réunions de Meulan ou d'autres beaux instantanés rappelant des souvenirs d'automobilisme, ils seront également les bienvenus.

En attendant, veuillez agréer, monsieur, l'assurance de mes sentiments distingués.

Raoul Lemoine, Artiste-Lithographe.

Automobile Club de France,
4, Place de l'Opera, Paris.

[We have pleasure in publishing the above request, and make no doubt that those of our readers who have photographs, &c., of automotor vehicles will send them to M. Lemoine—at least, we hope they will, as such a collection as suggested would be of very great value and interest.—Ed.]

Steam Automobile Fire-Engines.—Hull is apparently the first city in Great Britain to recognise the need of automobile fire-engines. This is not due to any municipal enterprise but to the foresight of the North Eastern Railway Company, which has very extensive premises at Hull, and, as the latter is a great timber port, the need for very efficient means of fire extinction is very plain. The new engine, which has already satisfactorily emerged from a series of severe tests, has been made at the North Eastern Railway Company's works at York and will form one of the fire-engines which the Company have at Hull, and there is no doubt that others will soon be built. The engine can travel 15 miles an hour, has been brought to a dead stop half-way down a steep hill, and has been manœuvred with the greatest ease within the limits of a 50-feet turntable.

AUTOMOBILE CLUB OF GREAT BRITAIN.

A General Meeting of members was held at the Club-house, 4, Whitehall Court, London, S.W., on Wednesday, February 9th. The meeting was largely attended, and was presided over by Mr. Roger W. Wallace, Q.C., Chairman of the Committee.

The accounts to December 31st last and the budget for the current year having been approved and passed and the revised rules having been adopted, it was announced that there remained only a limited number of vacancies in the roll of founder members, and that as soon as this had been filled it was proposed to impose an entrance fee and to increase the subscription.

Immediately after the termination of the meeting, the first house dinner took place in the Club dining-room. The dinner was attended by upwards of 100 members and guests, and was presided over by the Right Hon. Lord Suffield, K.C.B., a member.

The following members and guests were present:—The Right Hon. the Earl of Galloway, K.T., the Right Hon. the Lord Justice Clerk of Scotland (Lord Kingsburgh, C.B.), Mr. Roger Wallace, Q.C., Mr. Frederick R. Simms, Messrs. John Allen, A. Fairlie Allingham, Captain Ironside Bax, Messrs. W. Worby Beaumont, M.I.C.E., M.I.M.E., Mr. G. H. Little, C.E., Thomas J. Bennett, Walter C. Bersey, Alfred F. Bird, A. J. Boult, Frank Briggs, E. H. G. Brewster, Hugh Campbell, Herbert C. Capel, T. Clarkson, Charles Cordingley, Captain A. B. Cunningham, Messrs. John Freeman Dyson, Jesse Ellis, H. J. Gully, H. Hewetson, W. W. Hodges, William Bell Ingram, Ernest M. C. Instone, Maurice Jenks, Claude Johnson, F. Shaw Kennedy, J. Henry Knight, S. Howard Lane, Dr. W. W. Leadam, M.D., Mr. A. Ledger, Colonel J. W. Lee, Messrs. Wm. J. Leonard, Jas. W. McManus, J. Melling, C. Harrington Moore, A. F. Mulliner, A. C. Newstead, C. Oppermann, J. W. Parr, B.A., A.I.E.E., G. Foster Pedley, Thos. John Perrett, James Dennis Roots, Captain George D. Sampson, J.P., Messrs. J. Lyons Sampson, Oscar Schölzig, Dr. C. E. Shelley, M.A., M.D., M.R.C.P., Messrs. A. O. Stopes, Henry H. J. Sturmey, Theodore F. S. Tinne, Cecil F. Twist, E. Townsend, Theo. Vasmer, A. J. Walter, A. J. White, C. Grahame White, W. H. Willcox.

The toasts of "Her Majesty the Queen" and "Their Royal Highnesses the Prince and Princess of Wales and the Royal Family" having been proposed by Lord Suffield and honoured, the Right Hon. the Lord Justice Clerk of Scotland proposed the toast of "The Automobile Club of Great Britain." His Lordship referred to the backwardness with which new ideas have always been received by British people, and, as examples, recalled how the people of Sheffield had done their best to keep railways from running through or near their town; how the original inventor of the electric telegraph was implored by his family to give up so quixotic an idea; and how the prejudice against telephones still existed. Lord Kingsburgh pointed out that for this reason it could not be expected that motor-vehicles would come into general favour at a bound, but he avowed that he was certain the huge advantages of the movement would, in time, tell on the natural conservatism of the nation, and that this system of locomotion would become generally adopted for certain purposes. For these reasons his Lordship had every belief in, and wished for, the prosperity of the Club. The toast having been received, Mr. Roger Wallace, Q.C., whose name was coupled with it, replied shortly, as it was his intention to open the discussion which it had been arranged should follow the dinner.

Mr. Wallace proposed the health of Lord Suffield, and a vote of thanks was passed, with acclamation, to his Lordship for acting as chairman. Lord Suffield having replied, the company adjourned to the reception room of the Club, where the discussion on "The Best Means of Promoting the Utility of the Automobile Club" was opened by Mr. Wallace and by Lord Galloway.

Mr. J. Dennis Roots then read the following paper:—

One of the first things that impresses itself upon an intending purchaser of a motor-vehicle and which is at present one of the chief hindrances to the rapid extension of automobilism, is the delay arising from difficulties in the way of the manufacture. The manufacturer of a motor-vehicle has to make practically every part of the vehicle himself; there is hardly any part, however small, except the body and the springs and wooden wheels, if these be used, that he can purchase in this country to save time in manufacture. If steel suspension-wheels of the cycle type are specified, even these he must either make himself or have made specially. In ordinary carriage-building, the builder makes the body and generally purchases the axles of one firm, the wheels of another, and knows where to purchase all the various parts he may require, whether ironmongery or otherwise. In building an ordinary carriage it must be remembered the chief portion is the body; in building a motor-vehicle the body is a very minor part. Given the motor, frame, and wheels, you may fix upon it almost any kind of body you wish. If anyone should wish to make a bicycle, again, he can purchase every part of the machine wholesale and fit his bicycle together himself. The motor-vehicle builder, however, has not only to design every part of the vehicle himself but to make practically every part himself, with those exceptions stated, even to the necessary ball-bearings. Until a week or two ago, when a firm in Birmingham commenced to make the Ackerman jointed axle, this had to be either obtained in Paris or you must make it yourself.

Now I would submit that the Club might make it known to Birmingham firms, for instance, that various parts, such as large ball-bearings, steering and controlling levers, plated or otherwise, balance-gear, rubber-tyred wheels of the cycle type, and other small parts that are used and usable on almost all cars, might be made with advantage to both purchaser and manufacturer. I know it will be urged that this is one of those things that is entirely a question of supply and demand, and this is true up to a certain point, but there is no doubt a real demand now, yet no English firm manufactures them to my knowledge. Facilities of manufacture will be the greatest aid to the industry, will reduce the present comparatively high price of the vehicle, and generally extend automobilism. Representations backed by the weight which such an enlightened body as the Automobile Club confers might be made to a few likely manufacturers. I feel sure that some firms would be convinced of the advisability of being first in the field in what is going to be such an extensive industry.

I hope I am not looking at the subject too much from the manufacturer's point of view, but I would submit that whatever is for the benefit of the manufacturer is also indirectly to the advantage of the public and the purchasers of motor-vehicles. Conducting experiments for the determining of data relative to petrocars and motor-cars appears to me to be an advisable extension of the usefulness of the Automobile Club. One of the first points upon which definite information is required by the engineer is the necessary tractive force in pounds required per ½ ton and per ton of gross weight, for I do not think that the latter would be just double the other. This should be ascertained for iron tyres, for solid rubber, and for pneumatics. Also the tractive force for different kinds of roads, ordinary macadam, country road and London macadam road, for these are not, I am sure, the same thing; the tractive force for the ordinary London macadam would be much higher. I am, of course, not speaking of newly-laid macadam. Then, again, the tractive force for ½ ton and for every additional ½ ton up to 3 tons should be determined for gradients commencing from 1 in 20 up to 1 in 7. Definite data on these points would be very valuable. There is a good deal of conjecture about them. During the discussion on a paper recently read before the Institute of Electrical Engineers, opinions varied as to the tractive force required per ton on the level, between 35 and 65 lbs. Of course the amount would vary for different surfaces.

There are various points which will occur to everyone upon which an authoritative statement would be very useful. Some very wild statements have occasionally been made as to the H.P. necessary for petrocars and other motor-vehicles, but the H.P. is, within certain limits, calculable from the tractive force. Local authorities or surveyors might be requested to give the Club information as to the gradients of the steep hills in their neighbourhood.

Perhaps a few comments on the Local Government Board regulations would not be out of place, as such a body as our Club ought to be in a position to tender suggestions when they are up for revision, as they sooner or later inevitably must be. Admirable as some of these regulations are, there can be no doubt they were made in the dark, when hardly any one in this country, including the framers, had any knowledge of the subject. I will call attention briefly to two points in the regulations. It is provided that if the weight of a light locomotive exceeds 15 cwt. it shall have a tyre of 2½ inches wide. Now, in all probability, whether the vehicle be driven by steam or the explosions of benzoline spirit or of kerosine oil, if the vehicle weighs 15 cwt. then it will not carry much more than 15 cwt. That is 1½ tons total. I have measured the tyres of many vans in London which regularly carry a total of 3 tons, and the tyres are only 2 inches wide. The London omnibus, which weighs 33 cwt. and carries a load of about 2 tons, has a tyre of only 2¼ inches for the back wheels and 2 inches wide for front wheels. The inconvenience of this regulation has been impressed upon me recently very strongly, as in designing a kerosine oil motor-van, I have had to add a wholly needless cwt. to the weight of the van in superfluous width of tyre. My other point—the limit of speed to six miles an hour in any city, town, or village is needlessly hampering, and an almost impossible regulation.

Finally, I would with all deference submit to our Managing Committee that it is seriously restricting the usefulness of the Club in closing it at those times when the busy man is most likely to use it—in the evening. And even the man of leisure is not unlikely to desire to use the Club in the evening at those very times when he will find it closed.

Dr. SHELLEY, of Hertford, commented on the mixture of derivation in many words connected with self-propelled vehicles.

Mr. ARTHUR WALTER suggested that amongst the means of promoting the utility of the Club might be included the following:—(1) That the Club should collect and display pictures and photographs of the various forms of carriages supplied by different manufacturers, together with price lists and information as to how long after the receipt of an order the manufacturer could deliver a carriage; (2) That the Club should obtain and place at the disposal of members maps on which should be indicated the various gradients on the chief roads, notes as to the state of repair of the roads, &c., in order that owners of motor-vehicles might know which roads they might safely travel on and which to avoid; (3) That the Club should continue in the attempt recently inaugurated by it to form the register of competent motor-carriage drivers.

Mr. W. BEAUMONT said that the subject of discussion was the best means of promoting the utility of the Automobile Club. It was hoped that the Club would be recognised as the representative of the great industry in automobile construction and use, which without doubt we were now entering upon. It was desirous that the requirements of automobile employment should in the future be represented by a powerful association, and not, as hitherto, by individuals, whose efforts towards obtaining redress or facilities must remain futile, or nearly so, even though individuals were sometimes influential men. We were entering upon an industry which will again draw attention to the importance of perfection of the many thousands of miles of common roads used in the United Kingdom by about 1,500,000 draught horses, and by those who employ over 500,000 licensed vehicles. In the early part of this century the pressing need for improved communication between the great centres in this country had resulted in the employment of engineers to make a few really good roads, good as compared with any previously existing. The birth and rapid extension of railways made further attention to these main roads of communication for the time less necessary, the relief by railways being so great that for generations the work of distribution of merchandise was easily within the power of the means of the old system of transport. The time had now arrived, however, when the enormous growth of inland traffic with the growth of population and manufactures between the railway stations and destinations had once more directed attention to the vast importance of improvement in our common high-roads. The improvement necessary could not be brought about by isolated action, and combined action on this matter should be one of the functions of the Automobile Club, for it could be easily shown that nearly £4,000,000 sterling could be saved per year by road improvements which could be readily planned and carried out by engineers with the means and materials at their command to-day. Just as the time had arrived only a generation or so ago, when turnpike tolls were displaced and the road repairs paid for by means of rates, so will it be seen in the future that a penny of additional rates for road works will return to the ratepayers manifold that penny. Some of the old vexatious and senseless obstruction by opposition to motor-vehicles on common roads still exists; but we have to thank a few of our legislators and a few of the Local Government Board for the difference in the legal position of mechanical road-vehicles now and in the times previous to November 14th, 1896. By men ignorant of the importance and of the possibilities of mechanical road transport, engineers and freighters and the unprejudiced public have been treated as children whose actions must be under governess supervision, and the restrictive regulations under the old Locomotives on Highways Acts have their reflection even now in the new regulations under the 1896 Act. Engineers and the users of mechanical road-vehicles are told now what they shall or shall not do with regard to the proportion of parts of motor-vehicles. The folly of these attempts to teach constructors and users as to what is best mechanically or for the roads has been so well shown by the action of the old Locomotive Acts that it is time that such attempts at coercion by restriction should cease. As an illustration of this interference in technical details, the destructive barred-wheels of traction-engines was mentioned, the use of which was continued for years after the comparatively harmless wood-shod wheels had been in use in two or three towns to the advantage of everybody, but against rules. It was only recently that the Local Government Board removed this regulation. Repeated representations had been made on this and other subjects but without avail, but under the new Act, and the more enlightened policy of it, and of the Local Government Board, it may be hoped that by the aid of the Automobile Club the removal of restrictions useless and harmful may be more quickly effected. Further, the Automobile Club, through its members in different parts of the country, should be able to represent to the different local authorities the requirements of the whole motor-vehicle constituency, it should collect information to be dealt with at headquarters as to facilities desired and road improvements necessary, and it should record the doings of those favourable to automobile progress and of those who by blind prejudice, or by abuse of official position, would make progress impossible. By these and various other means, the Automobile Club should be able to represent throughout the country the requirements of mechanical road transport, and thereby represent the interests of the vast majority against the misguided prejudices of a very small turbulent minority. The interests of the users, direct and indirect, of the automobile were, in the matters of road improvements, equally those of the horse-owner and of the cyclist, and just as the cycle can now, through its organisations, speak with authority, if not with command, so must all the automobile world be able to show that progress in mechanical transport on roads means national progress in transport economy, and that when it makes a request on its behalf, that request must be listened to as a requirement. These, Mr. Beaumont said, were some of the subjects with which the Club should concern itself, and it was in connection with these that every member could take his part in promoting its utility. With reference to mechanical details of construction of motor-vehicles he would not then speak, as it was the broader question that was under consideration.

Mr. HENRY STURMEY suggested that the Club should—(1) Endeavour to facilitate foreign travel in motor-vehicles by obtaining from foreign governments permission for motor-vehicles to be admitted into their respective countries free of duty, say, for instance, on the same terms as apply to cycles in certain European countries. (2) That the Club should keep an eye on any attempts at legislation which would be deterrent to the advancement of automobilism. (3) With reference to Mr. Walter's suggestion as to maps, the Club should endeavour to obtain a map somewhat similar to that furnished by the Cyclists' Touring Club, but on which the gradients which are in excess of, say, 1 in 9, should be more definitely indicated than in the Cyclists' Touring Club map.

THE LORD JUSTICE CLERK OF SCOTLAND laid stress on the fact that the shape of autocars might be very much improved. The rectangular front should be avoided, and preference given, for instance, to a front similar to the bow of a boat, so that in event of collision there would be a better chance of fending off the person or obstacle collided with.

Mr. THOMAS CLARKSON suggested that the Club discussions might be under two heads:—(1) General, in which members not specially employed in the design or manufacture of autocars might take part; (2) technical discussions of purely scientific and commercial interest. He further suggested that steps should be taken to move the Local Government Board to alter the rule which restricts the width of motor-vehicles to 6 feet 6 inches.

Mr. PETTER made a very amusing speech in which he expressed the hope that the Club would have the effect of removing the prejudice of ladies against autocars and their drivers, since that prejudice was a matter of great pain and concern to himself.

Mr. ALFRED BIRD suggested that the Club might assist members who might suffer from unjust prosecutions in connection with the use of autocars. He further suggested that the Club should institute a competition for designs in the bodies of autocars.

Mr. ROGER WALLACE stated that he was intimately acquainted with a well-known artist, and that he would ask him to suggest a new form for the motor-carriage.

Mr. HARRINGTON MOORE, the hon. secretary, called special attention to the circular which had recently been issued to members asking them to afford information, concerning their own locality and any locality they might visit, on the following points:—(1) Accommodation for motor-carriages and cycles; (2) stores at which petrol and suitable oils may be purchased; (3) electric charging stations; (4) firms who undertake the repair of motor-vehicles; (5) competent motor-drivers. Mr. Moore stated that as some 60 to 70 motor-vehicles are owned by members of this Club, the Club as a body is in an exceptionally good position to obtain this information; and that both in these matters and in the general success of the Club the enthusiastic co-operation of members would mean success. Mr. Moore suggested the formation of a technical committee.

Lord Suffield summed up the general results of the discussion, and announced that the second house dinner would take place on Monday, March 7th, on which occasion a discussion on "The Bearing of Past Invention on Future Motor-Car Designs," will be opened by Mr. Worby Beaumont.

Mr. Roger Wallace announced that it was the intention of the Committee to arrange for lectures to be given, for papers to be read, and to further the social intercourse of members by means of ladies' concerts, smoking concerts, &c.

THE POST OFFICE AND THE MAILS.

We understand that the contract entered into between Messrs. Julius Harvey and Co. and the G.P.O. has been extended. The postal authorities are more than satisfied with the performance of the "Lifu" van, which has effected what amounts to a mental revolution. When it was first tried it had to run the gauntlet of that very large but not very distinguished army of critics who oppose changes of every kind, and who speak of automobilism as "being in its infancy." Thanks, however, to the excellent performance of the "Lifu" van, even the most hostile opponents have had to admit that "there is something in it." We may remind our readers that this van commenced to carry Her Majesty's mails on December 16th last, leaving Mount Pleasant Post Office at 10.30 p.m. and was due at Redhill at 1.42 a.m., and returning to the former office at 4.45 a.m. As a matter of fact, the "Lifu" van has averaged 25 minutes less time than the horse van. What this means to the public is that it will enable the Post Office to make another delivery in that district with but little extra cost. It is in this connection that the advantage is so great. A good automotor vehicle is practically, on good roads and at night-time, an express train, and can be run at a cost of but a few shillings per journey. In this way sparsely-populated districts can be served just as well as large towns. The horse-drawn mail cart is, on the other hand, strictly limited as regards performance, or, in other words, has a very small radius of action, and once it is necessary to have relays of horses the cost of running becomes enormous. The steam or petrol car carries its own energy, and can obtain further supplies at nearly every village.

The Post Office authorities quite appreciate the superior advantages of a good automobile and are encouraging the movement in every way. They have now on trial an electrical mail-van built by the Electrical Cab Company, but the motor mechanism differs in one or two essential details from that used by the makers on the electric cabs. It has been found desirable to replace the four-pole type Johnson-Lundell motor by one of the two-pole iron-clad pattern, in which the field winding surrounds the armature. This type of motor has proved more efficient than the former. There are two armature windings, two commutators, and two series field windings on each motor. The brushes are of carbon, fed end-on to the commutator by a simple flat spring. The capacity of the motor is about 3½ H.P., and the mean working current about 30 ampères. On the armature spindle is a raw-hide pinion having 20 teeth, which gears into the central wheel of the differential gear, this wheel being provided with 62 teeth. To provide for the different speeds of the driving-wheels in turning curves, the counter-shaft is in two halves, each half being driven by the differential gear similar to that employed on the cabs. The other important change is the employment of a driving-chain of the ordinary bicycle pattern in place of the laminated sprocket-chain hitherto used. The cells used are of the E.P.S. Faure-King type, specially made for this purpose. Each cell is 6½ inches square in plan, and 10 inches high, and contains 11 plates, which have a capacity of 172 ampère hours at a discharge rate of 30 ampères. Forty such cells are used, always in series, giving a pressure of about 80 volts. The cells are carried in a single tray, which is slung under the bottom of the van by four suspension links, supported from the body of the van by helical springs under compression. The total weight of the battery is about 13 cwt. The load carried sometimes amounts to 1 ton, and the maximum speed at which the mechanism is intended to drive the van is between 10 and 11 miles an hour.

It will thus be seen that automobilism is making steady progress; designs are being improved upon, and one of the great State departments is directly encouraging it. We cordially congratulate our friends the "Lifu" Company, Messrs. Julius Harvey and Co., and the Electrical Cab Company. We also offer our thanks to Mr. Preece, C.B., the engineer-in-chief of the G.P.O., for the interest and encouragement he has and is giving to the automobile industry.

PAPERS ON AUTOMOBILISM.

On February 7th Mr. Henry Cave read a paper on "Motor-Cars" before the Castle-gate Literary Society. Mr. W. Flint presided. The paper was illustrated by about 70 limelight views, which were kindly lent for the occasion by Mr. J. H. Knight, of Farnham. The lecture was highly appreciated by the audience, and a hearty vote of thanks was given to the lecturer for his services.

On the same date Mr. T. B. Murray, Glasgow, lectured to the members of the East of Scotland Engineering Association on "Electric Motor-Carriages." The lecturer, in his opening remarks, stated that to Edinburgh belonged the distinction of having produced the first electric carriage, which was built by a Mr. Davidson about the year 1842. Mr. Murray then explained how restrictive legislation had prevented progress being made in this country in what must soon be a large and important industry. Having discussed in detail the various parts of the electric carriage, and also the carriage as a whole, Mr. Murray explained the advantages of the Johnston-Murray patent motor for this class of work. At the conclusion of his paper the lecturer showed a series of limelight views, depicting a few historical vehicles and the latest types of American, French, and English electrical road carriages, perhaps the most interesting being specimens of the London Electric Cab Company's vehicles, which have been plying for hire in the metropolis for the last six months.

BRICK ROADWAYS.

In a paper read by Mr. J. Eayrs, M.I.C.E., at the annual meeting of the Municipal and County Engineers, on brick paving for carriage-ways, a system which has become popular in the American cities, "the cost of brick paving must," said Mr. Eayrs, "necessarily depend to a great extent upon the locality in which it is laid and the facility for obtaining the materials, and American figures would be very little guide to English engineers in carrying out similar works. It can, however, easily be compared with wood paving by substituting English bricks for foreign timber. The opinion of American engineers who have had experience in brick-paved roads has been ascertained as to the probable life of the paving; and whilst this necessarily depends very much on the situation, nature, and amount of traffic, climatic and other conditions, those engineers who have had the longest experience and the greatest length of roads under their control are of opinion that 15 to 20 years is the life of the pavement under ordinary conditions. The lowest estimate given was five years, whilst several have stated 50 years. It must not be forgotten, however, that the climatic conditions in America are much more severe than in this country. Engineers are practically agreed that brick paving for carriage-ways is growing rapidly in public favour, some towns using no other kind, and one city is about to take up 3½ miles of cedar block paving to replace with brick. It is claimed that neither granite, asphalte, nor wood can offer so many advantages as vitrified brick as a paving material, and that, if properly laid, it is as noiseless as any other kind of pavement; the surface is smooth without being slippery; it offers a minimum amount of resistance to the passage of traffic, and inflicts a minimum amount of wear and tear on horses and vehicles; it is practically impervious, and therefore perfectly sanitary; it is easily cleansed, and requires less scavenging than any other paving; it can be washed without injury or becoming slippery when wet; is readily taken up and relaid; reasonable in first cost and maintenance; and has a life which compares favourably with other materials, such as asphalte, wood, &c."

President	Sir David Salomons, Bart.
Secretary	Andrew W. Barr, Esq.
President of the Liverpool Centre	The Earl of Derby, K.G., G.C.B.
Hon. Local Secretary	E. Shrapnell Smith, Esq.
Semi-Official Journal of the Association	The Automotor and Horseless Vehicle Journal.

SELF-PROPELLED TRAFFIC ASSOCIATION
(INCORPORATED).

The adjourned General Meeting of the Self-Propelled Traffic Association (Incorporated) was held at the Cannon Street Hotel, on January 20th, 1898. The President (Sir David Salomons, Bart.), occupied the chair, and amongst others present were Messrs. E. Macrory, Q.C., Boverton Redwood, G. J. Jacobs (Guildford), J. H. Knight (Farnham), E. Shrapnell Smith (Liverpool), Thomas Clarke, C. H. Dale (Leicester), W. Hancock, Alexander Henderson (Glasgow), J. T. Hopwood, E. Townsend, Andrew W. Barr, Secretary.

The Report of the Council and the Accounts and Balance Sheet for the year ending December 31st, 1896, were submitted and unanimously adopted.

Mr. H. P. Boulnois and Mr. E. Macrory, Q.C., were unanimously elected members of Council.

Mr. A. R. King Farlow, C.A., was re-elected Auditor.

LIVERPOOL CENTRE.

Owing to several matters in connection with the May trials being still under consideration the official announcements are postponed till next month.

Programme for 1898.

February 22 ..	"An Account of our Trials and Experiments, with the Conclusions drawn therefrom." Mr. D. H. Simpson and Mr. W. L. Bodman, Joint Authors.
March 15 ..	"Steel Springs." Mr. Joseph Bedford (Sheffield).
March 29 ..	Paper: "Recent Improvements in Accumulators and in their Application to Traction on Common Roads." Mr. J. T. Niblett.
April 19 ..	Paper: "Arrangements for the May Trials." The Honorary Secretary.
May 24-27 ..	Trials of Motor Vehicles for Heavy Traffic.

Some Points in the Design of Automobile Vehicles intended for Heavy Traffic.*

Part I (Introductory).

One of the most important wants of the country is a good system, or systems, of cheap internal transport. We constantly have this remarkable fact before us—that produce grown in the uttermost parts of the world is brought to our ports at charges for freight very much less than the cost of carrying the same goods by rail from one town to another but a few score of miles apart. The reason is, that hitherto we have hardly recognised the importance and necessity of a system of cheap internal transport, such as could be used with advantage by the humblest producer. We have neglected our natural means of intercommunication while, as regards artificial means, railways alone have occupied our attention, to the exclusion of other and less costly means. On the Continent we find very perfect means of intercommunication. Railways are not relied on as with us, but canals and natural watercourses are developed to an extent quite unknown in this country, and no such process as buying up a navigation and then closing it by the imposition of prohibitive tariffs—such as we are so familiar with—would be possible. If our means of internal transport are dear, and for the most part restricted to expensive railroads we must not forget that until within the last few decades the necessity of very cheap internal transport was not so apparent.

As you know, an agitation a few years ago resulted in the revision and classification of railway rates, but it is doubtful whether the existing rates can be very materially reduced. Our railways are magnificent undertakings. A very high standard of efficiency is insisted upon, and very properly so, by the Board of Trade in the interests of the travelling public. But this high standard is necessarily expensive. It, however, strikes one that it is hardly an economical thing to send a consignment of, say, cast-iron African cooking-pots from Birmingham to Liverpool over the expensive and billiard table-like roadway of the London and North Western Railway. Neither does American cotton require such an easy and comfortable passage as it gets while journeying from Liverpool to Manchester. With a view to cheapen internal transport, and also with the idea of helping that unfortunate and long-suffering individual the British farmer, we passed the Light Railways Act. This measure has not been as yet taken much advantage of. Its benefits are somewhat discounted by the rigid nature of the regulations affecting construction and equipment. But a light railway, although more flexible than an ordinary railway, does not yet fully meet the requirements of traders. You cannot take a light railway up a back street and load the cars with goods. Its use is really confined to country districts and to act as feeders to the trunk lines. The next means whereby cheap internal transfort can be effected is by canals. This question has been most ably and exhaustively discussed by Mr. Leslie Robinson† in his paper read before the Institute of Mechanical Engineers. From this gentleman's figures it is evident that this important means of transport has been sadly neglected by us. Canal navigation, not by any means on a ship-canal basis, offers probably the cheapest mode of transport we know of. It, however, is limited in its scope. Canal navigation has never flourished in this country from causes only too well known, and which it is of little use to discuss. It would seem, however, that this means of cheap transport is likely to be extended even by those who in the past so foolishly and shortsightedly stifled by all means in their power this means of transport. I am glad to see that the Leeds and Liverpool Canal, under its very able management, is becoming a most useful object-lesson in this connection.

On the Continent, as it is often pointed out, railway rates are low and canal navigation a fine art, and hence goods made in the heart of Germany can successfully compete with ours. One does not see abroad rough goods, such as pottery or metal ware, loaded on railway trucks fitted with pneumatic brakes, carried over an expensive roadway; but one does see a Dutch schooner taken miles up the country by canal to a glass factory, and women and girls load her up with medicine and beer bottles. A few weeks afterwards you will see that vessel in the East India Dock, occupying the berth that used to

* Excerpt of paper read before the Self-Propelled Traffic Association, at Liverpool, on January 25th, by Geo. Herbert Little, Technical Editor of The Automotor and Horseless Vehicle Journal.

† See Automotor and Horseless Vehicle Journal, October, November, and December, 1897, and January, 1898.

be filled by a Blackwall liner, and those bottles come to Liverpool. Yet St. Helen's is not far off. Of course many causes besides low rates operate. Longer hours, lower wages, the employment of female labour, are important factors. We would not think of stationing a woman at a level crossing to flag-signal an express train, neither would we permit women to stow farm produce in railway trucks for conveyance to the market; while as for employing young women to look after very expensive and accurate machine tools in engineers' factories—such as is the case in civilised and Republican France and the United States, not to mention equally civilised and monarchical Germany—it is utterly out of the question. We should be insulting the majesty of that fetish, the British working man, whose handicraft is so ineffably superior to, and so much more valuable than, the brain-craft of the employer, who merely finds the capital and the work.

We now come to consider the means of effecting cheap internal transport by means of automobile vehicles. The merits of this system of intercommunication were, as you know, thoroughly demonstrated more than 60 years ago, but, as I have before remarked, the question of cheap internal transport had not the importance it now possesses, and, besides, the merits of this system were not appreciated by a people almost wholly given over to a debased and discreditable horse worship. I should say that the hostility with which so many persons in all ranks of society regard automobile vehicles does not proceed from any dislike to the new method of locomotion *per se*, but from that remanent barbaric instinct which made our ancestors many thousands of years ago worship the horse.

No animal has ever throughout the ages exercised such an influence upon successive generations of mankind as the horse. Regard for the horse is with us a cult or involuntary worship. In the temples devoted to this cult at Newmarket and elsewhere the horse is studied assiduously by men and women of all classes. These persons vie with each other in their thirst for equine lore. Nearly every daily paper—not, of course, excluding the Liverpool ones—retains the services of a high priest of the cult, who prophesies daily. On certain festivals the cities empty themselves in order that the citizens—old and young, rich and poor—may witness contests between horses. Seeing, then, how intense and deep-seated, how universal—at least among Saxon races—is this veneration for the horse, we cannot exclaim if we have rights somewhat tardily and grudgingly accorded to a movement which will largely relegate the horse to an inferior position in the minds of the public.

At the time referred to the horse had then, as now, a very large and influential army of worshippers who behaved much like the Ephesians of old. They went up and down the country crying, "Great is the horse of the Englishman," and such was the political power of these horse-worshippers that automobilism was effectually checked and stamped out by various legislative enactments which it is difficult to believe do not date from the Dark Ages. The effects of this unintelligent and illiberal policy are now to be seen in the frightfully depressed condition of the agricultural industry, farmers complaining that heavy rates for railway carriage and the absence of the means of cheap internal transport effectually prevent them from growing many foodstuffs at a reasonable profit. Other effects are to be seen in the flooding of the country by cheap and inferior foreign-made articles. Nations no more than individuals can play the fool without sooner or later paying the penalty. We are now repenting for our treatment of Gurney, Hancock, and Dance.

As I do not wish to discuss historical details more than I can help, I will not deal with the causes which led to the passing of that belated measure the Locomotives on Highways Act of 1896. A few criticisms on it may be allowed, as an impression prevails that in its way it is a fine specimen of modern legislation. I wish to dissociate myself entirely from any such opinion. On the contrary, I regard it as a decidedly unsatisfactory thing. The Act has been described as "a broad-minded and liberal measure, meeting the necessities of the time and giving full scope to the mechanical instincts of our people," and so forth.

This Act was passed at the latter end of the century, when it should have been a law 60 years ago. Instead of being a simple measure repealing in a single sentence all and every kind of restriction upon mechanical traction it is a long-winded screed written in a spirit of minatory permissiveness, as though the House of Commons was not at all sure that even yet they were doing a right thing in sanctioning anything which would detract from the value of their favourite fetish, the horse. Throughout the Act ample scope is afforded to local and judicial authority to gratify personal idiosyncrasies and prejudices, and already there have been not a few cases of most unjudicial prejudice against automotor-vehicles displayed by magistrates and others.

At first sight the Act apparently encourages automobilism. As a matter of fact, while it permits the employment of light horseless vehicles, it discourages the use of heavy ones. Thus we are limited to a weight of 3 tons for the latter, and a maximum speed of five miles per hour.

These limits, there is some reason to think, were fixed for the purpose of rendering the Act inoperative. The Government took counsel with its engineering advisers, and it was told that it was impossible to build an automobile vehicle that would be powerful and strong enough to carry loads of 5 tons and upwards at reasonable speeds on a weight of 3 tons.

This belief is very prevalent among English engineers, and I have heard even respectable mechanical authorities say it cannot be done. Whether the Government purposely fixed this weight as a maximum in deference to the wishes of those who follow the cult of the horse, and who constitute (like the brewing interest) such a powerful majority in both Houses, for the purpose of rendering the Act nugatory, I am unable to say definitely. But my own conviction is that this is the reason of fixing upon a 3 tons' limit, and my object to-night is to show how we can if not drive a coach and horses, at any rate drive a heavy automobile vehicle through this Act of Parliament.

The Act has many objectionable features, one of which is that power to vary its provisions is entrusted to a State department. We have only to remember the unfortunate results to the shipping industry that have ensued as a consequence of allowing the Board of Trade to practically vary at its will the Merchant Shipping Act by Orders in Council to see what harm may and possibly will result from giving these extensive powers to the Local Government Board. The evil of this is that important alterations in executive details can be made in deference to the wishes of a sufficiently powerful but possibly hostile interest, and possibly also against the actual wish of Parliament. Another objectionable feature is that it gives very large powers to local authorities. For my own part, I think the less power local authorities are entrusted with the better, because local power invariably means the ascendency of local prejudice. Thus a county council, or other similar body, can practically, if so minded, wholly prevent automobilism within its jurisdiction. All it has to do is to build a weak bridge across a brook strong enough for light traffic and then issue a bye-law under the Act preventing the use of it by heavy automobiles on the ground that its use would be attended with danger to the public. It can thus stop access to the Queen's highway to any automobilist; the latter having no redress of any kind. Similarly a local authority can obtain power to absolutely prohibit the use of automotors, and in many towns and districts where the agricultural and horsey interests prevail, this power will undoubtedly be exercised. My objection to this devolution of authority to local bodies is that it puts power into the hands of men who are not always qualified to exercise judicial impartiality; with no appeal from their decision. For instance, can we suppose that a parish, town, or county council, the majority of whose members are either directly interested in the use, breeding, or sale of horses, or depending largely upon the patronage of those who constitute the local "hunt," would exercise strict judicial impartiality in the use of automobile vehicles, and in the interpretation of the law relating to them? I think not.

Still another objectionable feature of the Act is its harsh penal nature. Under the statutes relating to ordinary vehicles the most serious offence is met with a fine of £5, and minor offences with fines of 5*s*. to 20*s*. and upwards, but under the "broad-minded measure" referred to, any—even the most trivial—breach can be punished with a fine of £10. This is but another instance of the unjust discrimination against the users of automobile vehicles.

As regards taxation, too, we see the same injustice. It has for years been a dream with successive Chancellors of the Exchequer to impose a van and wheel tax. Many of you will remember some years ago that Sir W. Harcourt, or was it Mr. Goschen, proposed this imposition. You will also remember the howl of protest and indignation that went up from peers, tradesmen, and costers in denunciation of the proposal, which the Minister promptly and discreetly dropped. While, however, the tradesman's cart is still a sacred thing, not to be taxed by avaricious Chancellors, an automobile is, if used as an ordinary carriage and weighing over 2 tons, made to pay three guineas.

In another respect I think the Act faulty. We are allowed under it to haul one wagon, such wagon not weighing more than 1 ton. Now to answer the requirements of Liverpool it would be necessary to carry at least 5 tons on that wagon, and the heavy wagons at present in use, and which are employed to carry from 3 to 5 tons, weigh from 30 to 35 cwt. It would, I think, be difficult to design a cheap and useful wagon weighing much less than this. A 1-ton wagon or lorry is at best a light affair and not adapted for heavy loads.

The Act is, however, a small mercy, for which in these days of dilatory legislation we must be thankful, and a meed of thanks is due to those public men who, against a powerful opposition, succeeded in getting it through at all. Speaking generally, it must be confessed that the legislation affecting transport, whether by sea, by rail, by canal, or by automobile vehicles, has been narrow in its views and repressive in its tendencies, and has generally had the effect of placing the home trader at a disadvantage as compared with his foreign rival. I am afraid that the question of internal transport will ere long force itself upon the attention of Parliament. We see an increasing dependence upon foreign foodstuffs, the reason for which is the absence of means of cheap internal transport. We are also losing our hold upon not a few manufactures which we have hitherto regarded as peculiarly our own. Many reasons may be adduced for this—superior foreign technical education, in some cases superior means of production, but the principal one is the heavy cost of transporting the raw material from the outports to the interior and sending it back as the finished product. As I have said, we cannot expect much reduction in railway rates. We must develop our canals and remove every restriction upon automobilism.

Before proceeding further it will be as well to consider existing practice in handling heavy weight on ordinary roads.

The railway companies and the large firms of carriers employ a heavy description of van weighing from 30 to 35 cwt., and which costs new from £50 to £70. On this van they will place loads varying from 3 to 5 tons according to the nature of the route. From my inquiries I learn that as far as possible the loads are such as can be comfortably hauled by two rather than by three horses. A pair of horses might cost £80 to £100 in London, but the magnificent horses one sees in Liverpool could not, I am told, be purchased for much less than £60 to £70 apiece, and will cost at least £1 per week each for maintenance, &c. We can then say that a horse-drawn van capable of carrying about 3 tons on the flat, its weight will be—

Van	1·5 tons.	Cost.. ..	£70
Two horses at 12 cwt. (each)	1·2 „	„	120
Total weight	2·7 tons.	Total cost	£190

I give these figures as to cost with all reserve, as such information is regarded as secret by the railway companies, why I do not know.

On a very good road, practically level throughout, such a van could haul a load of 4 to 5 tons at a speed not exceeding 2 miles per hour. On a gradient, such as is common enough in Liverpool, of 1 in 20, the load would have to be halved and three times the number of horses employed. It will be advisable to devote a few words as to the actual power of a horse. Very much has been said and written about the ability of a horse to exert at times a pull many times in excess of its normal pull. This power is, however, spasmodic, and, although useful in starting a heavy load, does not suffice to haul that load continuously up an incline. Neither is this power exercised very intelligently. The horse, unlike a steam-engine, does not increase its pull with an increase of speed. I am not disposed to unduly depreciate the horse, which will always be a useful motor for many purposes. Heavy traction is, however, the thing the horse is least adapted for.

Let us now consider what actual power is required to haul any given vehicle on any given road at any given speed, and overcoming a given resistance. Many empirical rules have been given for this, but the power required for any vehicle admits of very accurate determination when the data are known.

Let H.P. be the actual power required;
W the total weight to be moved in tons;
V the speed in miles per hour;
r the resistance per ton of vehicle;
a the angle of grade;

then—

$$\text{H.P.} = (r \cos a \pm 2240 \sin a)\ \text{W.V.}/375.$$

If, instead of having the angle of grade given, we have the gradient expressed as 1 in m, then we may write—

$$\text{H.P.} = \left(r \pm \frac{2{,}240}{m}\right) . \frac{\text{W.V.}}{375}$$

As regards the resistance, this may be made to include the axle-friction. The resistance on good macadam roads would appear to be from 40 to 60 lbs. per ton; but in order to ensure ample power on bad roads, and also to form a useful basis of comparison, I have taken a standard resistance of 100 lbs. per ton. On the excellent Liverpool streets I should say the resistance does not exceed 50 lbs. per ton.

As regards the H.P., this is that required on the brake, and the quantity found would, in the case of steam-engines, have to be increased by 20 per cent. in order to obtain the H.P. as indicated, or as that actually developed by the steam. The actual power required to haul a van weighing, with its load, 4½ tons 2½ miles per hour up a gradient of 1 in 17, such as is not uncommon in Liverpool, against a mean resistance of 100 lbs. per ton, is 6·9 B.H.P. nearly. Now, here we can elucidate a rather interesting point.

It is a matter of surprise and incredulity with many people that such large mechanical horse-powers are required as compared with the actual animal power. Really the explanation is simple. When Watt fixed the H.P. at 33,000 foot-lbs. per minute, he obtained his data from the exceptionally heavy and powerful horses used in breweries, but their best average work was only 22,000 foot-lbs. per minute, and Watt increased this by 50 per cent., so that our engineers' H.P. is 50 per cent. higher than the actual. If now we deduct 50 per cent. from the amount found in this case, we have 2·45 actual animal H.P. as that necessary; in other words, to haul this load three powerful horses would be required. On the flat this load would require 3 B.H.P., or 1½ actual animal power; in practice two horses would be employed.

In order to haul a vehicle such as I propose, weighing in working order 11 tons, at a speed of five miles per hour on the level, 14·6 B.H.P. would be required, or eight horses, assuming for the moment that these could exert the same pull at this speed as at lower speed. As a matter of fact, the pull of a horse varies inversely as the speed, and according to the data given by Trautwine the pull of a horse at five miles is about 50 lbs., or one-fifth of that at one mile. Without labouring this point, it will be seen that it is a commercial impossibility to haul by animal power a weight of 11 tons on a good road at five miles per hour, needless to say, hauling this weight up a 10 per cent. grade at half that speed is utterly out of the question. One, indeed, only has to see the number of horses required to haul a light field gun and its ammunition wagon at a respectable speed to see how impossible it is to deal with heavy weights at even comparatively low speeds with horses. If anyone will apply the formula given above to any number of cases and then apply, what I lack, the knowledge of the commercial side of the question, it will, I think, be found that the present usual loads—3 to 5 tons on the flat and 2 tons on a gradient, hauled by three horses at 2 miles per hour, about represents the economical limit of horse traction. On the other hand, for loads (total) not exceeding ·75 ton the horse is perhaps, in all round respects, superior to any mechanical motor at present prices. The actual economy in any given case can be, however, very accurately determined by Kelvin's law of economy.*

We will now pass on to consider briefly the features of the most recent examples of heavy automobile vehicles. Below I give the particulars relating to the Scotte and De Dion et Bouton vehicles, known officially as Nos. 1 and 14 respectively. These vehicles, with others, took part in Les Poids Lourds Competition, held last year at Versailles, and which I was permitted to attend. Both these vehicles are driven by steam motors and both have been eminently successful, and have answered every purpose for which they were designed:—

	Scotte, No. 1.		De Dion et Bouton, No. 14.	
	lbs.	tons.	lbs.	tons.
Weight of vehicle, empty.. ..	9,240	= 4·125	9,438	= 4·213
„ on fore axle	5,632		4,312	
„ on rear axle	8,558		9,240	
„ of water	1,540		990	
„ of coke	220		264	
„ of two men	308		308	
„ of tools	212		88	
„ of cargo	2,640		2,464	
Total weight in working order ..	14,190	= 6·335	13,552	= 6·05
Wagon	65·1%		69·6%	
Cargo	18·6%		18·2%	
Fuel, stores, &c.	15·6%		12·2%	

* *See* AUTOMOTOR AND HORSELESS VEHICLE JOURNAL, October, 1897.

	Scotte, No. 1.	De Dion et Bouton, No. 14.
Fore wheel, diameter	30·3 ins.	31·49 ins.
Rear " "	35·4 ins.	39·37 ins.
Wheel base	9·35 ft.	—
Length of vehicle	17·11 ft.	20·8 ft.
Breadth "	5·57 ft.	6·56 ft.
Weight of boiler	880 lbs.	1,056 lbs.
" contained water	110 lbs.	—
Steam pressure	171 lbs.	199 lbs.
Grate area	1·39 sq. ft.	1·9 sq. ft.
Heating surface	Not stated.	60 sq. ft.
Weight of motor	594 lbs.	660 lbs.
Type " vertical, 2-simple	4·33 × 4·5 ins.	—
Revs. per minute	400	600
H.P.	14	25
Consumpt of coke per hour per square feet of grate	67·6 lbs.	30·6 lbs.
Consumpt of water evaporated per pound of coke	5·3 lbs.	3·1 lbs.
Consumpt of coke per ton mile of total weight	2·2 lbs.	1·1 lbs.

Daily Expenses (Full Load).

	Scotte, No. 1.	De Dion et Bouton, No. 14.
Daily distance (miles)	68·2	89·9
Tons	6·05	5·87
Ton miles	412·6	528
Daily expenses, interest (6%), repayment of capital (15%), maintenance, repairs, wages, fuel, water, stores, and all expenses	2·04*l.*	1·98*l.*
Effective ton miles	68·2 × 1·2 tons = 80·8	90 × 1·12 tons = 101·06
Freight per ton mile	$\frac{2·04}{80·8}$ 6·048*d.*	$\frac{1·98}{101·06}$ 4·704*d.*

The figures are interesting and instructive. You will observe that what shipping people would term the dead weight capacity is but 18·6 and 18·2 per cent. respectively, while the wagon accounts for 65 and 69 per cent. of the total weight. In horse vans, the van and horses will weigh, perhaps, not less than 50 per cent. of the gross. Judging from the practice which obtains in naval architecture, these figures are very poor, and I suggest they can be much improved on. You will also notice that there is not very much difference in the leading features of the design. Although the De Dion vehicle has nearly 80 per cent. more H.P., the weight of the motor is but very little more; on the other hand, the pressure is higher, and the revs. also. We thus see the advantage of employing high pressures and high revs. You will also notice that the consumption of coke and water is much less in the case of the De Dion vehicle, and at first sight one can hardly credit the great difference. The figures are, however, official, and have been since checked. The consumpt of coke per ton mile is just one-half in the case of the De Dion vehicle. I do not profess to be able to explain these discrepancies, but they are, I think, worth analysing. They seem to me to indicate the necessity of very careful design in the engines and boilers, and mechanism generally. The De Dion had very good and copious lubrication, and this, I think, is one factor.

As regards the expense attached to running these vehicles, you will see that the cost per ton mile is in the case of the Scotte nearly twice that allowed in the estimate prepared by your Association for the forthcoming trials in May next, while in the case of the De Dion vehicle the cost is 51 per cent. higher. We must, however, remember that these vehicles were not built for the carriage of very heavy goods. They are, in fact, steam omnibuses, and hence there is a good deal of space unused. Had these vehicles been built as steam lorries their ton miles would have been very much increased and the cost per ton mile much less. These examples are, however, most useful to the designer. Among other things that they demonstrate is the practicability of employing high-steam and fast-running engines with absolute certainty and safety.

Another point about these vehicles. We have been assured that vehicles weighing much over 5 tons will rapidly destroy the roads. Now, these French vehicles are not new, they have done excellent service in all weathers and on every kind of road; but I have not seen in the French Press a single complaint about them damaging the roads, and on inquiry I find that although the performances of these vehicles have been most attentively watched, and trials have been carried out by the officers of that excellent branch of the French public service, Les Ponts et Chaussées, yet beyond recommending the adoption of these vehicles nothing has been said about the roads. I mention this as it is very necessary that local authorities should not allow themselves to be biassed or prejudiced in the matter, and I would suggest that the Self-Propelled Traffic Association should obtain the French Government reports on the subject so that the most authentic information should be at the disposal of those interested. It must be borne in mind that the French roads, being laid out and constructed largely for military eventualities, are much superior, as a rule, to ours. In France and in other Continental countries the object in view is the transport of heavy siege guns rather than farmers' wagons. Before quitting the subject of these French vehicles I think we may congratulate the distinguished French engineers MM. Scotte, De Dion, Bouton, Le Blant, and others upon whom the mantle of Gurney, Dance, and Hancock has apparently fallen.

Part II.

In designing an automobile road carriage for any particular purpose the principal considerations are the weight to be moved and the speed to be attained. As regards the material to be employed in construction, the nature of the motive power, the kind of fuel, &c., these will depend partly upon the foregoing and also upon local considerations. The problem we have to solve to-night is to sketch out the leading features of the design of an automobile wagon which shall carry a cargo of not less than 7 tons, which shall maintain a speed of five miles on the flat on ordinary good macadam roads, and which shall climb a 10 per cent. gradient on the same description of road at a speed of not less than 2½ miles per hour. As you all know, the maximum weight of vehicle allowed under the Act is 3 tons. We will assume the following weights:—

Vehicle, empty	6,720 lbs.	= 3 tons.
Cargo	15,680 "	= 7 "
Water	1,000 "	= 0·82 ton.
Coke	500 "	
1 man, 1 boy, tools, and oil	350 "	
Total	24,250 lbs.	= 10·82 tons.

Or, say, 11 tons in full loaded working order.

Motive Power.—I suppose the use of steam as a motive power, as in the present state of our knowledge no other form of energy possesses the preponderating advantages that steam does for heavy work. Although for lighter service oil-engines and storage cells are efficiently employed. Oil-engines using preferably what is known as "heavy oil" are being largely used for the purposes of marine propulsion, and are made to develop as much as 90 H.P. for yachts and trawlers, in both of which unskilled, or perhaps it would be better to say unprofessional, labour is so largely employed. Oil-motors are a convenient and inexpensive source of power, but for the purpose under discussion they are not suitable, because their use involves various trains of gearing in order to obtain variations in speed. Being unidirection, a reverse motion means the use of more gearing, while at small loads the motors are uneconomical, and, lastly, they do not permit that variation in speed and power that steam-engines do.

Steam for heavy road traction, as also for railway traction, and, to coin a phrase, water traction, is beyond question the only suitable source of energy known at present.

Dealing now with the power necessary to propel our proposed vehicle, we apply the formula mentioned before, and in order that our automobile shall be able to take any ordinary road we assume a resistance per ton of 150 lbs. This is about three times that which obtains in the Liverpool streets. Running out the simple calculation, we find that to propel this vehicle at five miles per hour on the flat requires 22 B.H.P., while to propel it on a 10 per cent. gradient at half this speed requires 27·2 B.H.P. Allowing 20 per cent. for loss in internal friction and in transmission, these figures become 26½ and 34 I.H.P. respectively. That is to say, that we must have a boiler and engine that will give off not less than 35 I.H.P. continuously, if required.

Here I would draw your attention to our formula:—

$$\text{H.P.} = (r \cos a \pm 2240 \sin a)\ \text{W.V.} / 375.$$

You will observe that the power required varies directly as the resistance, as the weight, and as the speed. In other words, the power follows a "straight line law." This is, as compared with the law that obtains in steamship performance, charmingly simple. In the case of steamships the power varies according to a law which has not yet been accurately determined.

Since, as we have seen, the power required in an automobile vehicle varies as the weight and speed, we may say, as a rule to be carried in the memory, that on ordinary roads on the flat, where R=50 lbs. usually, ·133 H.P. are required to propel a vehicle weighing 1 ton at a speed of one mile per hour. A better rule, and one which takes into account the worst kind of roads, is to allow ·4 H.P. per ton per mile.

The next point is to decide upon the material of construction. Limited as we are to a weight not exceeding 3 tons, and desirous as we are, on the other hand, of utilising this to the utmost advantage, we are bound to use those metals which combine strength with lightness. Now, the metal which so far combines these two qualities in a greater degree than any other is that alloy known as nickel steel.

Nickel Steel.—For the following particulars I am indebted largely to the paper by Professor Biles, M.I.N.A., read at the last summer meeting of the Institute of Civil Engineers.

Nickel steel is, as its name implies, a combination of steel and nickel, the latter being about 3½ per cent. It is adopted by our Admiralty for torpedo-boats, and this particular kind has a T. S. of 37 to 43 tons, with a 10 to 15 per cent. extension in 8 inches. Ordinary mild steel plates have a T. S. of 28 to 30 tons; about 14 to 15 tons elastic, and with an extension in 8 inches of 20 per cent.

Mr. Beardmore, who has been mainly instrumental in introducing this alloy, recommends a nickel steel having a T. S. of 52 tons ultimate, 28 tons elastic, and 13½ tons elongation in 8 inches. In other words, such material is about twice as strong as the former.

It is, however, at present somewhat dear, but the price will, of course, come down as the demand and manufacture increase. For automobile vehicle-work, whether these vehicles be light or heavy, nickel steel offers some distinct advantages. While obtaining the same strength in the body or framing, we can put the saving in weight into the machinery and make a more satisfactory job.

In order to assist designers I give the following table which gives the mean result of a large number of tests:—

Mild Steel Annealed.

Tensile	63,000 lbs.
Elastic limit	30,000 „
Elongation	28 per cent.
Contraction	80 „

Medium Nickel Steel Annealed.

Tensile	85,000 lbs.
Elastic limit	45,000 „
Elongation	25 per cent.
Contraction	80 „

According to Professor Biles—whom we may regard as a distinguished authority on naval construction, and who is well known in Liverpool as the designer of two of the fastest Atlantic liners—this allows a reduction of one half in scantlings subjected to tensional stresses, or, allowing for butt connections, a reduction of 33⅓ per cent. in weight. In any automotor vehicle the stresses are naturally very severe, and hence a good margin of strength must be provided in order to guard against any deformation. If we employ mild steel, we should for tension stresses (following Unwin) not permit a higher working stress than 6,600 lbs., which is almost one-fifth of the elastic. Taking the elastic strength of nickel steel at 28 tons, we get 12,500 lbs. as the safe working stress. As a matter of Lloyd's or Board of Trade inspection this, no doubt, would be considered as providing a prudent margin, but we might go as high as 20,000 lbs. and still be within the elastic limit.

For structures such as ships at sea, bridges, railway engines, machines, &c., where any failure of material might entail personal injury, a large factor of safety is not only desirable but absolutely necessary, but for the framing of a vehicle moving at a low speed no such precaution is necessary, and hence for the framing, &c., a factor of safety much lower than would be used for the foregoing structures may be safely employed.

(To be continued.)

PROCEEDINGS OF TECHNICAL SOCIETIES.

Mechanical Features of Electric Traction.*

(Continued from p. 158.)

EXPERIENCE demonstrated that the only effective plan was to attach the motors to an independent truck-frame, and to have all the mechanism of the car entirely independent of the car body. For this purpose an independent truck was introduced, consisting of pedestals secured by centre bars; upon the pedestals the motors were suspended by cross-bars connecting the side frames of the truck together. While these trucks supported the motors independently of the car body, they did not properly support the car body itself, which had increased in length and width. The increased length and width of the electric car, together with the increased speed at which it ran, rendered a stronger and longer truck necessary. At first the old street-car pedestals were fastened to a separate pair of sills. The axle-boxes still played up and down in these pedestals to the full extent of the motion of the car body. This device proved insufficient. The next step in advance was to secure the pedestals carrying the axle-boxes to side frames, which carried the springs supporting the car body. This construction, however, allowed excessive swaying of the car body, owing to the fact of the connection between the wheels and the body not being sufficiently rigid. Moreover, no provision had been made for easily removing the wheels, which required the truck to be practically taken to pieces. The brakes were hung to the upper chord of the truck, the effect of which was that, when the springs were compressed, the brake shoes dropped lower on the wheels, changing the distance between the shoe and the wheel.

The introduction of mechanical motors, occupying so little room that a capacity of 50 or 60 H.P. can readily be placed in the space allowed by the truck, has led to a large increase in the weight of the car body, and a consequent lengthening of the wheel-base. The modern electric-car bodies carried on four wheels are seldom shorter than 18 feet over the end panels, and sometimes reach 22 feet length, exclusive of the platforms, while the whole length of the car over the platforms is from 30 to 32 feet. This increase of nearly 25 per cent. in the length and more than 25 per cent. in the weight of the bodies has been accompanied by an increase of only about 20 per cent. in the wheel-base of the trucks. As a result, a long and rigid spring-base is an absolute necessity for a modern electric truck. Without this the whole stress of carrying both the dead weight of the car and platforms and the fluctuating weight of the load would fall on the car sill and body, and the motion of the car would continually wrench and strain its framing. In the conditions met with in street service the wheel base cannot be lengthened much over 7 or 7½ feet; and on this account a long spring base must serve the purpose of an increased wheel base for the long cars now employed. To obtain easy riding it is necessary that all the springs should be sufficiently light to obviate vertical motion in the car body; consequently these light springs, in order to prevent excessive motion of the ends of the car, must be carried out just as far apart as it would be necessary to carry the wheels if the old horse-car arrangement were adopted for the modern long-car bodies.

To secure the necessary rigidity of the long side frames, and at the same time keep their weight within reasonable limits, different plans have been adopted. In earlier designs it was attempted to overcome the difficulty by casting the pedestal and overhang in one piece, and lengthening the joint between these castings and the bars. Another method consisted in trussing the overhang with straining rods running over the tops of the pedestals, and provided with turnbuckles for taking up the strain as the overhang worked down; but turnbuckles slack off, and the bolted joints wear loose, and a continual wear and rattle was the result. Some makers constructed the side frames of the truck in one piece, by bolting heavy centre-bars to the pedestals. Others again forged the side frame of the truck, and welded the whole together into one piece. But these designs have not proved sufficiently strong to support properly the permanent pressure upon the ends of the overhang, when the overhang is carried out to the length of the modern car body.

The demand for this special class of work brought out a host of devices, of which ten years' experience has sifted the useful from the useless; and it may be fairly stated that the chief principles

* Paper read at the Institution of Mechanical Engineers by MR. PHILIP DAWSON.

involved in the design of a thoroughly good motor-truck, fulfilling all or most of the conditions imposed by electric traction, have now been fully recognised, with the result that the electric motor-truck has been matured to a standard form. Truck building has become an independent business in America, although many car works still make some form of truck for themselves. Rigid frames had been employed in trucks for cars driven by gas, steam, compressed air, or cable grip; but in all of these the conditions are entirely different from those in electric motor-cars. This experience was dearly bought by some of the earlier electric tramways, as was testified by many a scrap-heap composed of trucks which, after running but a few miles, had to be discarded.

The quality of the motor-trucks may mean the success or failure of an electric tramway; and to secure a good truck is quite as indispensable as to use a well-constructed and efficient motor. A motor-truck comprises many parts, the most important of which are the side frames, springs, wheels, axles, boxes, bearings, motor bearings and suspension, sand boxes, brakes, and safety appliances. The following are the essential conditions which must be fulfilled by a truck in order that it may be suitable for electric traction:—

1. The truck must be as light as possible, consistently with rigidity and strength.

2. It must be thoroughly braced, so as to keep it stiff and square without having to depend in any way on the car body. The strains on a motor car in rounding curves, and when passing a change of gradient, are extremely severe: much more so than with horse-cars, where the horses pull the car round on curves, and go slower at a change of gradient.

3. The journal-boxes must be self-lubricating, must require but little attention, and must be dust-proof.

4. The brake action must be simple, effective, and easily adjustable; and the brake shoes must admit of being replaced at a moment's notice, and must be mounted in such a way as not to be influenced by the vertical motion of the car.

5. The truck must be constructed in such a manner as to render access easy to all parts; and to admit of motors, wheels and axles, journal-boxes, brake gear, and other parts being easily removed, without having to dismember the truck. Cross strains on bolts should be avoided as much as possible.

6. The car body must be attached to the truck in such a manner as to be readily removed on loosening a few bolts.

7. Springs must be arranged so as to render the running of the car as smooth when empty as when fully loaded, and to prevent the pitching and rolling motion to which street cars are so liable on sharp curves and rough roads. This is a highly important point, not only for the comfort of the passengers, but also to prevent rapid deterioration of the car wiring and car bodies; deterioration of the wiring is likely to cause grave results to the motors by producing short circuits.

8. An appropriate choice of wheels is most important.

There are three different kinds of trucks: the rigid four-wheel, the radial six-wheel, and the four-wheel bogie for eight-wheel cars. Of these three, however, only the first and third are generally used, the radial truck not having given the satisfactory results which were expected.

Four-wheel Truck.—In the rigid four-wheel truck, where the wheel base is naturally restricted, it is of the greatest importance to have an arrangement whereby the car body is supported as far outside the wheel base as possible, and to diminish as much as may be, by the judicious use of springs, the destructive effect of jolting, both upon the car body and upon the motor equipment. The best modern truck, which has been employed on all the latest and best-equipped British and colonial tramways, is the "Peckham," of which models are exhibited. It has been adopted by Bristol, Dublin, Guernsey, Clontarf, Coventry, Isle of Man, North Staffordshire, Dover, Leeds, Birmingham, Brisbane, Sydney, and other places, and in all cases has given the utmost satisfaction. The support selected as the model for a truck frame is the standard cantilever bridge truss, which experience in bridge-building has shown to be the strongest form of construction. This truss principle has been closely followed in the construction of the Peckham truck; and while various modifications in detail have been made to adapt trucks to the various conditions occurring in street tramway practice, the characteristic bridge form of truss has been strictly adhered to in all of them. The cantilever truck has now come to be regarded as the standard for the best work in the United States, inasmuch as 15,000 are now in use in that country.

As the length of the car body grows greater, the difficulty increases of supporting it properly at the ends without increasing the height of the car platform above the ground. The resistance offered by any truss to bending varies directly as the cube of its depth. If, therefore, the car platform were raised high enough above the street level, it would be an easy matter to support the sills of any car effectually so that it should be impossible for them to droop at the ends under heavy loads. It is an entirely different thing, however, so to support them when the height from the rail to the lower edge of the sill is limited, as it must be in street tramways. Beyond 27 inches, or at most 30 inches, every inch that the car platform is raised above the level of the street makes it so much the more difficult for ingress and egress. This is, therefore, practically the limit in height to which the car body used for city service can be raised. This problem has been solved by the use of extension rods in a way never before applied in street tramways. A second bridge truss is constructed by employing the extension rod as a lower member, and the car sill as an upper member; and this truss is supported flexibly upon the main truck truss. The truss extension rods, instead of terminating, as heretofore, at the extremity of the truck frame, are carried below and around its lower member, and are stayed to the car sill by bolts passing through the truck pedestals and end springs. The angle of the truss extension rods has not been changed in any way to secure a longer support; but as they are dropped bodily lower, they give a wider base of support to the car body than would otherwise be possible. By this method it has been found practicable to carry upon single trucks, with a wheel base of only 7 feet, cars as long as 35 feet.

Other important improvements include the flexible gear, which is so constructed that it allows the cantilever extension truss to be built in sections: so that the portion under the journal boxes can be removed, when necessary, for taking out the wheels and axles, but when in place it makes a continuous truss. This gear also allows of introducing in its upper portion coil springs for supporting the truck frames flexibly upon the journal boxes, thereby relieving the truck frames as well as the car body from the rigid metal contact with the rail, and also relieving the rail from the hammer blow which would attend a rigid connection between the rail and the car body.

Swivel Truck.—The rapid growth of inter-urban lines, upon which the tendency is to use long cars, and the desire on many tramways to use long cars for city work, have resulted in the swivel truck. This is the result not only of railway experience, but also of many years' experience of electric tramway needs. A truck so constructed runs exceedingly easy, the weight being doubly-cushioned by the two elliptical springs and spiral springs over each axle-box. The brake gear is simple, and the shoes are applied with a powerful leverage. The centre of gravity of the trucks has been brought down as low as possible; with cars having straight sides, the body of the car need not be more than 27½ inches above the rail. The wheel base has been kept short and the space between the axles kept clear, so that it is possible to mount two motors on the truck without difficulty. The arrangement of the springs on the trucks renders it possible to remove the bolster and elliptic springs quickly and easily whenever it becomes necessary to examine and overhaul the motors. When this has to be done, the car body is simply jacked up with the bolster and the truck frame can then be run out from under the car. The rivets used in the construction of all these trucks are driven in hot by means of pneumatic riveters under 30 tons pressure.

Motors.—In the early days the motors were all used with double-reduction gearing, with consequent great waste of power in a double transformation of the high armature speed to the low speed of the car axles, an efficiency of 60 per cent. being rarely obtained. At present, good design, workmanship, and materials have brought about such a change for the better that under most conditions an efficiency of 80 per cent. is attained, which remains constant with widely varying loads. When the application of electricity for propelling street cars was first practically attempted, it was endeavoured to apply the existing stationary motor to the existing running gear. The motor and axle were connected by means of belts, sprocket chains, friction clutches, and other mechanical devices, all of which, with few exceptions, have now been abandoned on account of the great expense of maintenance and their low efficiency. Double-reduction spur gearing was first introduced on the experimental line at Woonsocket, Rhode Island, which was jointly equipped in 1886 by the Thomson-Houston and Bentley-Knight Companies; and the advantages of a specially-constructed and self-contained motor-truck were there demonstrated. The high speed and comparatively cumbersome construction of motors at that time necessitated a double reduction in gear between armature and axle, each reduction being about 9 to 1. Thus an armature speed of about 1,500 revs.

per minute gave a car speed of about 15 miles per hour. The later makes of double-reduction motors, of which a great many have been employed both in the United States and in Europe, have done excellent work; but more recent and keener competition in electric traction has resulted in more advanced designs being developed.

The electric motor having demonstrated its ability to do the required work, the next problem was so to improve it as to reduce the working expenses as low as possible. This was partially effected by improving the design of the double-reduction motor, and to a much greater extent by the introduction of single-reduction gearing. The success of single reduction stimulated still further improvement in design; and motors mounted direct upon the driven axles and devoid of all gearing were developed. These, however, have not yet come into practical use for street cars on account of their increased weight and also of their rapid deterioration owing to the absence of any spring support, in consequence of which the motors receive all the shocks due to the comparatively rough tramway lines. The increased weight and rapid deterioration, and consequent increase in original cost and maintenance, have prevented their competing on even terms with improved single-reduction motors.

(*To be continued.*)

Automobilism on Roads.*

There are some millions sterling thrown away every year in the United Kingdom, as a result of insufficient expenditure on roads and means of transport. The fact that there are over a thousand millions sterling profitably invested in the railways of the kingdom is alone a proof of the national importance of the best means of transport of men and materials. We want not only more transport facilities but we want vast improvements in our existing ways of conveyance.

In another place I have said that "with the exception of land and ruins there are few material things of value to man which do not derive that value, in part at least, from transport from their original position." This may seem to be a well worn truism, but it is necessary to remember it when it is urged that cheap means of transit is one of the most important of all the subjects occupying engineers to-day, and one which offers, as it has always done, one of the most profitable sources of investment. It is not generally known that to-day it costs more to send a ton of goods by rail between some places in this country than it cost formerly to send it by horses on the common roads, but everyone does know that the Post Office finds it cheaper to send its parcels by road than to pay the rates demanded by the railway companies for that traffic. The cost of haulage by rail is very small, but the terminal cost and cost of the railway establishments as vast machines, are so heavy that the cheapness of railway transit in many cases disappears.

The requirements under the many Acts for the regulation of railways have, in this country, done much to bring this about; and while for long distances goods are conveyed at cheap rates, the short distance charges are necessarily heavy.

The average cost of transport to-day of goods between Liverpool and Manchester, a distance of 35 miles, is 9*s.* 6*d.* per ton. At the present cost of horse keep it could be done for about 8*s.* 6*d.* by horse, and by traction engines it can be done for from 1*d.* to 1·25*d.* per ton mile, or from 2*s.* 11*d.* to 3*s.* 6*d.* the whole distance to destination per ton at a good profit. The quantities to be conveyed, however, are so enormous, at least 15,000 tons per week, that the common roads would be cut to pieces with a quarter of it in a month. This is only one of many lines of communication where greater facilities are required, facilities which cannot be afforded by main line railways at present constructed and equipped.

The great requirement is a means of transport which will carry and deliver goods at a charge which shall bear some relation to the cost of haulage. There are hundreds of lines of communication which are at present almost without means of transport, but which may be served by railways and tramways constructed under the now very popular Light Railways Act, or by mechanical road vehicles. But with all that can be done by railways or tramways, there are the millions of tons of passengers and goods to be provided for between railway stations and destinations. We call this a mechanical age, and yet we are to-day as dependent on the horse and the common road wagon for the delivery to us of the goods brought from any part of the country as were our forefathers.

We pride ourselves on our road-constructing ability and apparatus, and yet our roads are no better than some of those of the Roman of a thousand years ago, and in our towns we admit this by the construction of tramways which are metallic admissions of the badness or insufficiency of our ordinary roads and pavements. These tramways and their cars we permit in our streets to the detriment of every other form of street vehicle, simply because the tractive resistance on a smooth hard road is less than on a rough road. We find that two horses can haul 42 passengers on a tramway instead of 26 in an omnibus, and so we allow our street traffic to be crippled by the hard-and-fast direction of movement of the heavy cars on these street railways. We put down grooved rails that wrench our carriage-wheels off, and twist our spines, and cut our rubber tyres to pieces. These palliations of bad roads we tolerate rather than make good roads and suitable vehicles to run on them. We are converting our streets into badly managed railways, with level crossings everywhere, and on which railway cars and common road vehicles struggle for supremacy, and horses struggle to keep a footing.

A visit to many of the London tramway and omnibus centres and starting places shows that we are rapidly reaching a density of traffic impossible to contend with, if the streets are to be anything more than lines of free railways, on which every car and omnibus and coal-wagon driver is traffic manager. In most provincial towns this sort of thing has not been reached, but there are several in which it is already obvious, as it is in London, that a large part of all the passenger traffic must be diverted from the streets to railways proper. Nothing but the short distance passenger accommodation must be allowed in the streets, either by tramcar or omnibus. As early as possible motor-cabs and omnibuses must displace horses, so as to save the space now occupied by them, avoid the spreading all over the streets of that which renders them dirty and unhealthy, and avoid the pounding of pieces of the wood, asphalte, and other of the best pavings, with the 3 cwt. hammers of iron-shod horses' feet. More suburban service railways are inevitable, as the population increases, and a big question arises in the selection or even discovery of the best and least objectionable form of railway.

The new deep underground lines will in London do a good deal to meet the increase in traffic in some ways, but they will develop traffic of their own, which for the busy parts of the day will detract from their powers as relief lines for existing excessive street traffic. Extended overground relief is possible in only a few places and directions, and in London these will be all required to relieve the crush which at present characterises such outlets to suburban homes as Ludgate Hill, Liverpool Street, Broad Street, London Bridge, Waterloo, and some of the metropolitan stations.

The city and suburban passenger traffic presents a problem which will occupy engineers and capitalists some time; but it is essential now that the whole subject should be dealt with comprehensively, and not a series of isolated schemes. When all this is done, the distribution of merchandise across towns and suburbs remains. If it is so difficult to provide for the transport of freight which takes itself to and from the trains, how much more difficult is the problem of cheap and expeditious transit of goods, which already employs about 3,000 horses hauling vans and carts of different kinds in London alone!

One of the first necessities is the provision of the best possible of street and road surfaces. At the outset of this problem we are confronted with the difficulty of providing equally for ordinary light traffic with not more than about a ton per axle, and for that up to as much as 2 tons per wheel. The latter must be provided for, and hence the lighter vehicles must accommodate themselves to the best surface obtainable which will withstand the wear of the heavy traffic. Fortunately, the light vehicles can be more readily made to accommodate themselves to the roads than the roads can to withstand uses of the heavy horses and vehicles, so that expediency brings back the problem to one of improvement upon our existing methods of wagon construction and maintenance of roads.

To some of these improvements I may refer briefly. They consist in—(1) Better and more durable surface, well supported on a good foundation. (2) Better methods of maintenance and repairs; and by this I mean constant attention to, and repair of, defects as they appear, just as on a good railway watchful care is bestowed by an ample and well-drilled service of men on every inch of the road. (3) The improvement everywhere of the gradients all over the country, by minimising them to the greatest possible extent.

Before dealing with each of these necessary improvements, it must be pointed out that I am assuming the existing type of vehicles to be

* Excerpt from the inaugural address delivered by Mr. Worby Beaumont, M.I.C.E., M.I.M.E., &c., before the Society of Engineers, London, on February 7th.

more or less permanent, or, at all events, persistent to so great an extent that the roads must be able to carry them. There is, however, I think, no doubt that the time is rapidly approaching when the load per axle on all heavy vehicles will be so far reduced by increased number of wheels per vehicle, that tyres of some yielding but good wearing material will be used for all purposes, and that we shall cease to use our roads and their materials as though they were the beds of mortar mills, traversed continually by 2-ton steel-shod edge-runners. We put minerals into the pans of edge-runner mills to get them ground to powder, and expect that this shall happen at a considerable rate of crushed output. We do just the same thing with the metal on our roads, and hope the same results will not follow; but they do, and so long as we construct roads as we do now, and run heavily-loaded iron-tyred wheels over them as we do, we shall continue to waste millions per annum in road renewals and in horse food and horse flesh.

Assuming, however, that the improvements in vehicles do not occur rapidly, the first and second of the road improvements I have mentioned render it absolutely necessary, in the first place, that the almost inconceivable folly of the practice of making expensive roads and road-beds one week and tearing them up the next, for more pipes and wires or repairs, shall be given up.

We live in an age in which people are every day making more and more use of artificial aids to comfort, and public supply and distribution of necessities. We get heat, light, fuel, and water supplied us by buried conveyors, and buried conveyors take away our sewage and drainage. We receive and send telegraph and telephone messages by buried conveyors, and we send packages of letters through buried air-pipes. All these conveyors we put under our costly street pavements, and generally act as though street and road surfaces were like pie-crusts, the usefulness of which only becomes obvious when they are broken up. The cost of this burial of all the conveyors, the cost of the breaking up of the roads for new burials and renewals, the cost of remaking the roads even in the imperfect way in which it is accomplished, and the time lost to hundreds of thousands of travellers and trades are so great per year that to state the truth would appear like gross exaggeration, and yet in the whole of London there are only a few miles of subways by which the waste is prevented. Subways should be looked upon as a necessity. Until we have them, well-made roads and well-maintained road surfaces are impossibilities in London.

The paving materials at present in use will be difficult to improve. Granite sets, where used, should generally be smaller, as well as properly founded. The macadam roads are, however, very far from being as good as they might be; they are neither properly made, nor efficiently maintained.

It is customary now, for some roads and streets, to make a good substratum of concrete; but the surface seems to be made under the supposition that the broken granite will pack itself, and that granite lumps approaching the size of cocoanuts can be well compacted by the steam roller. Nothing can be further from the actual results. A good deal of crushing and pushing into the simulation of a compact as well as a level surface of granite goes on during the rolling, but the road crust is of uneven density, looseness, and tightness when the roller steams off home. The pounding by horses' feet, and the pressing and grinding by the narrow wheels of ordinary vehicles, fast and slow, then commences. The looser places are tightened; the harder, better packed parts remain more or less obdurate, and the road surface soon becomes a dirt and rock representation of a choppy sea. Every horse-vehicle that rattles over the road in this condition increases the imperfection, and soon the humps and hollows are enough to make themselves felt in a four-wheel cab, or to throw a cyclist off his saddle if he moves at more than two miles an hour. Destruction then is very rapid. Every wheel descending at from six to 10 miles an hour from a hump will hit the hollow, or the sides of adjacent bumps, with a hammer of from half a hundredweight upwards, wielded with a striking velocity of 1,000 feet a second, which the recoil of the carriage springs gives it.

A road once made is left for a considerable time to take care of itself. If our road authorities would spend a pound to save two, they would employ gangs of well-directed men from within a few days of the opening of a newly-made road, to inspect, pack, level, and make good every defect in the stage of its incipient evidence, breaking the big lumps *in situ*, and raising and packing the soft hollows. In this way the light, quick travelling iron wheels would come to the aid of the road-maker, instead of doing nothing but destruction.

For the making of the road it is necessary, in the first instance, that the rock-breaker should be given more work. The granite should be broken up to one-third the ordinary size used in and round London. It should then be packed in place by apparatus that can easily be devised, so that every piece approximately fits against all the pieces surrounding it, as it does when small-sized metal, such as that used in the Cambridgeshire roads, is used. The steam-roller then does better work from the first, and does it more quickly. The attempt to compact the large road-metal often used by the steam-roller is about as successful as an attempt would be to compact, by the same means, the large pebble reaches of the Chesil beach, or that at Aldborough.

(To be continued.)

NEW INVENTIONS.

Claiming particularly to apply directly or indirectly to Motor Vehicles, &c.

Compiled for "THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL" by HERBERT HADDAN and Co., Registered Patent Agents, of 18, Buckingham Street, Strand, W.C., London.

Patents Applied For.

Abbreviations: Impts., Improvements in; Relg., Relating to.

1898.			
Jan.	5.	277.	J. J. H. STURMEY. Impts. relg. autocars.
,,	5.	280.	J. J. H. STURMEY. Impts. relg. autocars.
,,	5.	278.	J. J. H. STURMEY. Impts. cooling devices for motors.
,,	5.	290.	C. T. B. SANGSTER. Impts. valves for pneumatic tyres.
,,	5.	310.	C. G. HARRISON. Impts. joints for tubes.
,,	6.	393.	A. GORSE. Improved driving gear.
,,	6.	400.	C. C. WALKER and W. J. GREGORY. Impts. driving gear.
,,	7.	464.	J. G. A. KITCHEN. Impts. motor-driven velocipedes, &c.
,,	7.	471.	W. H. DUNKLEY. Canopies or hoods for motor-cars, &c.
,,	8.	562.	J. W. BROOKS and S. VALE. Impts. pedals.
,,	10.	685.	M. WERNER and E. WERNER. Impts. hydrocarbon motors.
,,	12.	860.	W. RADFORD and W. SMITH. Chainless driving gear.
,,	12.	916.	B. HIGGS. Driving bands for motor-cars, &c.
,,	13.	943.	J. KETTLE. Impts ball bearings.
,,	17.	1,286.	G. IDEN. Impts. motor-cars.
,,	18.	1,434.	G. C. MARKS (H. ADLER). Impts. tubes for cycles, &c.
,,	21.	1,671.	J H. KIRK and W. JEFFS. Impts. joining tubes.
,,	22.	1,754.	W. H. GRAHAM (H. MAXIM). Impts. motor-cars.
,,	25.	1,973.	M. SHEARER. New or improved motor-cycle.
,,	27.	2,167.	J. MOORES and H. O. FARRELL. Impts. electric generators.
,,	28.	2,234.	G. A. ATKINSON. Driving chains.
,,	29.	2,343.	C. M. JOHNSON. Motor-car.
,,	29.	2,364.	C. and H. ROE and H. KNIGHT. Impts. transmitting mechanism.

Specifications Published.

THE following is a List of Specifications recently published, and obtainable at the Patent Office, 25, Southampton Buildings, London, W.C., at the uniform charge of 8*d*. per copy. Owing to the enormous pressure upon our columns it has been found impossible to deal in any other form with the accumulation of patents now being taken out in connection with automobilism. As far as possible, a selection for special mention is made by the Editor from the more prominent inventions:—

Applied for during 1896.

22,935.	F. W. LANCHESTER, Worcester. Gas and oil-motor engines.
20,046.	O. IMRAY, London. Compressed-air motors.
19,823.	F. PARKER, Brighton. Motor road-carriages.
16,424.	R. HADDAN, London. Motor-cars.
25,202.	J. G. STIDDER, Croydon. Motor road-cars.
25,628.	F. PARKER, Brighton. Motor road vehicles.
30,162.	ROMER and PERKES, London. Explosive gas-motors.
27,207.	E. J. PENNINGTON, Coventry. Electric ignition.
28,751.	E. P. L. MORS, Paris. Transmission of motion.
26,399.	S. READ and M. TURNER, 12, Old Steine, Brighton. Gas and oil engines.
26,877.	G. W. TARVER and E. H. JONES, 53, Clerkenwell Road, London. Handle bars.
26,886.	B. J. JACOBS, Briar Cottage, Yeovil, Somerset. Reversing apparatus.

THE AUTOMOTOR
AND
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CONTENTS.

AUTOMOBILISM AND THE LONDON FIRE BRIGADE.

THE articles which have during the past few months appeared in the AUTOMOTOR have had the effect of stirring up the London County Council to something like inquiry, and lately we have been approached unofficially by various people interested to know what is being done, or rather what can be done, to improve the London Fire Brigade. Long before the disastrous Cripplegate fire we expressed certain opinions* on the plant and equipment of the Brigade which were only too abundantly confirmed by that conflagration. Since then there have been not a few other serious fires, and, as we pointed out months ago, that a fire in London invariably means the total destruction of the premises in which it occurs. It is reassuring to know that not only the members of the L.C.C. but also the officers of the Brigade seem to see the necessity of "doing something." At least, we gather this from various evidently "inspired" utterances and "interviews" that have recently appeared in the Press. For ourselves, we cannot say with certainty what is being done in the matter, as our criticisms having apparently given offence to the members of the Committee and officers of the Fire Brigade, we are not favoured with the indulgence accorded to other journals. Some months ago we wrote Colonel Rotton, the Chairman of the Fire Brigade Committee, asking him to receive one of our technical staff. He sensibly, we think, declined; he said he was "busy." Quite recently, too, Dr. Collins, the Chairman of the Council, likewise declined to be seen. Of course, the reason is sufficiently obvious, and we need not enlarge upon it. To the lay Press the Brigade Committee and staff, for reasons also sufficiently obvious, are *so* accessible and grant interviews gladly. Thus the *Daily News* lately published an account of an interview at Headquarters, and obtained some interesting although for our purpose not very useful information. The *St. James's Gazette* has also been accorded an interview with Commander Wells, R.N., on the subject of automobile fire engines. From the published account we should say that the gallant officer knows but very little about automobilism, while the scribe knows less. Neither are agreed as to the source of energy, but the Commander thinks it will be steam, but not necessarily "coal-steam" (*sic*). We are then told that electricity and gas are too limited. "You can't pull up at a lamp-post and get a fresh supply of electricity." Well, we may ask, why should you? The Commander continues:—"Gas, too, is just as bad; for you've got to carry cylinders, filled at so much pressure—so many atmospheres—and if you run short, you're done for. But oil you can get pretty nearly anywhere, and so you can coal. Then there's another thing quite as important. If your motor-car breaks down—well, you can get a hansom or walk. But that's no use to the Fire Brigade. I must have a machine that can start off at once. Don't you think lightly of the horses—they work all right. You may see a pair look a bit fagged now and again—perhaps they've a young coachman, who hasn't reckoned on the distance he had to go and the weight to be drawn. But you can always rely on the team for a sprint if you want it. Suppose the motor-engine won't budge—well, we're stuck altogether. It's no light matter to think of sending round for a specialist to come and see what's wrong while the house burns down, is it?" I assented, replies the interviewer, and dodged in a question as to the experiments. "Oh, yes," replied Commander Wells; "I'm busy on it; but I can't say we're much beyond the toy stage yet. There's one of my men on it now," he added, stamping sharply on the floor to hint to somebody underneath to moderate his hammering. "We've had things here from the private makers to try, and they're all right, perhaps, but they're no good to us. We're trying to keep in close touch with the market, though we're a bit behind in some ways—there isn't such a thing as a ball bearing in the Brigade, for instance. Still, we're working away; but we're only in the experimental stage yet."

It will be gathered from the above that the ideas of the gallant Commander are rather vague. It evidently does not occur to him

* *Vide* AUTOMOTOR, June and July, September and November, 1897.

that with the aid of a thermal storage plant a steam automobile could "start off at once" and be round the corner before the crew could get on board. We might also tell him that if he thinks he will learn anything serviceable to the public by conducting "toy" experiments with the aid of "one of his men," he is woefully mistaken; he will learn nothing of practical use. We are glad to note that he admits that his charge is "a bit behind in some ways." Yes, a very long bit, we think. Commander Wells is, we are sure, sincerely desirous of improving the Brigade in every way, and so, we think, will be the members of his new Committee. We therefore presume to give a little advice to all concerned. It is no use wasting public money and time in conducting "experiments," whether "toy" or otherwise, for this reason—automobilism consists in the solution of problems of more difficulty than are found in railway engineering; they can only be successfully attempted by well-educated engineers. Commander Wells is not an engineer, and, with no disrespect to him or his officers, we assert that there is no one in the Brigade who is qualified or competent to advise on the construction of fire automobiles. One of the reasons why improvement is so slow in the Brigade is that apparati are submitted to the judgment of men who, good enough as practical firemen, are yet without the requisite scientific and technical knowledge to enable them to form a competent opinion. Thus chemical engines are condemned by men who have never learned anything of chemistry or engineering. Hence any conclusion that may be reached by the Brigade on fire automobiles must be regarded as merely lay opinion. We think that one of the first things the new Fire Brigade Committee should do is to obtain from Commander Wells a statement of his requirements for a fire automobile—that is, the speed to be obtained under various conditions, the volume of water to be projected per minute, and the height of the jet. A specification should be got out, and some leading firms be asked to tender on a liberal basis. There would be no lack of contractors. Firms do not care to spend £1,000 or so on a machine they cannot sell, and hence fire automobiles are not yet used in England—not because the problem of their manfacture has not been solved, but because neither Fire Brigade Committees nor Fire Brigades have yet sufficiently realised the vast possibilities of automobilism. Such bodies are intensely conservative, and regard new means which they do not understand with natural enough suspicion. But to say, as do many such persons, that in an age which has produced the automatic gun, an automobile torpedo, and an automobile street car, a fire automobile cannot be produced, is too absurd for serious discussion. Commander Wells and his Committee may rest assured that if they want fire automobiles they can obtain them.

G. H. L.

LES POIDS LOURDS.

Report of the Commission—IV.

(Concluded.)

IN their concluding observations the Committee express regret that the programme of the competition does not admit of any comparison being made between the different vehicles; for otherwise it would have been possible, when attempting to establish a classification between the competitors, to make a comparative study of the different methods used by the builders to solve the problem. The difficulties to be overcome might have been better understood, and the way to provide satisfactory vehicles in all their parts might have been shown.

However, in order to facilitate research, we exhibit in a single table on next page the net cost of the different vehicles.

It is probably useful to repeat once more that this net cost applies only to vehicles working under the same conditions as in the competition. As much with regard to the nature and outline of the course to be followed as to the speed that it would be possible to adopt effectively during the competition, the competitors have had an absolute freedom of movement quite natural in driving in the open country, but inadmissible in towns where the traffic is subjected to many regulations. The reader must, therefore, be on his guard against calculations which would have for a foundation figures that had not been carefully studied of the ways to follow, and the special exigencies of the services that would be in view.

Much of the working cost mentioned in the following table would have certainly been more advantageous if the builders of the vehicles had better understood the ruling idea of the competition. Probably, in order to gain a few minutes on the distance, they have taken advantage of the minimum of a ton load imposed in the programme to place on their vehicles weights less than that which they have declared elsewhere to be their normal loads. They have thus succeeded in augmenting the speed which serves as a basis for the working of the vehicle, but they have, to their cost, miscalculated the gain.

However, the net cost as calculated shows that, from now, the mechanical traction on roads is capable of securing, with a decided profit, regular transport services for passengers and even goods.

For instance, suppose a service of this kind would be between a railway station and a locality situated at a distance (which, in order to give an idea, we will say is 9¼ miles). Admitting there is a daily traffic of about 40 passengers, with their luggage, as well as some parcels and 8 tons of goods, for the passengers and the parcels the scale of charges of the tramways is as follows:—

1st class passengers	—16	centimes	per mile.
2nd ,,	9·7	,,	,,
Per ton of parcels	68·0	,,	,,

As regards goods, they charge usually—

1st class goods, per ton	—26	centimes	per mile.
2nd ,, ,,	22·6	,,	,,
3rd ,, ,,	16·0	,,	,,
4th ,, ,,	13·0	,,	,,

But the scale of freight charges lately made for the tramway at Vals-les-Bains, at the Aubenas Station, are—

1st class goods, per ton	—34·5	centimes	per mile.*
2nd ,, ,,	51·6	,,	,,
3rd ,, ,,	47·0	,,	,,
4th ,, ,,	39·0	,,	,,

An automotor vehicle can make three journeys daily, coming and going—altogether 56 miles. If there are from 10 to 12 places in a vehicle for an average of two-thirds of its seats occupied, the corresponding movement of passengers going as well as coming would be about 40.

For goods, a vehicle capable of carrying 3 tons, but usually carrying an average of 2, can make two journeys, going and coming, daily—altogether 37 miles. On an average the traffic would be 8 tons. Under these conditions, the daily receipts per mile would be 8·31 francs, or annually 8·31 × 365 = 3033·15 francs per mile.

In the case of a tramway these takings would just cover the cost of working, even with the best and most economical management. As with the original capital used in the making of the road this could not be less than 48,387 frs., or £1,935 per mile, the annual interest and instalments would be entirely in the hands of the department, town, and state, which usually gives a grant of half. Even at the low rate of 4 per cent., the annual interest divided between the town, department, and state would be 1,935 frs., or £77 per mile. On the other hand, the preceding figures show that a regular service established with most of the competing vehicles—viz., those that took part in the trial—would give, with the takings, a daily profit of about 12·9 centimes per mile, corresponding to 12 frs. per day for the 9¼ miles, or 4,380 frs. per annum (£182 10s.).

It must be taken into account that this is an annual net profit of 4,380 frs., after having deducted the interest on instalment of the capital in the calculation above made. In the example we have just given the service can go on without any State grant.

It should be remarked that the first cost of establishing a service consisting of an automobile omnibus, a 3-ton lorry, and a reserve vehicle would be about 63,000 frs., or £2,520.

The very considerable advantages can be seen at once of the substitution of automotors for tramways on roads and to railways when a line of service is yielding too little to pay the original capital used in establishing the line. The great advantage of automotors is that they can be tried anywhere—where tramways are bound to fail. Besides, there is this other advantage, that as soon as the traffic is sufficiently developed to justify the expense of a line the automotor cars can be used in establishing a service in another direction.

Before concluding this long report it is, perhaps, as well to say a few words about the aim of the Automobile Club Committee when

* In this translation we have, as far as possible, rendered the metric units into British in order to facilitate comparison. Francs are taken at 25 = £1.—ED.

Table giving Working Cost per Mile for the Transport of a Passenger with and without 100 *kilos.*, = 220 *lbs., of Luggage, and of* 1 *ton of Goods for the various Vehicles taking part in the Concours of Les Poids Lourds, Versailles*, 1897.

—	PASSENGERS AND LUGGAGE.										GOODS.	
	Omnibus, Scotto No. 1 (Steam).		Omnibus, De Dion et Bouton No. 14 (Steam).		Omnibus, Panhard et Lovassor No. 10 (Petrol).		Bogie Motor, Do Dion et Boutou No. 13 (Steam).		Train, Scotte No. 3 (Steam).		Lorry, De Dietrich No. 8 (Petrol).	Goods Train, Scotte No. 2 (Steam).
Horse-power*	14		25		12		35		16		6½	16
Useful load (cargo)	2,680 lbs.		2,464 lbs.		2,200 lbs.		5,500 lbs.		5,500 lbs.		2,640 lbs.	9,240 lbs.
Commercial speed (m.p.h.)	6½—6¾		8½—8¾		6—6½		6—6½		6—6½		4·8—5·4	4
Daily journey	66 miles		87 miles		63 miles		65 miles		63 miles		54 miles	42 miles
	Working cost per mile.		Working cost per mile.		Working cost per mile.		Working cost per mile.		Working cost per mile.		Working cost per ton mile.	Working cost per ton milo.
—	Passenger with luggage, or 220 lbs. goods.	Passenger without luggage.	Passenger with luggage, or 220 lbs. goods.	Passenger without luggage.	Passenger with luggage, or 220 lbs. goods.	Passenger without luggage.	Passenger with luggage, or 220 lbs. goods.	Passenger without luggage.	Passenger with luggage, or 220 lbs. goods.	Passenger without luggage.	—	—
	frs.	frs.	frs.	frs.	frs.	frs.	frs.	frs.	frs.	frs.	frs.	frs.
One-third loaded	·179	·128	·143	·101	·20	·14	·108	·0774	·13	·08	·963	·920
Two-thirds loaded	·092	·0645	·0726	·0516	·103	·074	·055	·040	·058	·042	·520	·480
Fully loadod	·062	·045	·0484	·034	·0726	·051	·035	·027	·04	·03	·38	·332

* The Cheval Vapeur = ·9863 of the British Unit.

they announced for October, 1898, a new competition of heavy weights on the same lines and conditions.

Several competitors have been rather doubtful about this announcement, thinking that they saw in it an intimation indirectly given to those interested in the business, so that they, the latter, should not organise regular transport services before this new competition gave them the knowledge of the progress made in generators, motors, and other parts of the vehicles. The Committee has never entertained such a thought. They certainly have never affirmed that there is no progress to be made, or that from henceforth everything is perfect in all parts of the automotors; but they do not see any reason why it would be useful to postpone the establishment of any service which can bring in a profit with the vehicles at present in use, without waiting for the utmost perfection.

If builders in a year or two bring to perfection a more economical motor, or one with a greater commercial speed, nothing will prevent their being utilised on lines already established, and with a traffic sufficiently developed to necessitate a better stock. The vehicles first bought will then be used for the service of new localities, or, slightly altered, will be passed over from passenger to goods traffic. Is not this what is done every day on railways? An engine has been made for an express train; when a greater speed is required a more powerful and more perfected one replaces it; then it is used as a goods train until the day arrives when a new one is substituted for the second, which is then passed over to another line. Has any one ever seen an engine destroyed? It will be the same with automotors. More perfect ones will progressively be substituted for those first bought, but these will be made use of for other minor services, as, having been paid for, they will continue to turn in profit.

In announcing a new competition for heavy weights in October, 1898, the Committee wishes to let all builders know that they have at their disposal profitable and economical means of making their vehicles appreciated by those interested, viz., Directors of Transport Corps, and Municipal and County Councils.

MOTOR-VEHICLES WITHOUT DIFFERENTIAL GEAR.

THE Steam Carriage and Wagon Company (Limited), of Chiswick, have devised an arrangement of gearing having as its object the production of motor-propelled vehicles of simple construction that may be readily steered without the use of the so-called Jack-in-the-box motion on the counter-shaft sometimes employed in such vehicles. For this purpose each driving wheel of a pair is driven from a separate counter-shaft, these two counter-shafts being arranged with their axes in a common straight line, and each having fixed on one of its ends a pulley; the two pulleys are juxtaposed and are driven by a common belt, itself driven directly or indirectly by a motor of any suitable kind, the arrangement being such that normally the two pulleys will be driven at a common speed, and that consequently the two driving wheels will be driven also at a common speed for propelling the vehicle in a straight line. In connection with the steering gear there is provided a belt shifting or striking device of any convenient construction such that when the steering gear is actuated, to cause the vehicle to depart from a straight course, the belt shifting or striking device will be operated so as to shift the belt wholly or mainly on to the pulley from which is driven that driving wheel of the pair which is then to travel through the greater distance in a given time. This may be effected in various ways.

Referring to the accompanying illustrative drawings—Fig. 1 is a sectional elevation of so much of a motor-propelled vehicle as is necessary to illustrate the invention; Fig. 2 is a plan; Fig. 3 a front view; 1, 1ᵃ are the driving wheels, and 2, 2ᵃ are the two counter-shafts which are geared by chain or other suitable gear at the outer ends of the said shafts as shown, one with each driving wheel; pulleys 3, 3ᵃ are fixed one on the inner end of each counter-shaft, each pulley having one face, so that the two pulleys constitute, as it were, one broad-faced pulley composed of two parts a slight distance apart, and the driving belt, 4, is normally equidistant from either outside edge of pulley face. 5 is a motor of any suitable kind, on the shaft of which is fixed a driving pulley, 6, around which the belt, 4, passes. The striking device, which is shown in detail in

FIG. 1.—ELEVATION.

Fig. 4, comprises a slide, 7, adapted to be moved cross-wise in guides fixed to the underframe of the vehicle and carrying a pair of depending arms, 7^a, between which the belt passes and which are or may be fitted with rollers, 7^b. At their lower ends they are connected by a bar, 7^c, that extends laterally through a slot in one arm of a bell crank lever, 8, this arm being connected to the bar, 7^c, by means of springs, 7^d, interposed between it and fixed collars, 7^e, on the bar. The striking device is, by these springs, held normally in a position to keep the belt on the central portion of the periphery of the compound pulley. The springs also allow the steering gear to be rapidly operated as they permit it to be moved in advance of the belt which is subsequently caused to move over by the spring compressed during the movement of the steering gear. For shifting the striking device the bell crank lever, 8, is connected by a rod, 9, to a crank disc, 10, that is partially rotated when the steering gear, which may be of any suitable kind, is operated. In one form, the steering wheels, 11, 11^a, each run on a separate short axle, 12, able to be turned about a vertical axis and forming one arm of a bell crank whose other arm, 12^a, is connected by a rod, 13, which is operated through suitable connections from the steering handle. 14 is a hand-wheel

FIG. 2.—PLAN.

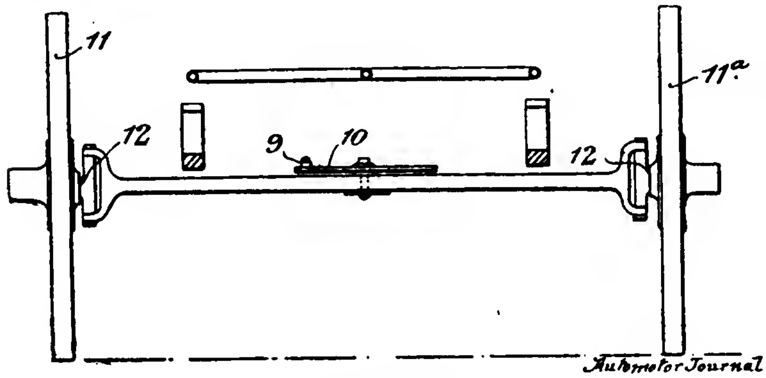

FIG. 3.—FRONT VIEW.

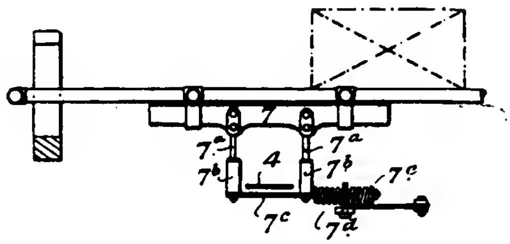

FIG. 4.—STRIKING GEAR.

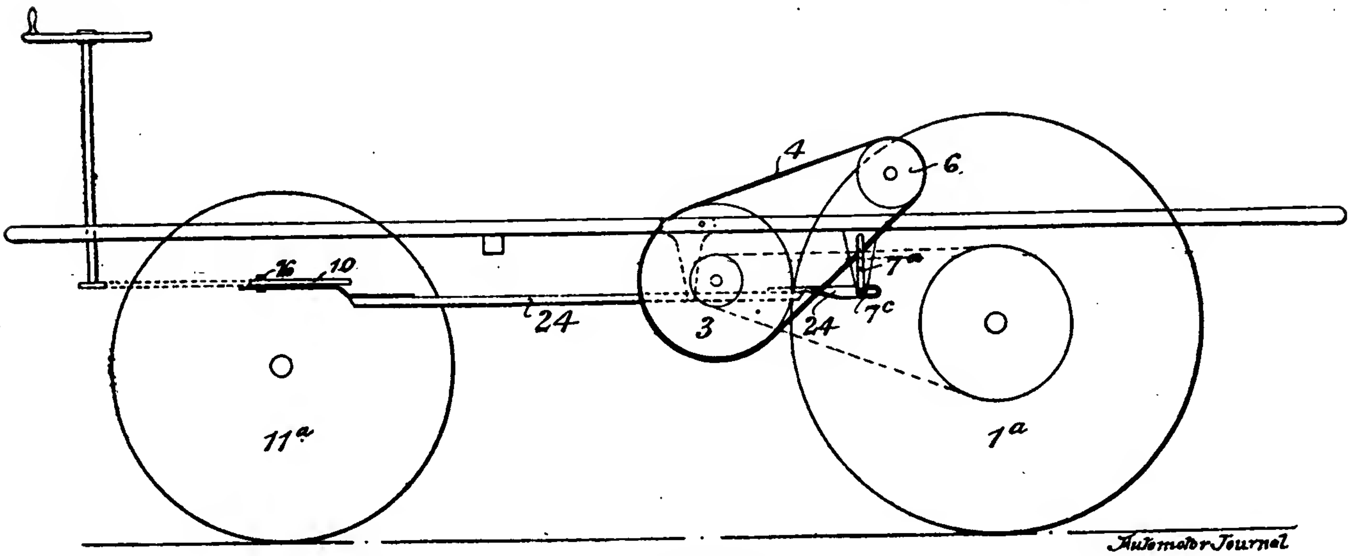

FIG. 5.—ELEVATION.

FIG. 6.—PLAN.

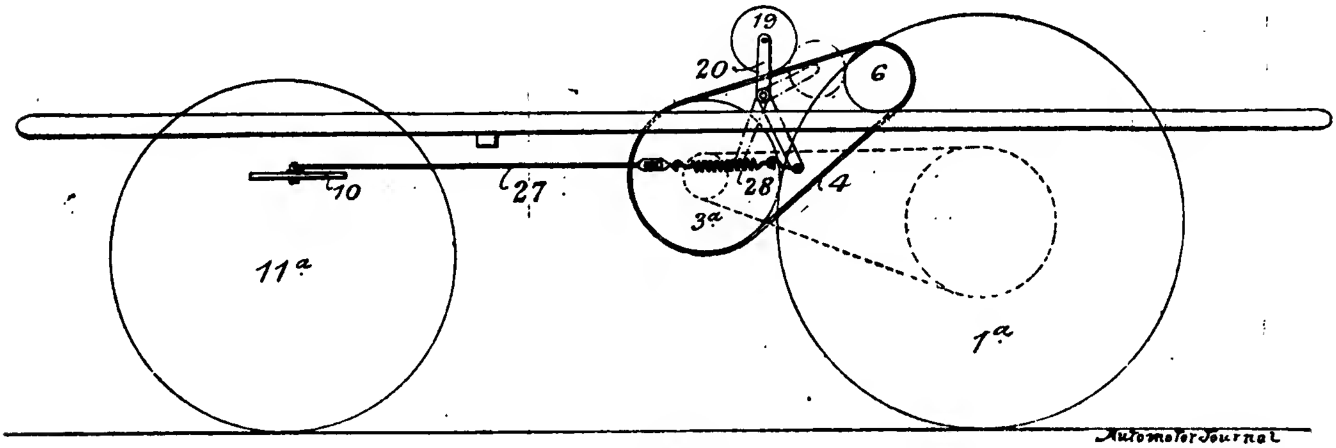

FIG. 8.—ELEVATION.

with handle, 15; the spindle, 16, of the hand-wheel has fixed to its lower end a sprocket wheel, 17. The crank disc, 10, is formed with sprocket teeth around its periphery and is driven from the wheel, 17,

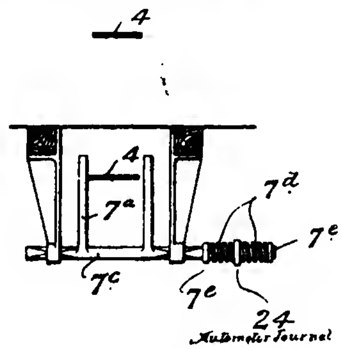

FIG. 7.—STRIKING GEAR.

by a chain, 18. For keeping the driving belt, 4, taut when required, a jockey pulley, 19 (Fig. 1) is journalled in bearings at the end of a lever, 20, that is connected by a rod, 21, with a hand lever, 22, fitted with a locking rod, 23, the arrangement being such that the speed of the driving may be regulated by applying more or less pressure through the jockey pulley, 19, upon the belt, even whilst the motor is running at a constant speed.

Figs. 5, 6, and 7 are views corresponding to Figs. 1, 2, and 4 of a modification of the arrangement above described in which a lever, 24, of the first order is pivoted at 24a between the counter-shafts, 2, 2a, and the shaft, 25, whose ends carry the axles of the steering-wheels; the lever, 24, is attached by a slot and pin connection, 26, to the disc, 10, of the steering gear and to the striking device, as shown. In this example the striking device comprises a pair of arms, 7a, projecting upward from a bar, 7c, that works in guides fixed to the underframe of the vehicle; the bar, 7c, passes through a slot in the end of the lever, 24, between which and fixed collars, 7e, on the bar, 7c, are interposed the springs, 7d.

Figs. 8 and 9 are views corresponding to Figs. 1 and 2, and show another modification where, instead of driving the two pulleys, 3, 3a, by a common belt, 4, each pulley is driven by a separate belt provided with a jockey pulley, 19, similarly mounted to that shown in Fig. 1, and connected with the steering gear by rods, 27, and springs, 28, the arrangement being such that normally both belts are kept taut, but that when the steering gear is operated to turn the vehicle from a straight course, the one jockey pulley will relieve or release its belt sufficiently to slacken the driving of, or to cease driving, that wheel which has to pass for the time being through the shorter or no

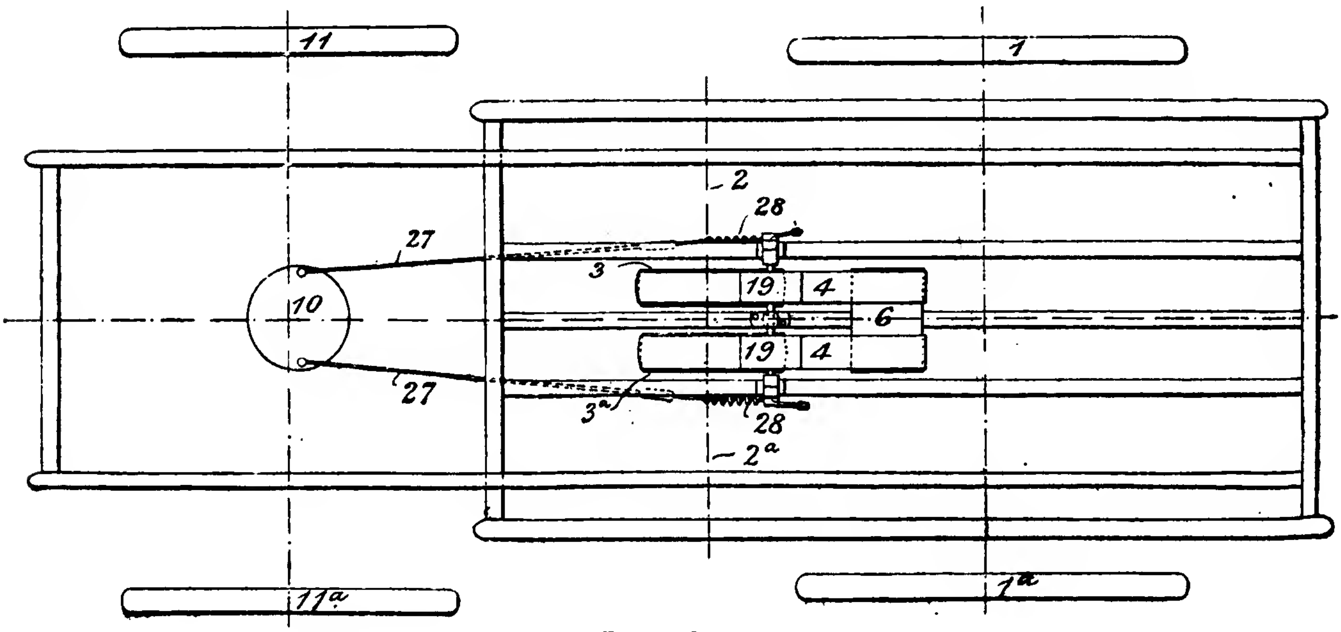

FIG. 9.—PLAN.

distance. The normal position of each jockey pulley is midway between the two positions indicated; the full lines indicate the position when the belt is first put on, and the dotted lines indicate the position when the belt has become stretched and the pulley has been adjusted to keep it taut. In this case there is no provision for varying the speed by slackening jockey pulleys. In some cases motor-propelled vehicles may be provided with driving arrangements constructed according to this invention, but without striking devices, jockey pulleys such as above described, or the like adapted to be operated from the steering gear; in such cases the relative speeds at which the pulleys 3, 3ª, are driven will, on the steering gear being operated, automatically vary owing to the difference in resistance to driving then offered by the respective wheels, 1, 1ª, to which the pulleys are geared and the consequent slip of the belt on the pulley geared to the wheel which has to travel the shorter distance.

LIQUID FUEL.

MR. J. S. ZERBE, in the course of an interesting article in the *Mechanical World*, on some experiments in liquid fuel burning, says:—In order to give some idea of the system adopted by the United States naval authorities it will be necessary to point out a few of the distinguishing features employed in the old systems of using fuel oil, and, primarily, it should be observed that there seems to be a general impression among all who have heretofore entered this field that the atomiser or burner is the essential feature in the process of burning oil. The burner is simply a stoker, and while it is true that one burner may stoke better than another, this advantage is a small one when compared with the firebox equipment. A firebox which is not specially equipped to burn liquid fuel will never do good work, however perfect the burner may be. Over 700 patents have been obtained for burners, and less than 30 for firebox equipments. This shows most emphatically how vigorously inventors have struggled at the wrong end of the problem, and explains why failures are so common the world over. Furthermore, it may be said that there are two ideas predominant in the minds of liquid fuel experimenters beyond which they seemed loth to go. The first is that a candle or barrel-shaped flame is essential, and that the flame should be ejected against a baffling wall erected within the firebox. These features are primeval in their character, fundamentally wrong in their operation, and radically deficient in results when applied under any type of boiler. The essential thing is to perfectly aërate the hydrocarbon gases evolved by the heat of the combustion chamber. Where oil is thrown into the heated chamber the gases form rapidly, an immense expansion takes place, and the interior of this conical flame cannot receive the requisite amount of air to produce perfect combustion; hence, owing to the rapid movement of the mass, it passes into the tubes with a large portion of unconsumed particles, and thus passes into the flue and out of the stack in the form of smoke. At this point the inventor sought by a new expedient to arrest the flame, break it up, and produce a mixing operation by introducing a baffling wall. The flame in striking this wall would naturally be deflected upwardly, so that it would strike the boiler sheet or tubes, and thus form a zone of intense heat at the wall, which has been found to be very destructive to the boiler. But this is not all. The wall naturally diminishes the size of the combustion chamber, which should in all cases be larger than for coal in preference to being smaller. There is also a very serious defect in the old style so-called oil equipments in the manner of admitting air to the firebox. In all cases it has been customary to admit air in a mass, either around the burner or into the firebox at one point through the grate surface. This results in producing a disagreeable noise. Cold air is admitted to the boiler, and when so supplied in a body the desirable mixing operation is not accomplished to produce a steady, uniform flame of great intensity. Some inventors provide conduits and retorts for heating air, while others provide a vaporising chamber for the oil; but all these attempts to utilise auxiliary mechanism or contrivances outside of the firebox to prepare the fuel and air are needless expenditures of force, make the system complicated and difficult to regulate, and are useless expedients when compared with the "direct conversion" system, which contemplates the taking of the fuel and the oxygen in the natural state and producing complete combustion within the firebox itself. Manifestly such a system is much simpler in construction, more easily operated, and less expensive.

The construction of such a system, therefore, contemplates the following features:—

1. The firebox must perform the entire operation.
2. The grate surface must not be decreased in area.
3. The heating surface of the firebox should not be diminished.
4. The flame should cover the entire grate surface.
5. There should be no retarding wall within to produce a great zone of heat at one point.
6. Cold air must not be permitted to enter the firebox, and it should never be admitted in a mass.
7. The shape of the flame should be such that the air will freely mingle and aërate the entire mass.

To accomplish this a very simple form of firebox construction was provided. The entire grate surface is covered with a single layer of specially prepared firebrick. This brick has on one side ducts, partially across one face, and these bricks are nested against each other at an angle of 45 degrees, so that when the bars are covered small ducts are formed through this bed over the entire surface. This bed formation has several very important functions. It breaks up the air, so that it enters the firebox in small jets, and after the burner has been in operation a short time the entire bed is heated up to incandescence, thus heating the air as it passes through the ducts. The bed, when in this state, also acts as a substitute for an incandescent bed of coal, giving out radiant heat to the boiler, and thus economising fuel. The burner or atomiser is specially adapted for use with this brick bed, as it is designed to throw a fan-shaped spray, thus causing the flame to cover the entire bed, so that when the subdivided jets of air come up through the ducts in the bed, every part of the flame has its requisite supply of heated air, which readily commingles with the hydrocarbon gases. The burner is simple in construction, being composed of two castings, an upper and lower part, substantially similar in construction, the upper part having an oil supply connection and the lower part an air or steam inlet. These inlets terminate in open transverse channels, from which radial grooves extend to a point near the forward circular end of the burner. The contact faces of these ducts are dressed off, and between them are placed three copper gaskets or diaphragms, the intermediate one of which has its forward edge extending to the circular rim of the burner, while the upper and lower gaskets have V-shaped notches cut therein, the bases of which communicate with the radial ducts. These gaskets are composed of No. 30 gauge copper or even thinner material, and as the oil and compressed air, or steam, are forced through the small interstices, the V-shaped openings permit the liquid and steam to expand horizontally, producing a continuous sheet at the mouth of the burner. The two parts and the gaskets are held together by means of bolts. This form of burner has several distinct advantages. In cutting the gaskets a greater or less number of these ducts can be brought into action, or the flame can be horizontally disposed over a wide or narrow area, dependent on the shape of the firebox. By using thicker or thinner gaskets the capacity can be increased or decreased; and as the oil channel which supplies all the ducts is horizontally disposed, the burner can be directed at any angle desired without having an undue flow of oil to the central or the side ducts. In the torpedo-boat tests compressed air was used.

Better Late Than Never, or Has It Been Asleep.—The *Yarmouth Advertiser*, like most of the Press, is manifesting somewhat tardily an interest in automobilism, and so in its issue of the 5th inst. it gives an account, as a news item, of the run from London to Richmond that took place on November 29th of last year! Our contemporary speaks in terms of mild appreciation of automobilism, and sums up the question in the most judicial manner, thus:—The possibilities of scientific development are so vast that a principle once proved to be workable, the details to make it commercially acceptable may be regarded as no more than a work of time (and a very long time, too). The application of electricity, too, is yet in its infancy (of course), and, compared with what is known, an inexhaustible field of discovery remains open. That animal power will eventually disappear from the streets is hardly to be anticipated within measurable time. (How true!) But that the demand for horses will steadily lessen is tolerably certain. The appliances of life and of commerce tend more and more to complexity and the disuse of muscular force. The motor-car, whatever its initial difficulties, is the road vehicle of the future, to the cheapening of conveyance, and the facility of trade.

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THE STREET TRAFFIC OF LONDON.

Our contemporary, the *Railway News*, in the course of an interesting and carefully compiled article on this subject, says:—In 1865 public interest was largely engrossed by the discussion of what was to be done for dealing with the important question of the metropolitan traffic. A generation has passed since that time, and the population, which at the census of 1861 stood at 3,250,000, is now, according to the last census of 1891, increased in density to 5,633,000, or an increase of over 2,250,000. The public mind was so engrossed with the importance of the question of providing adequate accommodation for the growing population that the united wisdom of Lords and Commons was concentrated in a Royal Commission, to consider and report upon the best mode of dealing with the street traffic of the metropolis. Many Bills were submitted to Parliament for the construction of railways, and other schemes for dealing with this important question. The outcome of the labours of this Commission was the proposal of a scheme of underground railway which should form what has now become the "Inner and Outer Circle" of railways. Two of these projected lines—namely, the Metropolitan and District—now carry 135,000,000 passengers. Since their completion two other lines have been constructed—namely, the North London and the City and South London—these two last year carried 56,000,000 passengers. Tramway companies have since been introduced, radiating in various portions of the area, and these together bring into the district 150,000,000 passengers. Four of the great railway companies—Great Eastern, Brighton, Chatham, and South Eastern—together carry 220,000,000 passengers.

We gather from a police return that there are 3,190 omnibuses and 1,378 tramcars in the metropolis, making together 4,568 public vehicles. Added to this there are 3,583 four-wheel cabs and 7,923 two-wheel vehicles, or our familiar friends the "hansom" and the "growler." Together we have a grand total of 16,076 cabs and omnibuses and tramcars to aid in the locomotion of the population of London. The General Omnibus Company run 1,151 vehicles, and these carry 172,000,000 passengers; the Road Car Company runs 350, and these carry 58,000,000. But there are still to be included in the aggregate of omnibuses licensed by the Commissioner of Police 1,650 omnibuses that are not owned by the two leading companies. It has been asserted that the 1,650 not owned by the two companies convey one-half of the average of those in the principal thoroughfares, and that these together aggregate a total of 100,000,000 passengers. So far as the street traffic of the metropolis is concerned, as represented by the vehicular proportion of its population, we have therefore the astounding figures with which we have to deal in estimating what will be the probable requirements for the underground London railway system which is already being steadily constructed, and for which still further Parliamentary powers are authorised by the Legislature. Here is an estimate of the number of travellers by the Metropolitan and other railways entering London, and the number of passengers by tramway and omnibus:—

Metropolitan; Metropolitan District; North London; South London	191,000,000
Suburban traffic of—	
Great Eastern; Brighton; Chatham; South Eastern	110,000,000 (estimated)
Great Northern; Great Western; Midland; North Western	100,000,000 (estimated)
Tramways in London, official returns	150,000,000
Omnibus, General (1,150)	172,000,000
Road Car (350)	58,000,000
Other omnibuses (1,650) (not enumerated)	100,000,000
	881,000,000

From an American exchange we learn that the Diezel Motor Company has been incorporated at Albany with a capital of $1,000,000 in $100 shares, beginning business with $600,000 capital. The directors are Charles F. Wilken, Percy Thorpe, John C. A. Sutor, and E. Emmet Doherty.

Taxation of Motor-Cycles in France.—The French Chamber of Deputies on the 11th inst. decided that the tax on motor-cycles should be trebled as from April 1st, and that every machine of the kind should have a label attached with the name and address of the rider.

Naturally.—At a meeting of Dunoon Commissioners, on the 8th instant, a long letter from the Dunoon and District Carriage Hirers' Defence Association was read, pointing out that the narrow roads in the burgh were quite unsuitable for motor-car traffic, and if allowed to continue would be a great source of danger to themselves and the general public, especially during the summer season. After an animated discussion the matter was remitted to a committee. The present licenses expire in May.

A New Motor-Vehicle for Heavy Traffic.—The Liquid Fuel Company, of Cowes, Isle of Wight, inform us that they have lately built and run a steam-van, using petroleum as oil fuel, and from actual tests have found that it will easily carry loads of 3½ tons on grades of 1 in 10, and at a cost of about 2½*d.* to 3*d.* per mile. This van has pivoted axles and steers very easily with a load of 3½ tons. Add to this the weight of the vehicle, 2 tons, with the necessary fuel and water, and there is about 6 tons on the wheels.

Electric Carriages in Berlin.—The *Elektrotechnische Zeitschrift* of February 24th contains an illustrated description of two types of electric carriages which are being demonstrated in the streets of Berlin. These carriages, which have been built by one of the leading cycle companies, are fitted with bicycle wheels and pneumatic tyres, which can be inflated to a pressure of 120 lbs., whilst the bodies are supported on steel tubular frames. The wheels have ball bearings, and steering is effected by means of a lever connected with the front pair of wheels. Each carriage is equipped with a motor suspended from a steel frame lying parallel with the rear axle, the latter passing through the hollow armature shaft, and being driven by differential gearing from a toothed wheel arranged on that shaft. The battery consists of 44 cells contained in four boxes, the total weight being 8 cwts. It can be charged at a pressure of either 65 or 110 volts, and the connection allow of four different speeds being attained, three by altering the disposition of the battery, and one by weakening the motor field. The carriage is provided with a watt-hour meter, which indicates the condition of the battery, and the total weight complete is 16 cwts. It is possible to attain a speed of 12 miles an hour, and one charge will allow of the carriage covering a distance of 27 miles before the cells require to be re-charged. The carriages possess a pleasant appearance, having been built specially for the work.

A Medical Man on Motor-Vehicles.—Dr. T. Prichard Roberts (St. Albans) writes to the *British Medical Journal*:—Some weeks ago in that paper a question was mooted as to the best autocar or motor for the use of a medical man. After an exhaustive trial of a motor-tricycle built for me by the Beeston Cycle Company, Cheylesmore, Coventry, which I have run nearly 500 miles during the last month without any accident whatever, I thoroughly recommend this make. There is little trouble in either starting or stopping, good break power, and scarcely any noise or vibration. Petrol or doubly-distilled benzoline, of specific gravity 680, is the oil used for propulsion, which costs about 1*s.* per 100 miles. Tube ignition is preferred to the electric spark for the explosion of the vapour. The speed can be regulated to anything between 4 miles and 20 miles an hour by a small lever immediately in front of the rider. With an extra-power cylinder any ordinary hill can be climbed, and the steepest with a little assistance by pedalling. This is a great boon to a medical man, as he can cover from 50 to 60 miles a day with little exertion and at a trifling cost. A motor is easily got ready at night. On arriving at a patient's house the lamp can be turned out, and the machine put away in a small space. I may add that the petrol can be obtained at Messrs. Carliss, Capel, and Co., Chemical Works, Hackney Wick, London. Commenting on this the *British Medical Journal* says:—"The prime cost of the machine is not mentioned, but the main objections to its use appear to be that the rider is very much exposed to the weather; that on wet roads the travelling is very heavy, and that he is compelled to dismount on coming to a newly-stoned piece of road."

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SELF-PROPELLED TRAFFIC ASSOCIATION

(INCORPORATED).

LIVERPOOL CENTRE.

Programme for 1898.

March 29 ..	Paper: "Recent Improvements in Accumulators and in their Application to Traction on Common Roads." Mr. J. T. NIBLETT.
April 19 ..	Paper: "Arrangements for the May Trials." The HONORARY SECRETARY.
May 24–27 ..	Trials of Motor Vehicles for Heavy Traffic.

MR. JOHN A. BRODIE, M. Inst. C.E., has been elected a Vice-President of the Liverpool Centre of the Self-Propelled Traffic Association, in succession to Mr. H. Percy Boulnois, M. Inst. C.E. Dr. H. S. Hele-Shaw, M. Inst. C.E., has joined the Council.

Trials of Motor Vehicles intended for Heavy Traffic.

THE following gentlemen have been selected to act as judges:—

From London Council.

Sir DAVID SALOMONS, Bart., Pres. S.P.T.A.
Professor BOVERTON REDWOOD, F.I.C., F.R.S.E., &c.

From Liverpool Council.

Professor H. S. HELE-SHAW, M.I.C.E., &c.
JOHN ALEX. BRODIE, Esq., M.I.C.E.
EVERARD R. CALTHORP, Esq.

The following gentlemen will hold themselves at the disposal of the Council to act as reserves, if necessary:—

S. B. COTTRELL, Esq., M.I.C.E.
H. B. WEST, Esq., M.I.M.E., M.I.N.A.

In connection with these trials the following circular letter has been addressed to members and others:—

Liverpool.

DEAR SIR,—The support of all members of the Association is earnestly hoped for in furtherance of these important trials, and I venture to appeal for your financial aid towards the expenses connected therewith.

The estimated total amount required is £750, to be apportioned under the following heads:—

(*a*) Awards and Expenses of Awards.
(*b*) Expenses of Trials.
(*c*) Freight, from port to port, on Foreign Vehicles competing at the Association's invitation.
(*d*) Publication of Report.
(*e*) Entertainment of Foreign Visitors.

With respect to the "Entertainment," I may say that Baron de Zuylen (President), Comte de Dion (Vice-President), and other prominent members of the Automobile Club de France, are expected to attend the trials, and the opportunity offered is thought to be a fitting occasion to return the many compliments paid to members of the Association when on the Continent.

Hoping that you will allow me to add your name to the list of subscribers,—I am, yours faithfully,

E. SHRAPNELL SMITH, Hon. Sec.

"SCIENCE, LIVERPOOL," is the telegraphic address of the S.P.T.A. (Liverpool Centre), which has been specially registered for the purpose of these trials.

THE date of the Dinner to be given to the foreign delegates and others has not yet been definitely fixed, but it will probably be on May 27th.

THE Executive Council of the Automobile Club of France is acting in concert with the Self-Propelled Traffic Association to secure the presence of at least one of each of the chief types of French heavy motor-vehicles. It is doubtful, however, whether these can take part in the trials in consequence of the regulations of the Locomotives on Highways Act debarring the majority of them from competing on the English roads.

TRIALS FUND.

The following subscriptions have already been remitted or promised:—

Sir David Salomons, Bart...	100 guineas.
Mr. Alfred L. Jones (Elder, Dempster, and Co.)	100 "
Mr. Alfred Holt	50 "
Mr. John A. Brodie	10 "
AUTOMOTOR AND HORSELESS VEHICLE JOURNAL	10 "
Mr. W. Worby Beaumont..	10 "
Mr. Maunsell C. Bannister	10 "
Mr. Everard R. Calthrop	10 "
Mr. A. Bromley Holmes	10 "
Mr. Anthony G. Lyster	10 "
Mr. Arthur Musker	10 "
Mr. Henry H. West	10 "
Mr. S. B. Cottrell	5 "
Mr. W. A. Darbishire	5 "
Mr. E. Shrapnell Smith	5 "
Mr. J. K. Starley	5 "
Mr. Geo. H. Cox	2 "
The Right Hon. Lord John Hay, G.C.B., Admiral of the Fleet	2 "
Mr. Geo. F. Ransome	2 "
Mr. John Simpson (Stirling)	2 "
Mr. R. J. Urquhart	2 "
Mr. A. Ludeck	1 guinea.
Mr. J. Walwyn White	1 "
Mr. John Wilson	1 "

As further donations are given, names will be published. Cheques or money orders to be made payable to the S.P.T.A. Trials account, and addressed to Mr. Shrapnell Smith, Hon. Local Sec., and organiser of trials.

Should the amount collected prove to be in excess of the expenditure such surplus will be handed back to the subscribers, *pro rata*.

Referring to the participation of the French automobilists in these trials the President of the Automobile Club de France has written as under to the President of the Self-Propelled Traffic Association:—

Paris, le 19 Février, 1898.

Sir David Salomons, Bart.,
Président de la Self-Propelled Traffic Association.
30, Moorgate Street, London.

MON CHER PRÉSIDENT,—Comme suite à ma lettre du 31 Janvier adressée à M. Shrapnell Smith, j'ai l'honneur de vous informer que le Comité de l'Automobile Club de France après avoir pris connaissance des conditions du Concours que vous organisez pour le mois de Mai, vous a voté des remerciements pour votre aimable invitation.

Il n'est pas douteux qu'un certain nombre de nos collègues ne s'empressent de répondre à votre appel.

Nous vous ferons connaître vers le 1er Avril le nom des personnes qui nous auront manifesté le désir d'aller à Liverpool.

Le Comité a également regretté que les conditions de poids et de dimensions auxquelles doivent satisfaire les véhicules ne puissent permettre à la plupart de nos constructeurs de prendre part à ce Concours.

Nous avons cependant fait un communiqué à la presse de votre convocation.

Veuillez agréer, mon cher Président, l'assurance de mon respectueux dévouement.

Comte Henri de la Valette,
Secrétaire Technique.

Steam Road Vehicles.*

So much has been written and said upon that particular branch of the subject that it is not necessary for us to enter into any statement of the reasons that influenced us in deciding to confine our researches to steam as a motive power, but to give at once the requirements we then laid down, and the attainment of which we consider a *sine quâ non* for ultimate commercial success. Our investigations were to be pursued to give us the knowledge and experience needful to prospective manufacturers; but it is an assured fact that we, and probably every other experimenter, who two years since commenced similar work for similar reasons, have been astounded at the immense amount of difficulty the question offers, and the expense and work its solution requires. Surprise need not be expressed that so few successful cars for heavy loads are at work, but rather that anything has been done, when it is considered what extremely high æsthetic as well as commercial conditions one has to deal with.

Leaving carriages out of the question, we confine ourselves for the present to goods work, as represented by vans, lorries, and wagons generally. To commend itself to an user, and to make it valuable to the future credit of the maker, we considered then, and we are not in any way at present inclined to modify our opinion, that a goods vehicle should in its carrying capacity be as roomy as a horse vehicle used for similar weights, at least twice as speedy, absolutely safe under all conditions of *wear*, *accident*, or *neglect*, as powerful for starting and manœuvring as its equivalent horse lorry, and in its prime cost not exceed to the user three and a half times the cost of one horse lorry with its horses and appointments, capable of moving an equal load on any single average journey. In addition, the public will demand that it must not be noisy or unpleasant, nor injurious to the roads; and the maker, if he be wise, will endeavour not to promote adverse criticism by the creation of any designs too strangely contrasting with existing types. A steam vehicle consists of five essential parts, each of which has had a long existence in other uses, but which, when an attempt is made to combine them in such a car as we specify above, proves itself singularly awkward. These are:—

1. Boiler and feed gear.
2. Engines, transmission and driving gear.
3. Car and framing.
4. Steering.
5. Brakes.

By far the most important of these is the boiler and its feed arrangements.

Our conditions for a van boiler were: — (*a*) Absolute safety against explosion through over pressure or lack of water, and capacity for standing a great deal of either stress before becoming deranged for work. (*b*) High pressure, if possible excessively high, as, say, 400 to 500 lbs. per square inch. (*c*) As a consequence of this to have no water-gauge glass. (*d*) To have no very large volume of water under pressure in the boiler which might, in an accident due to collision or upset, become a danger.

The only boilers that we considered capable of fulfilling those conditions in any degree were water-tube boilers pure and simple, a flash boiler such as Serpollet's, or, as we hoped, it might be possible to evolve a combination of the two. The chief trouble in the use of water-tube boilers of the small size used on autocars is the feed, which presents a series of difficulties not present in any other practice. This difficulty is of course greatly accentuated when no gauge glass is used, and the feeding has to be absolutely independent of the driver. The oscillation and vibration of the car make it difficult to read the gauge glass unless it is very close, and at high pressure we certainly consider it dangerous. Its use also necessitates the boiler being inside the body of the car, and this is objectionable, and for the carrying of some goods may be very detrimental. Moreover, to comply with our condition that no large volume of water should be constantly present in the boiler meant a very steady and continuous feed. We started by constructing a trial boiler, to find out a suitable feed-control gear, and to get data as to steaming power, time for raising steam, and fuel consumption. It was built up of 36 tubes, bent into grids, and coupled with small bolt flanges to a cylindrical phosphor-bronze water-drum 1¼ inches dia. internal and a ditto steam-drum 5 inches internal. The tubing used was solid drawn seamless copper, ⅜-inch o/d $\frac{1}{16}$-inch thick. This boiler had 33 square feet of heating surface worked at 200 lbs. pressure, occupied (the generator only) 2′ 6″ × 1′ 9″ × 1′ 2″, and weighed 180 lbs. It was, of course, intended to use a condenser with this boiler, but owing to the difficulty of finding room in an unroofed car, such as we built for our experimental work, we had to abandon all idea of using a condenser, and therefore this boiler. But even had we used a condenser the boiler was much too delicate to comply with the conditions we wanted, although it gave some interesting results in an experimental casing. It would evaporate nearly 100 lbs. more water per hour than its own weight at 150 lbs. pressure. Steam of 100 lbs. pressure could be got from all cold water in 5½ minutes by dipping the lighting wood in petroleum and feeding the fire carefully. It several times stood 400 to 500 lbs. pressure without a tube or joint going, and on the various occasions when we ripped tubes open by using excessive pressure or neglecting the feed, absolutely no trouble or danger was caused.

Boiler II was made in order to use less pure feed water. Straight tubes of ¾-inch bore were expanded into boxes, with lids at the back, practically identical with those used by Gurney. The water and steam drums were practically as in Boiler I, only split longitudinally like Yarrow's water drums to get to the tubes for removal or expanding in place. This boiler was built up by giving each row of tubes an upward rise from the water drum of about 15 degrees, being, in fact, evolved from the grids of our first boiler with the boxes substituted at the bends to get the accessibility mentioned above. This boiler gave very good results indeed, but an accident to the feed supply started the water-box joints leaking through, as we concluded, the iron bolts stretching with the overheating.

Boiler III.—In order to reduce cost and weight, for these individual boxes were both costly and heavy, and to obviate this trouble with expansion in the bolts, split phosphor-bronze drums with phosphor-bronze bolts were substituted. This boiler when tried in a brick casing off the car gave very good evaporative results. It weighed (generator only) 280 lbs., had 33 square feet of heating surface, and occupied about the same space as Boiler I. Its evaporation over eight hours averaged 270 lbs. per hour at 150 lbs. pressure, thus giving nearly 9 lbs. per square foot of heating surface, and 8·3 lbs. water per lb. of gas coke from and at 210°. We shovelled coke into the fire box, filled up the water tank, and regulated the flow of steam, approximately to ordinary road conditions, for eight hours continuous steaming, but had no gauge glass or other indicating gear to show the water level. This boiler was then placed in the car, and although the car was fitted at that time with pneumatic tyres the road vibration turned the boiler into a sieve. This left us in the position of debating whether it would be possible to make this type of boiler to stand the vibration of rough and smooth roads, for every trial we made gave us the same result. Joints that were good and sound in the shop simply shook to pieces at once on a bit of Lancashire road. Although we are forced to deal cursorily with these boilers each one occupied several months in making and trying, and each boiler was modified and remade several times. Metal to metal joints, soft copper ring joints, and asbestos thread joints were all tried. So much so that, although by this paper we only made five boilers, we believe that in the two years we have tried 16 or 17 differently made forms of these boilers. We show you here a sample of one of the drums, and in every case each boiler was hydraulically tight at double its working pressure. We decided to give up bolted joints, and copper, and phosphor bronze, so designed, and put in hand

Boiler IV.—This was to be made throughout of steel; solid drawn steel tubes to be expanded into connecting boxes machined out of steel bar, and the top and bottom rows expanded into solid drawn steel water and steam drums. There is very little doubt that this would have made an excellent and very strong boiler, but when about half way through it we decided that the enormous amount of work it involved and its consequent cost would preclude its being successful for autocars, from a commercial point, even if it were

* Excerpt of a paper read before the Liverpool Centre of the Self-Propelled Traffic Association, February 22nd, 1898, by D. H. Simpson and W. L. Bodman.

thoroughly satisfactory in its working. We show you here one of the connecting boxes of this boiler.

Boiler V.—We turned our attention to a different type of water-tube boiler, that is the so-called—but as we think miscalled—instantaneous generator of the Serpollet type. We think this boiler is a good deal misunderstood, the usual idea being that a series of tubes are placed over a fire, heated up to a red heat, and a little water injected into them, which is made then and there into steam, passes through the tubes and into the engine. This would subject the boiler to excessive wear due to the high fire heat, and the engines to a course of burnt oil and cylinder walls. As a matter of fact the process is in actual working very normal. The temperature of the last tube is only that of the issuing steam, usually about 500° F. The flow of steam is quite regular, and stopping the withdrawal of steam only gradually increases the pressure. Always that is provided the boiler possesses the essential features of a proper working "flash boiler." These are:—

(a) A restriction of the passage to bring the water into intimate contact with the heating surface, and prevent "gulps" of water passing through surrounded by steam.

(b) Adequate weight of metal to replace the volume of water necessary in an ordinary boiler to allow for fluctuations of work by absorbing heat.

(c) Ample capacity to avoid working too near the corresponding temperature of steam at the working pressure, *i.e.*, working with too little superheat.

(d) In case of excessive overheat after a long stand either all joints, piping, engines, &c., constructed to stand the superheat, or means used to regulate and reduce the temperature of the steam to within reasonable limits.

This type of boiler has only been possible of construction since the manufacture of solid drawn steel tubes; welded tubing will not stand the treatment necessary to constrict the passage or the subjection to high fire heat without splitting. The best known methods for constricting the water passage are the well-known crescent of M. Serpollet, and the round tube with a core. We decided to try a method, novel in its application, to flash boiler tubes, but well known as a very successful surface for heating by steam in feed heaters and calorifiers. This is the "Row" patent indent, in which the tubes are pressed between dies alternately at right angles, giving the tube a peculiar "wavy" shape, causing the fluid passing through to come into most intimate contact with the sides, and to get most thoroughly broken up for the absorption of heat. Experimentally to try this boiler and get at the most convenient and correct size of tube we made several boilers varying in the bore of tube from ½ inch to the present tube shown you here.

This boiler, VI,* is the last we have made, and the one we are now trying. The tubes are of solid drawn steel, with the ends swaged down, making them practically very stout double-ended gas bottles. Twenty-two of these constitute a boiler for the evaporation of about 300 lbs. of water per hour. They are coupled in series over the fire, being connected by steel tube bends. We would call your attention to the joint used, as it has a great variety of uses, and is of immense power. The ends of the main tubes are screwed 11 to the inch, and off the bends 14. A strong hexagon nut screwed to fit the bend at one end and the tube at the other is used to draw the bend up the tube, the difference in thread giving a pull equivalent to an ordinary union nut with 51 threads per inch, and the strength of 14. Forty-four joints rung up with this joint stood 800 lbs. hydraulic test, at the first time of screwing up.

The generator, as composed of steel tubes of special shape, is placed in a suitable casing over a fire. Connected to the steam outlet is a double-ended steel gas bottle, which has a tube passing through its centre, through which the feed water from the pump passes on its way to the generator, and is thereby heated, removing some of the superheat of the steam, and by the introduction of hot water increasing the duty of the boiler. Also after standing or when the steam is very hot, water is sprayed into the drum, and is evaporated by the extra heat of the superheated steam and passes on to the engines.

This system of injecting water into the steam and cooling it down to a reasonable temperature, *still leaving our boiler hot as a reserve of heat*, we consider overcomes one of the greatest difficulties of this type of boiler.

The method of starting and working will be clearly understood by comparing the diagram with the following:—The generator is raised to a black heat, say, 800° F. A stroke or two of the hand-pump, HSP, sends the water up the pipe, PD, the injection valve, ISV, is opened, and a small amount of water allowed to enter the drum, ID. The valve, ISV, is then closed, and the water travels through the feed heating tube, FHT, in the centre of drum, ID, and on through the feed pipe, FP, into the generator. The superheated steam then passes into the drum, ID, where any excessive superheat is extracted by the feed water passing through the central tube, and by the water injected into the drum.

The hand pump is worked until the water relief valve, SPV, which is set to working pressure, starts returning the surplus water to the water feed tank, FWT. Then the main stop valve, MSV, may be opened, starting the engines, which work their own pumps, EP, keeping up the supply of water, any surplus being returned by the relief valve.

Feed Water Control.

The following is a brief table of the different methods used at various times to control the feed water supply to our water-tube boilers without using any automatic gear:—

(a) Pump worked off crank-shaft calculated to give about average requirements:—To regulate this the small injector shown was placed at the water level. If the water was low the injector sent some in until it rose to the level of its steam-pipe when water was returned through the overflow to the tank. This failed chiefly because the returned water overheated the water in the feed-tank and caused trouble with both pumps and injector, and the steam was also too wet taken at such a low level for the injector.

(b) Pump off the crank-shaft, feeding through a live steam feed-heater, the steam-pipe of which was taken from the water-level, and any water that came over discharged by a steam-trap back to the feed-tank, injector taking steam from higher up the drum. Trouble was experienced with trap and injector.

(c) Was a thoroughly reliable method. An independent duplex steam-pump was used—steam taken from the water-level passed through a live steam feed-heater and through the pump, the water from the pump exhaust being drained back to the feed-tank. Its fault was the excessive quantity of steam it used, equal to 30 per cent. of a small boiler evaporation, which was thus reduced to about 6 lbs. per pound of fuel. Numerous modifications of these were tried, but in substance these were our main systems of feed control.

Engines.

The chief feature in the design of our engines has been the use of bored guides, ball socket bearings, and any other device that would enable the engines to run under bad conditions of twist or wind in the framing. It will be seen from the photograph that no bed plates are used, the engines being hung directly to the tubes of the car perch framing. On one occasion, through an accident, the main tube of the perch frame was bent down 1¼ inches, giving one engine a bad twist, but, nevertheless, it worked for several days without perceptable trouble. Ordinary curved slot double eccentric valve motion was fitted. Our first intention was to work compound with either total simpling and facility for working both engines at high pressure, or to increase the starting pull by admitting high pressure to the low pressure only.

We determined to make every possible effort to avoid using gearing of any kind, so our first car was designed with only 32-inch driving wheels, the crank-shafts being forged solid with the wheel hubs, the high-pressure engine on one wheel, and the low-pressure on the other. This, at 12 miles per hour, only gave us an engine-speed of 126 revs. per minute. We anticipated trouble at slow speed, due to the unequal power on each side of the car, but at a speed as low as two miles per hour the motion was perfectly steady. The low pressure cylinder, if in a favourable position, could always start the car, but if this was on the centre the small high pressure engine was unable to do so. Moreover, we found that, as often happened in our experiments, compounding and simpling is an amazingly easy thing to arrange on paper, and for nearly all other work is correct enough, but on the car it was extremely troublesome, involving a number of connections and a liability to fluster a driver working in traffic, the very place where frequent starting and stopping made simpling of most value. So we removed our high-pressure engine and put in another identical with the low-pressure and worked both at high-pressure, still preserving independent direct driving.

These engines could in almost every conceivable case start the car—if not forwards, a yard backwards was sufficient to get into

* We illustrate this boiler in our present issue.—ED.

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a positinn to go ahead. As was to be expected, we had several mechanioal faults in this system. Our engines were too short in stroke, and tbe crank-sbafts too weak to sustain the car load, and frequently closed, binding the connecting rod brass; but we certainly concluded that direct driving is a possiblo and paying system for all loads under 1 ton gross that require transporting at high speeds. One combined starting handle and the steering handle is all the driver bas to attend to—no transmission gear, beautiful on paper, but a horrible *bête noir* in practioe, to arrange on a spring suspension, and always liable to derangement by dirt and dust. The only penalty is a higher steam consumption, somewbat larger engines, and, consequently, slightly more boiler. But in dealing with the small load (*i.e.*, say four to six persons) mentioned above, the percentages of these increases is so small that tbe increase of fuel cost at the rim is practically nil; whilst the saving in primo cost and repairs over a heavily-geared car such as seems most fashionable would, in our opinion, certainly equal 5 per cent. and 5 per oent. per annnm respectively.

Our next trial was to obtain data for heavy loads, and we proceeded to develop our dog-cart phaeton into a small lorry, such as you see in the pbotograpb. We replaced the 32-incb driving wheels with wheels 50 inches in diameter, working on an ordinary Collinge patent axle, and preserved tbe whole of the under-frame of our previous car without alteration. In order not to necessitate too much alteration, we only geared 4 to 1, and even at that bad to drop our machinery, as you will see in tbe photograph, a great deal too near the ground fnr proper practice. In the case of a light car and load it is evident tbat, should the engines botb be on their centres, it is not muob trouble to pusb the car a little to get right for starting, but in the case of a heavy load this would not be possible. We were, bowever, determined at all costs to avoid "jack-in-tbe-box" gear, whieb is liable to get a twist and fire, is heavy, and is not by any means efficient in transmitting tbe power on corners. Manœuvring in difficult places will bo of the highest value in goods work, and we arranged our engines to work as follnws:—The pinion on the erank-shaft of eacb engine is driven by a plain claw clutch sliding on featber keys. Tbe sbafts of each engine are independent, but come together in the middle of the car, where tbe two halves of a two-claw clutch slide on feather keys on eacb shaft. The two halves of the clutch are so placed on tbe sbaft that they only fall into gear when the crank of the engine are at right angles. The chain wbeel clutch lever and middle olutcb lever are coupled together each to eacb on both sides, and by means of tbese three plain claw clutches fnur differsnt operations oan be accomplished:—

1. Each ohain clutch in gear and centre clutch out gives each wheel a separate engine and plain, independent driving.
2. Near-side cbain elutcb in gear, centre clutch in gear, off-side clutch out, and road wheel running free, gives a big effort to belp the car to start sbnuld the wbeel be in a hole or starting on a curve from left to rigbt after standing, say, in a bay or hovel. Both engines being coupled togetber at right angles insures certainty of starting.
3. Off-side ehain clutch in gear, centre clutch in gear, near-sids clutch out of gear, road wheel running free. This gives a similar motion to No. 2 position, but for the opposite wheel and curve.
4. Near-side chain clutch out of gear, centre clutch in gear, off-side cbain elutch out of gear. This position leaves tbe engines disconnected from the road wheels, coupled at right angles, free to be run light, for warming them up, pumping water into the boiler, or doing nutside work, such as driving a small dynamo, pump, &c.

By means of this comparatively simple mechanism we do away with friction clutches, countershafts, and differential gear for turning corners, as in no case can the two road wheels be coupled together, they either each havlng a separate engine each to each, or one two engines at right angles, and the other wheel free to revolve.

In driving the car we work onr engines both on the throttle and notched, a tbrottle valve being coupled to the reversing shaft, which shuts steam off from tho engines in mid-gear, and gradually opens as the lever is moved over from mid to full gear.

Construction of Car and Framing.

Apart from their uses, road vehicles may be roughly classed as perch suspension and plain suspension vehicles. In a perch carriage the power is transmitted to the rear wheels directly from the foro carriage to the hind axle without the necessity to pass through the body and springs, and this is the proper and most mechanical method. The simplest fnrm of perch is a plain timber oarriage, and tbere seems to bo a general concensus of opinion tbat, even when this perch is not used as a frame to carry the driving machinery, it will be the best suspension for autocars as offering tbe most rigid drive from axle to axle.

In our case we have made the perch very pure in its construction, the rear axle being rigidly attached to it, and the fore axle being directly attacbed to the peroh tube through a central bush. This axle is thus absolutely free to play as an oscillator without any spring restriction whatever. Tbe tnbes of tbe perch carry the engines, so that our chain-gear wbeel-centres are rigid and do not vary. Our earliest boilers were also placed on this perch, but as they made such a large percentage of tbe total dead weigbt, and materially affected tbe draught, we bave since placed them on tbe spring portion or body of tbe car. We have made every attempt, and shall continue to do so, to keep the boiler at tbe rear end of the vehicle and absolutely below it; and as a general rule, it may be taken that this will be our lines of arrangement, subject to slight individual modifications in the body of the vehicle:—Perch suspension, the engines being carried iu the perch frame. Frout axle absolutely free to oscillate about its centre. Short wheel base to facilitate turning (our present miniature lorry is 10 feet 3 inches long, with a 4-foot 3-inch wheel base). Boiler at the rear, eutirely below the platform or bottom of vehicie; water tank in front of boiler, fuel reserve in front of tank. The whole of the platform is thus clear except for the flue at the extreme rear. This fits in a socket to lift away for loading with a jib crane. The driver sits on the platform at the off side with a small footboard hung in front, and takes up comparatively little room. All this necessitates the platform being somewhat high from the ground; 4 feet 6 inches would be necessary if the boiler is solid fuel fired and absolutely beneath the platform witbout auy raised part as in the photo shown here, but we certainly cousider that 9 inches absorbed here is better tban taking up 4 or 5 feet in the length of the car. Moreover, this method of using the whole area of the car for dead load allows a builder to arrange his weights with great nicety, and keeps them all low down for stability. Metal *v.* Timber construction will have to settle itself by a judicious amalgamation of tbe virtues of botb systems. It is possible that we can claim to have been the only people to ever design and make a car tbat was entirely metal even down to the spring blocks. This was a "four-wheeled dog-cart," carrying four passengers, and, although coustructed entirely of Mannessmann steel tube, it followed the lines of an ordinary pbaeton very closely. We used it for tbe trial of nearly every boiler we made, and it would have been used by us for the present series of experiments but that we found ourselves so cramped for room in it that the smallest alteration in connections or arrangements involved very tedious work.

The advantage of metal construction for road vehicles is the possibility it allows for absolute interchangeability, enabling repetition work to be dono to absoluts standard, and its comparative indestructibility. But it is undoubtedly more expensive; it is very difficult to joint, so that the range of designs available is very limited; it acts badly under vibration, easily takes a set if too beavily loaded locally, and for equivalent loads is certainly heavier than timber. This last statement will be accepted with reserve, but up to the prssent we have drawn designs for several lorries and vans of size available to work the heaviest loads, and using tube, H, aud timber constructions. In all cases the timber allows a decided saving in weight when carefully calculated up. If anyone desires ossily to prove this he has only to draw out a wooden oak and ash-built wheel, say 3 feet 6 inches high, with 4-inch spokes and 6-inch by 1-inch tyres, the whole suitable for a very heavy lorry, using 3-inch drabble arms for axles. Then let him design a metal wheel capable of doing absolutely equivalent work with renowable tyres and renewable axle boxes, he will find, whether he uses steel disc, H or T iron or tubular or solid spokes, that his metal wheel is cousiderably the heaviest. It must be borne in mind that in practical lorry building the suspension, &c., necessitates a large number of parts being affixed to the frame, aud a fair width of bearing becomes needful. This the timber framing supplies, but to get it from a metal one often means the use of a heavier section than is needful so far as the strength, &c., is concerned. We bave come to the conclusion that timber framings, judiciously edge-plated or "flitched," will enable lightness to be obtained, with the needful accession of strength tbat the narrow "long-backs" of the "Act" will necessitate if very bulky loads are to be carried on steam lorries. The metal tubular construction necessitates a very costly joint and metal H ditto a very beavy joint as well as being fairly costly.

Steering will be a matter that, in reference to heavily-loaded cars, will require a great deal of experience before it can be said to be satisfactory. We, ourselves, think that jaw axles are the most suitable for self-propelled work, admitting of an easier, freer design to the front, a perfect oscillation to the front axle, and differential locking which is very valuable on wet ground.

We have made a hydraulic steering gear to test, as being very powerful for heavy loads. We have not given it up to the present any very extended trial, for on our extremely short wheel base it was too sensitive and turned us too quickly for regulation. Of course, the bath chair handle style will not be powerful enough for loads, and we use at the present time a worm gearing of six to one, and a chain gear that again multiplies the power. This is sensitive enough for a child to use when the car is in motion, but it will hardly stand the strain of locking the wheels when standing, as a driver might want to do to get out of an awkward corner.

Brakes, although important, are not nearly the momentous question on a steam car that they are to users of oil-motors. In his reversing gear a driver has the finest stopping appliance that he can want, and this reason has influenced us in making the reversing lever the primary driving handle. If, in addition to this, he is provided with a good stamp of foot brake he should be able to hold his load on the descent of any hill that he can mount. We have had a hydraulic brake on our car, and in practice, as it is a very cheap brake to apply, it could readily be fixed for emergency work and to comply with the Act.

Fuel.

The fuels available for steam lorry boilers are :—

Lancashire Gas coke	averaging	6*s*. per ton.
Furnace coke	"	15*s*. "
Anthracite	"	23*s*. "
Tar and crude oils	"	30*s*. "
Petroleum	"	90*s*. "

We have obtained as good steam results from gas coke as from furnace coke, but it is of very varying quality, and it would be almost impossible to use it on the road owing to clinker and dirt. Anthracite is as costly here as in London. Furnace coke seems to fulfil every possible condition that can be required from solid fuel. Clean to handle, easy to obtain, works at a cost slightly less than 0·5*d*. per ton-mile of load, absolutely free from dirt or clinker, does not require anything excessive in draft, so that the flue nozzle can be kept very silent. We made a number of experiments to burn liquid fuel. The sole value of liquid fuel in goods work would be its convenience, and it is almost impossible to overrate the value it would have in that respect. It saves from 150 to 200 lbs. in the weight of the boiler case. It enables the boiler case to be one-third shallower in depth. It enables one to force the boiler under stress of load in an exceptional degree. It is not bulky to carry. It is easy to obtain *en route*. But its disadvantages, we came early to the conclusion, absolutely damn it as a fuel to burn on vehicles at present. Its noise, when burnt in any quantity exceeding one gallon per hour, is absolutely intolerable. Its absolute unreliability under the slightest change, often quite imperceptible, of circumstance in atmospheric condition. The unpleasantness of handling it; and, finally, its cost.

Vaporisers.

Vaporisers may be dangerous and certainly necessitate the use of cleanly and, therefore, comparatively costly oils.

Atomisers are forced to be so small in aperture that they easily gum up and knock off.

Necessity for Additional Pumps and Connections.

It does not seem to have occurred to many people that the use of petroleum in vaporising burners is really equivalent to establishing another small boiler, with all the needful control gear, piping, &c., and working a fluid that in the event of a burn-out of the vaporiser becomes a danger.

One of the weak points of a steam-car is the piping and joints, and it is no recommendation to a system of firing that all these are duplicated in a small size of pipe that is always troublesome.

The comparison of cost is easy. At the best liquid fuel cannot, if it is a clean oil suitable for vaporizers, be bought at less per pound than seven times the price per pound of furnace coke, and it cannot in practice be made to do better than three times the evaporation of coke, so that it must be in working double the cost. There is the claim that when shut down for standing it saves, but the claim will not hold water. Tar or crude oil, worked in a spray or trickle burner, is as cheap as solid fuel, but it must be warmed and has a terrible knack of clogging, of suddenly varying its flame and sending over dense smoke, and behaving generally badly. Still, with all these disadvantages of cost and trouble, if only the noise of burning could be absolutely prevented, we think it would be the preferable fuel, solely for the convenience it gives in the design of the boiler-case and in stoking.

The commercial points of a self-propelled vehicle that an intending user should require are, in our opinion, and as the result of careful consideration :—A prime cost about equal to three and a half times the prime cost of a horse-lorry capable of moving the same load with all its horses and appointments ; a depreciation account and repair bill not exceeding 33⅓ per cent. per annum of the prime cost, to keep it always in the highest condition; an attendance and driving that does not exceed his horse-lorry for wages, or but very slightly; an utter absence of all refinement in feed, driving, and steering gears. If he obtains this, and can so arrange his work that the lorry is in fairly constant employment, he will on these charges effect a most substantial saving over horse traction. The greatest economy will be effected through the maintained speed that he can get; more especially is this marked in the lighter lorries.

The conclusions we have come to as to the commercial future of self-propelled vehicles for goods and general traffic are somewhat at variance with those generally held, and they may be interesting to you. It is usually accepted that the heaviest load that can be carried will, by its reduction of the wages item and the fewer number of cars necessary, work out most successfully. This is not wholly our opinion, which is that the item of speed is of paramount importance to load, provided that a correct mean is found. Thus a lorry carrying 1 ton can probably be forced to an average of 12 miles per hour, equalling 12 ton-miles of load per hour; one carrying 2 tons to 8 miles per hour, equalling 16 ton-miles; whilst a heavy lorry carrying 4 tons could not exceed 4 miles mean speed, equal to 16 ton-miles per hour. By this the 2-ton lorry should be able in the working day to nearly equal its heavy rival. We will not consider it in relation to anything capable of shifting more than 4 tons of load, as we should just like to see such a vehicle built and at work. Such a lorry as a 2-ton lorry, working at 8 miles per hour, is a feasible vehicle, and its use would possess many advantages over a heavier class :—Smaller units, less light load work, and great convenience of handling either in bad places or in a breakdown; the high speed would enable much longer journeys to be undertaken inside an ordinary working day—as, say, 30 to 40 miles each way; less capital is idle during repairs; greater safety in construction, as the builder would not need to work so near his factors of safety; less possibility of disagreement with local authorities; and, above all, the fact that resilient tyres could be used, and the risk and wear and tear of running enormously decreased. To find out the prime cost of such a vehicle, or rather to see the margin that a lorry user has to work with, we made the following comparisons, worked out at the highest limit in all cases; but we have taken the 2-ton lorry as only having a mean speed of 6 miles per hour, although we think that in practice it will be easier to run such a lorry at 8 miles per hour than a 4-ton lorry at 4 miles :—

A horse's capacity for work is as nearly as possible the equivalent of 36 ton-miles per day for 300 days per annum. Of this it will be found that whether he works alone or in company with another approximately one-third is tare work and two-thirds, or, say, 25 tons per day, is load. 1 horse work = 1 ton tare, 2 tons load, at 2½ miles per hour, for 5 hours' actual working per day = 25 tons per day for 300 days per year = 7,500 ton-miles per annum. The horse cost alone per ton-mile of load should work out about 2*d*.

Cost of horse, say, £60.	£	*s*.	*d*.
Interest on that	3	0	0
Forage, at 12*s*. per week	31	4	0
Depreciation and repairs	15	0	0
Shoeing, at 5*s*. per month	3	0	0
Rent, rates, taxes, &c., 3*s*. per week ..	7	16	0
Harness (2 years' wear, at £6 10*s*. per suit)	3	5	0
Rugs, &c.	1	10	0
For 7,500 tons of load	£64	15	0

The lorry cost should work out at 6*d*. per ton-mile.

Cost of lorry, including sheet, say, £45.	£	*s*.	*d*.
Interest on that	2	5	0
Depreciation and repairs, 25 per cent. ..	11	5	0
Housing, &c., 2*s*. per week	5	4	0
For 7,500 tons of load	£18	14	0

Actual labour cost alono per ton-mile = 2·5*d.* per ton.

Man at 24*s.* per week, boy at 6*s.*, £78, = 2 + 6 + 2·5 = 5·1*d.* per ton-mile, as the total cost.

The working capacity of an equivalent steam lorry would be 4½ times as great as this.

Steam lorry weighing 2 tons, load 2 tons, speed 6 miles per hour = 12 ton-miles of load per hour for working day of 10 hours = 120 tons per day = 36,000 ton-miles of load per year of 300 days. That is to say, that if work could be arranged to keep the steam lorry constantly at work for that period it would displace annual charges = £765. Now several of the charges of such a steam lorry doing that work can be accurately given.

	£	s.	d.	
Wages—Man and boy, 34*s.* per week	83	4	0	
Fuel at 6 lbs. per ton of load per mile = 100 tons	75	0	0	A.
Water at 1*s.* per 1,000 gallons at 30 lbs. per ton load	5	8	0	£92 18*s.* 0*d.*
Oil at one-sixth of fuel	12	10	0	
Lighting, 18 lbs. wood per day, at 10*s.* per ton	1	4	0	
Licence	2	2	0	
Housing, at 3*s.* per week	7	16	0	
	£187	4	0	

This leaves £578 4*s.* to cover the two items of interest and depreciation, which, at 5 per cent. interest and 25 per cent. depreciation, it would do on a prime cost of about £1,935. Of course, the probability is that not more than 50 per cent. of the horse load could be arranged to be conveniently done by the power lorry, which would give £967, plus one-half of the running charges in items A, viz., £46 9*s.* = £1,013 9*s.*, as an equivalent cost price to horse-lorry work. But as £400 is quite a possible and reasonable figure at which these steam lorries for 2 tons loads should be produced, there should be, even after an allowance for higher attendance charges than we have given has been made, a substantial saving of at least £100 per year on each horse at work. The distance covered by such a lorry working at this pressure would be 60 miles per day.

In working a load of 2 tons tare, 4 tons load, with 2 horses at 2½ miles per hour for 5 hours = 50 ton-miles per day, or 25 per horse of load—

		d.
Cost for horses per ton-mile of load	=	2·0
„ lorry „ „	=	0·3
„ labour „ „	=	1·25
		3·55 per ton-mile.

An equivalent steam lorry 3 tons tare, 4 tons load, working at a mean speed of 4 miles per hour for 10 hours, would have a capacity of 160 ton-miles per day = 3⅕ horse lorries displaced, or annual charges of £710. The annual charges of such a lorry, in addition to interest and deposit and repairs, would be—

	£	s.	d.
Man and boy, 34*s.* per week	83	4	0
Fuel at 6 lbs. per ton-mile; load 128 tons, at 15*s.*	96	0	0
Water at 1*s.* per 1,000 gallons, 30 lbs. per ton	7	2	0
Oil, &c., at ⅙ fuel	16	0	0
Lighting	1	4	0
Licence	3	3	0
Housing	7	16	0
	£214	9	0

Leaving £496 per annum to cover interest, deposit, and repairs before an equivalent cost to horse work is reached. As £500 is a possible cost for such a lorry, these items at 5 per cent. and 25 per cent. respectively, work out to £150 per annum, leaving £346 margin.

The following comparisons of work at 8 and 4 miles per hour will exemplify the meaning of obtaining economy by increasing speed:—Say a man has 8 tons to shift from Liverpool to Warrington, a distance of 16 miles = 128 ton-miles, two lorries carrying 2 tons each time could transfer the load and return in 8 hours. Two lorries carrying 4 tons each could only do the same. Double the length of the journey, say, Liverpool to Manchester, and it becomes too long for a working day for the heavy lorries, but four 2-ton lorries could do it and return finished in 12 hours.

Speeding to economise is the most modern practice, and we think that the less one regards this Light Locomotives Act as a means for substituting traction engines for ordinary horse work the better. If a load is so heavy in its single bulk that it cannot be safely carried on a 2-ton lorry, it becomes a subject for a traction engine; any goods that could be broken in bulk to transport speedily we believe it would be economical so to treat, and certainly in the early stages of this industry much safer.

The paper was illustrated by several photographs thrown on a screen by the oxyhydrogen light, with the aid of which Mr. Simpson pointed out details in the working of the machinery used in the various experiments, particularly in the later and more successful stages.

The Chairman (Mr. J. Brodie, M.I.M.E., &c.), said the best thanks of the Society were due to the gentlemen who had prepared the paper. It was a very valuable one, and these gentlemen had spent a great deal of time in investigating the subject.

Mr. Alfred Holt said the paper had given him great pleasure. It was evidently the result of very considerable experience, and the taking of a great amount of pains. He had before expressed the opinion that the solution of these questions was not so easy as some gentlemen assumed, and the lecturers in this paper acknowledge the great difficulties they had and have to face. He sympathised with them and heartily wished them success. I would like to make one or two remarks, which may, perhaps, seem irregular or disjointed. The paper says of the proposed power goods' vehicle, that "its prime cost should not exceed to the user three and a half times the cost of one horse lorry with its horses and appointments." In his (the speaker's) opinion that involved a capital cost which was rather greater than would be readily accepted by cart owners. He was, however, very much pleased to see an opinion expressed by the authors which he considered a very sound one, namely, that they had "decided to confine our researches to steam as a motive power." He would ask whether it was possible to make a vehicle suitable for this purpose merely by making two wheels revolve. He questioned it very much, and certainly the revolving of two wheels as aimed at by the authors of this paper. They had repeatedly seen lorries in the streets with two wheels fastened, with horses and driver holding back, and yet unable to sufficiently retard the progress of the vehicle without running the side-wheels along the kerbstone. He was afraid that any vehicle which depended only on making two wheels revolve, or preventing them from revolving, would be insufficient without a roughening of the tyre or the adoption of some mode akin to the cog action. With regard to the jaw clutch motion he would ask the authors if this was likely to prove a durable or lasting arrangement in the case of heavy loads. He was of opinion that it would be unlikely to stand. There was one point he noticed with pleasure. His experience on this point had quite upset his first theory, and he was glad to be supported from this independent source in the belief that a much stronger wheel could be made from wood than from metal. Wooden wheels, and even wooden driving wheels for locomotives were used on the first Lancashire railway, but these were discarded on account of their bulk, and because the heat from the engine affected them.

Mr. J. B. Corrie said the authors in their paper spoke of the burner clogging. He had some experience of burners, especially with the Holden burner on the Great Eastern Railway, which was that there was no trouble. It gave very excellent results, and the only thing that was objectionable was the noise. Then there should be no smoke with a triple burner, if it was properly regulated.

Mr. J. P. Lea (Manchester) said he wished to inquire as to the disposal of the steam. If it was condensed the necessity for a large supply of feed water was reduced. With regard to the form of the boiler one naturally thought of the question of the cleaning of the tubes, especially as they were so irregular in shape. Then he would like to know whether there was always a stated pressure in the boiler—whether the steam was exhausted down to one stated pressure. Then he was in doubt as to the way in which the mechanism actuated the wheels. He wished to express his thanks to the authors for giving them the results of what must have been expensive experiments.

Mr. E. Shrapnell Smith asked what was the total metal weight compared with the horse-power, and also referred to the exposure of the machinery to dust. He would like to have an explanation of the means taken to reduce the superheat. As hon. secretary of the Liverpool Centre he was glad to hear that they would have one of these wagons at their trial in May next, and for this and for the excellent paper he was personally much indebted to the writers of the paper. (Applause.)

In response, Mr. SIMPSON said they tried no definite make of burner, but if the makers of the Lucigen could produce a burner that was thoroughly satisfactory, and require no extra piping, they would be only too pleased to adopt it. In reply to Mr. Holt, he would say that the mechanical difficulties of driving each wheel of four were at present almost insuperable. Efforts were being made in France to do this, but they were not yet satisfactory. With regard to the adhesion question, nothing but practice would settle it satisfactorily. If the weights were heavy sanding would be necessary, perhaps, as it was now used to get a good start when the ground surface was greasy. The same remarks would, of course, apply to the question as to the use of brakes. With regard to spray burners they worked beautifully in climates like France and India, but it was different in our climate. They would, perhaps, work well when going, but after a stop—if only for a minute or two—they would not start even with a 100 lbs. pressure to the square inch. It seemed the oil passed through a peculiar gum action—a pin would remove the obstruction immediately. Even in a large orifice the effect was to close the nozzle. He agreed that the Holden burner was almost a perfect one. They had not the slightest difficulty in regard to the disposal of steam. In answer to the gentleman who spoke of the tubes, he might say that the tubes cleaned themselves. They were subjected to a temperature of 400°, and any deposit in the water was turned into fine powder, and carried off. The speaker here explained in detail the method of carrying off the superheat, and said that if the engine was stopped water was forced from the boiler, as the temperature rose, into the cold-water tank, so that they got a silent blow off. The clutch was not used in ordinary working, but only in starting. It was used to get the right position to start, to get the engines at right angles if they happen to be both at dead centre at the same time. He could not give proper data as to weight of motor as to car. As near as he could say, the boiler would weigh 10 cwt., the engine gearing about 3 cwt., and the total weight of car 30 cwt., to carry 30 cwt. or 2 tons. With regard to their last boiler, they had experienced nothing but satisfaction. It worked thoroughly satisfactorily.

The proceedings then terminated.

In deference to the wishes of several members of the Self-Propelled Traffic Association an adjourned discussion on the paper took place on March 1st, Mr. A. Holt, M.I.C.E., presided.

The HON. SECRETARY (Mr. E. Shrapnell Smith) read a letter from Professor Hele-Shaw regretting his inability to be present. The paper they had before them was a most valuable one, not least on account of the account it gave of the failures experienced by the authors, which disposed hearers to accept with greater confidence the conclusions at which they had arrived.

The CHAIRMAN said this meeting was held at the express desire of many members that they should have an opportunity of discussing a valuable paper. (Hear, hear.)

Mr. BANNISTER said the paper was intensely interesting to him, as though he was more indirectly concerned in locomotive engineering and not a manufacturer of motor-cars, it was a matter of the greatest importance to help in any way in the development of this branch, which had for its object the transportation of produce from one part of the country to another. With regard to boiler conditions, while agreeing that an improvement in many respects was necessary to overcome the innumerable difficulties to be surmounted, he was of opinion that the real solution lay in the simplification and elimination, as far as possible, of mechanical details, rather than going in for the application of devices necessary in ordinary steam engine requirements. He did not agree that it was necessary to adhere to the existing type of car. He thought car and engine and all connected should be designed to meet the special requirements, and it should be designed as simple as possible. There should be few working parts—the fewer the better. The large number of cocks, valves, steam pipes, regulators, chains, and so on, which seemed to be in the present arrangement, should be eliminated as far as possible. This would be conducive to the betterment of the machine, and make its life longer. Even if this was done at a sacrifice of economy in fuel he thought it would be better so. (Hear, hear.) Of course, it was quite impossible to have a boiler of one single piece, but the joints should be so few and so strong that ordinary vibration should not cause them to leak. The tests should be very much greater than that given by the authors. He used very high pressure in his business, and he thought that even for ordinary land or marine boilers where vibration was normal they tested their boilers to eight times the working pressure. He thought the leaking of the boilers was due to the fact that they hung from the car, and that this could be overcome with a little—rather, he should say, a great deal of—trouble. His suggestions were made to elicit information from the authors. He wished to ask if it would not be possible to eliminate the drawing off of the steam direct from the boiler, and also the trouble in starting and stopping, whether they could not have some simple arrangement for water feed—two pumps for instance. He asked why the authors went to the trouble and expense of making headers when they could get those of Babcock and Wilcox, who stamped out their headers and worked their boilers up to 500 lbs. pressure—their headers being absolutely tight.

Mr. WHITE said he was sorry the authors had given up Boiler No. 4, which was an exceedingly good type, and he suggested that the expense could be much reduced if the joints were made by the hydraulic method used in bicycle tube building. The pressure, of course, would have to be correspondingly greater. He was inclined to believe that this Row type of tube would allow of a deposit, and otherwise it was an exceedingly good type. The question of feed for the boilers could, he thought, be easily settled. Suppose they put an insulated point which would touch the water when it rose to a certain point, and so be electrically connected with a smaller motor, which again would be connected with a throttle valve in the feed water. He was sorry they did not go in for roller bearings, which would largely reduce the power required to drive a motor. He liked the idea of the engines being coupled direct instead of through gearing, for it was necessary to eliminate the number of working parts as much as possible. He was also sorry they had abandoned the idea of a compound engine, which would allow them to dispense with a certain amount of gearing. Up to the present wood framing was better than tube framing, for you were more likely to get a good carpenter than a man who could put broken tubes to rights.

Mr. WEST said the authors had, in his opinion, chosen rightly when they stuck to steam. He hoped the authors would reap their reward, for they certainly deserved it. (Hear, hear.) He was glad to see that the authors laid it down as a rule that they would have the same amount of platform as the present. Then as to the demand that the speed should be twice that of a horse—that is, six miles—which, with heavy loads, was as much as they could hope to attain to begin with. The paper did not leave them hopeful for the future, for heavy traffic was spoken of as not likely to be much carried by this class of car. As long as they had a limit of three tons fixed by Act of Parliament as the basis of the tare of the vehicle he was afraid they would not go ahead as fast as they should do. There should be no limit, for the thing would cure itself. In some parts of France they had omnibuses which carried a large quantity of luggage and 14 or 15 passengers, and he thought there would be a future for a car here that would fulfil such functions as these. He was struck by the ingenious arrangement for the working of the wheels, and he agreed that wood was the best material for a car. Tubing was very light and strong, but liable to damage, which damage would be unrepairable.

Mr. E. SHRAPNELL SMITH asked if the authors, in their experiments, found "gulphs" of water surrounded by steam going through the tubes. The possibility was not such a remote one as might be imagined, because, as he had occasion to learn some months ago, water would assume the spheroidal form even at a temperature of 202°. With regard to the power excited in starting the engines and its effect, he said that at the moment you want the maximum effort they were limited to the adhesion of one wheel, or only one-fourth of the adhesion to be got out of the whole vehicle. Again, the machinery was attached to the perch without the use of springs, and this might account for the joints going as described. With regard to the comparative figures they could not be taken as absolutely correct, for modifications might have to be made. For instance, the paper spoke of the maximum work of a horse being 25 tons per day, whereas a master carter had assured him (the speaker) that many Liverpool horses did something like 48 to 50 tons per day. Yet the authors had undoubted authority for their statement, but in Liverpool the horses did more than usual. It was interesting to think that the use of 2-ton vehicles would greatly multiply the units, for supposing a load of 1,000 tons had to be carried between Liverpool and Manchester it would require 500 vehicles—or one every three minutes. He must, to a certain extent, combat the statement that four tons was as yet about as much as could be carried by a vehicle of about the same weight. He had visited the works of builders who were endeavouring to work out this problem,

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and he had seen a motor-car weighing 2 tons 13 cwt. carrying four and a half tons of pig iron, and he had no doubt if the platform was larger a similar weight of other goods could be carried. The vehicle was decidedly noisy, and, comparing it with that of Messrs. Bodman and Simpson, it was not in the same street.

The CHAIRMAN, after expressing in his own name and on behalf of the Association their thanks to the authors, said the primary object of improvements in vehicular traffic was to cheapen the cost of transit, and this applied very forcibly to the case of Lancashire. The only argument the railways would listen to was that of competition, and so far they had punished Lancashire severely. He was convinced that Lancashire paid for half of the non-productive railways in the kingdom (hear, hear), such as lines in North and South Wales, Oxfordshire, and other places. Referring to the subject more immediately before them, he agreed that steam was the best motive power.

Mr. SIMPSON, in response, said they had always endeavoured to get as simple a boiler as possible. Their tests for the working pressure were only limited by the capacity of their testing pump, and they would in future test up to 1,000 and 1,800 lbs. for a working pressure of 250 to 300 lbs. With regard to the regulation of the feed water, it was far simpler to regulate the supply by a stop-valve, as in the Serpolet, than have it fed automatically, which would necessitate a gauge-glass. In the Row tubes they interposed a series of bafflers. The water came round the sides of the tubes, and not through the middle. There was no deposit, and, besides, the high temperature turned what might be deposited into a fine powder, and it was easily blown off. No. 4 boiler would be an undoubtedly good one, and the hydraulic method would be beautiful and thoroughly practical; but there was a difficulty of repairing in actual work, which militated against the adoption of this plan. Roller-bearings would be a great saving, but they were in an experimental stage, and it would be an experiment to adopt them.

Some Points in the Design of Automobile Vehicles intended for Heavy Traffic.*

(*Continued from p.* 193.)

Dimensions, &c.—These are partly fixed for us by the Act, which says that the outside breadth shall not exceed 6½ feet. We then have the Self-Propelled Traffic Association stating their requirements, viz., that the height of the deck shall not be more than 4 feet 3 inches nor less than 3 feet 9 inches, and also that there shall be 110 square feet of surface. Allowing a space of 5 feet for machinery, &c., we find that the overall dimensions must be 22 feet long by 6½ feet wide. In order to stow 7 tons of American cotton on this deck-space of 110 square feet, there would be 32 bales, each 490 lbs. weight, and each occupying 31 cubic feet; the pile would be 9 feet high, and, taking a mean height of deck of 4 feet, the top of the pile would be 13 feet from the ground. A longer car would be preferable for many reasons but, as we shall see, the Act penalises good design through weight. A longer car means much greater weight in order to obtain the necessary longitudinal strength.

Gauge.—An important matter is the gauge to adopt. I recommend the ordinary railway gauge, 4 feet 8½ inches, because in this city the streets are laid for the tramways to this gauge, and alongside the docks and warehouses we have a sunk railroad. There, in effect, plateways must be utilised by automobilists to their fullest extent No doubt the tramway and railway companies will hardly appreciate the intention of using their property in the way suggested; but the Act does so little for us, and the automobile vehicle is regarded by many as a kind of mechanical Ishmael, that we must make the most of our opportunities in every direction. By making use of these tramway and railway lines we reduce the resistance per ton to about 25 lbs., and the B.H.P. required to propel our car, weighing 11 tons, at five miles per hour, is but 3·7, or say 4½ I.H.P. This reduction in H.P. shows the great advantage of platewsys such as suggested by Mr. A. Holt.

Framing, &c.—For the framing we should employ nickel steel channels. In order to determine the least section, and therefore the least weight, we consider the weight of the load as 7 tons and the weight of the machinery as 1½ tons, or 8½ tons in all; this is 2¼ tons on each girder. We regard each girder as being supported at two points 15 feet apart (the wheel base). We also assume the load to be uniformly distributed over this length, and to be 28 lbs. per inch.

Employing the usual formulæ and a factor of safety of 3, we find that channel sections, 4″ × 3″ × 3″ × ·3″, are amply strong, this section weighs 12 lbs. per foot. Did we use steel we should have to use a 5″ × 3″ × 3″ × ·5″ section, which weighs 16 lbs per foot. Thus by using nickel steel we effect a saving in weight of 25 per cent. The framing would of course be strengthened and braced by diagonal and transverse ties; it would have a flooring or deck of 1½-inch elm, and its total weight would be 1,300 lbs.

Tubes v. *Channels.*—Here it may be well to allude to the growing tendency with automobile vehicle-builders to use tubes for framing, under the idea of obtaining strength. For purposes, as in cycles, where the stresses are mainly of a tensile or compressive nature, tubes are unquestionably the right things to use, but for heavy wagons the stresses are such as induce bending. In order that a tube shall be as strong as a beam, we must make the moduli of their sections equal; that in order to have a tube as strong as the girder above mentioned we must make, adopting the usual nomenclature—

$$\left(\frac{BH^3 - bh^3}{12}\right) = \frac{\pi}{32} \cdot \frac{D^4 - d^4}{D}.$$

Working this out, we find that the external diameter of the tube must be 6 inches and the internal diameter 5·65 inches, and the weight of such a tube is 11·7 lbs. per foot; its thickness being but ·175 inch, or less than $\frac{3}{16}$ inch. There is thus an apparent advantage in using tubes; but while the tube is structurally strong it is locally weak, and such a tube would be easily damaged. On the other hand, by making them thicker and heavier, they would stand having external connections made, and the tubes would form excellent feed or oil tanks. There is thus a good deal to be said in favour of tubes. For such very rough and heavy work as is here proposed I think channels are preferable.

Wheels, &c.—We now have to consider the method of applying the wheels. In ordinary wagons the axle on which are the wheels is secured to plate springs, which in their turn are attached by links to the framing. For wagons this method, which is in almost universal use, is no doubt as good as can be devised. In automotor vehicles we see that this method is also adopted—wrongly, as I think, because a little consideration will show that in any automotor vehicle the reaction of the forces, when the wheel is being forcibly moved, tends to move the axle in a longitudinal direction, also the gearing tends to the same end. Hence in locomotives it has been found essential to prevent any such action, and so the driving axles are held in bearings or boxes which are maintained in position by horn plates and all fore and aft motion entirely prevented. This system, I think, must be followed by us. As regards heavy automobile wagons there can be no question of the propriety of this. I therefore suggest the fitting of horn plates similar to those used in railway passenger or goods cars. Those horn plates would weigh about 41 lbs. each. The axle boxes would be fitted to them in the usual way. Instead of using the heavy plate springs which are so generally employed, I propose to use either spiral or volute springs in conjunction with indiarubber plate springs. Such springs would deflect more and weigh much less. The plate springs weigh, in fact, three times as much as a spiral spring, and only have a range of deflection one-sixth of the latter. For the axles I propose to use Mannesmann steel tubes. The excellence of the manufacture is too well known to need any description. This Mannesmann metal is a high grade brand of Swedish steel. The wheels would be made of mild steel of T section, 5 inches wide, the spokes would be also of mild steel, the hub would be a Mitis metal casting, each wheel would be 36 inches diameter, and would weigh 200 lbs. The fore part of the wagon would be carried on a pivoted bogie as is the usual practice.

A few remarks about wheel tyres may here be made, as this is a matter of very great importance. The width of the tyres has so far been settled by purely empirical rules Sir David Salomons states that a 3-ton vehicle should have 4-inch tyres. Other authorities say that the width should be 1 inch per ton. Obviously the width will vary directly as the weight, and inversely as the hardness of the ground, and also inversely as the diameter of the wheel. As regards the weight, this is practically unimportant in streets so well paved as those of Liverpool and other large cities, and loads of 9 tons per square foot, such as can be safely borne by rock or other substance, can equally well, and even better, be conveyed over granite setts on concrete floors.

In the country with good macadam roads it would not seem possible to impose greater loads than 3 tons per square foot of area. Now the area of contact between a wheel and a flat surface is

* Excerpt of paper read before the Self-Propelled Traffic Association, at Liverpool, on January 25th, by GEO. HERBERT LITTLE, Technical Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

theoretically a line. In practice it will be an area depending upon the diameter of the wheel and the nature of the ground. A wheel, 3 feet diameter, heavily loaded on a macadam road would have a length of contact of not less than 6 inches, or, for a four-wheeled vehicle, 24 inches in all; then in order that the area of contact shall be 1 square foot the width must be 6 inches; that is the 3-ton vehicle must have tyres 6 inches wide. The Locomotives on Highways Act, however, merely specifies 4 inches for all vehicles weighing over 2 tons. Assuming that a loaded vehicle weighs 5 tons and that the length of the arcs of contact is 24 inches and the tyres 4 inches wide, the pressure is 7·6 tons per square foot. Needless to say, macadam would never stand this. On the other hand, wide tyres are inadmissible owing to the impossibility of keeping the weight within the Act. We thus see that country roads are too soft for heavy traffic, and that heavy traction on them is, in their present state, not possible. We also see that with these roads and owing to the necessity of keeping down the tare weight, we are forced to make 4 inches width the maximum. We are really limited to a gross weight of 4·5 tons.

Before heavy traction can be indulged in and the country districts reap the advantages of cheap transport, the roads must be paved throughout as are the Liverpool streets, or at least made as good as the French roads. Owing, however, to this matter being in the hands of numerous local authorities uniformity in practice would be difficult. The Locomotives on Highways Act makes no provision for this, and hence it is faulty.

In my design I have adopted 5-inch tyres as being a bit better than the Act and less harmful to the roads, but here we are limited by considerations of weight, and this shows that the Act requires amendment.

Weight of Wagon.—So far, then, we have got our vehicle; all parts designed for a load of 7 tons. It will be as well to see how the weight comes out. We have:—

Framing and deck, including all bracing, connections, &c.	1,300 lbs.
4 horn plates	165 „
2 axles (hollow)	120 „
4 axle boxes	160 „
4 wheels	800 „
4 spiral springs and fittings	280 „
Frame of bogie and connecti	300 „
	3,125 lbs.

Or 1·4 tons.

Many of these items have been purposely increased, and an ample margin of strength has been allowed in all cases. We may, therefore, take it that a heavy wagon without machinery, such as indicated, can be built weighing about 3,000 lbs. This, of course, is only possible by the adoption of special high grade metal and by making all parts of no heavier section than is required after providing a proper factor of safety. As before said, I have adopted 3 as a suitable factor. Very careful workmanship is also requisite, and, needless to say, the ordinary coachsmith would have to be replaced by the accurate fitter. Hence such vehicle will be necessarily expensive at first.

Machinery.—We now pass on to consider the design and weight of the machinery; but before doing so some attention may be well paid to the general subject of weight and power. In order that a fair comparison can be made between automobile vehicles and other descriptions of automotors we must know the weight of machinery per I.H.P. I have, therefore, got out the following table which refers to different classes of automobile machines:—

Description of Automobile.	Weight of machinery per I.H.P.
Cargo steamers	400–450 lbs.
Mail „	400–420 „
Battleships and cruisers	260–300 „
Torpedo-catchers	45–50 „
Express tank locomotives	270 „
Admiralty launches (old type)	175-200 „
Steam lifeboat "Queen" (maximum power)	72 „
„ „ „ (normal „)	143 „
Typical road traction engine	1,100 „
Scotte, No. 1 (45 I.H.P.)	40 „
De Dion, No. 14 (45·1 I.H.P.)	44 „

These figures, which I believe to be reliable and representative of good average values, are worth a little consideration. It will be seen that the ordinary steam road traction-engine is the heaviest motor in use, being nearly three times heavier than the marine cargo-steamer motor, and no less than 20 times heavier than a torpedo-boat motor.

It will be noticed, too, that the Scotte and De Dion vehicles have machinery weighing about the same—or a little less—as that of torpedo-boats. In the latter, however, the weight includes condensers and their pumps, fans, and all the numerous valves, &c., whereas in heavy road motors the most simple designs will be used, and hence, judging from the prolonged and uniform success with which the Scotte and De Dion motors have run in constant work, we may safely allow in designing a weight of 45 to 50 lbs. per I.H.P. as being ample to secure good and substantial machinery. This weight implies the use of common materials of construction. If we employ nickel steel we can with confidence reduce this weight by certainly not less than 15 per cent., while a reduction by 20 per cent. would still give a superiority to mild steel. This means that we can safely specify for a high-pressure boiler and fast-speed motor and its accompanying gearing; the whole weighing not more than 35 lbs. per I.H.P. This means that on a margin of 1 ton weight for machinery we develop 64 I.H.P., or about 48–50 B.H.P. This would suffice to take a vehicle, weighing in all 14 tons, up a 10 per cent. grade at a speed of three miles per hour, against a resistance of 150 lbs. per ton.

Before leaving the question of the weight of machinery, I would digress for a moment in order to draw your attention to some facts connected with that automobile vehicle, the steam lifeboat "Queen," which is stationed at Liverpool. As you will notice, she has a very large H.P. and a comparatively low speed. In vessels of this class the Admiralty constant, $\frac{V^3 D^{\frac{2}{3}}}{\text{I.H.P.}}$, usually has a value of about 100. In the "Queen" it is only 32, showing a remarkably low propulsive efficiency.

Returning to our vehicle. As will be seen, we have but an available weight of 1·6 tons, and on this we have to provide all the machinery, and the question is, what type of engine and boiler shall we select?

We must, first of all, settle the maximum power to be developed and the heating surface. The power we have before determined is 33 I.H.P. As regards heating surface, the number of square feet per I.H.P. varies in the most erratic manner, according to the type of boiler used. Thus, in marine practice, we may say that the number of square feet of heating surface per I.H.P is given by $\frac{16}{\sqrt[3]{P}}$ where P is the boiler pressure. According to the rule we should have to provide no less than 91 square feet of heating surface. Now a return-tube marine boiler working at 100 lbs., and containing this amount of heating surface, will weigh no less than 2·25 tons. That is, the weight is 150 lbs. per I.H.P. of engine and 45·5 lbs. per square foot of heating surface. The particulars of this boiler are taken from the catalogue of a very well known firm of engineers. The weights are rather high, and in marine practice the weight for larger boilers is about 41 lbs. per square foot of heating surface.*

Water-tube boilers are, on the other hand, all that can be desired as regards lightness. Thus the "Lifu" water-tube boiler weighs but 25 lbs. per I.H.P. of engine; that is, a boiler that would supply all the steam required for our purpose would only weigh about 825 lbs. or ·37 ton.

Although water-tube boilers are so much lighter they are less efficient as regards heating surface than marine boilers, the latter of the Scotch type being among the most economical steam producers known.

The relation between heating surface and H.P. in the "Lifu" boiler seems to be expressed by—

$$\text{H.S. per I.H.P.} = \frac{25}{\sqrt[3]{P}}.$$

Thus we should require for our automotor about 130 square feet of heating surface as against 91 in a boiler of the marine type.

A few words about the Thornycroft boiler may not be out of place. This well-known and very successful type of boiler has been applied with advantage to automobile vehicles with some necessary modifications in the typical design. From published statements, however, it would seem that the relation between heating surface and H.P. is expressed by—

$$\text{H.S. per I.H.P.} = \frac{19}{\sqrt[3]{P}}.$$

* *See* Milton on Water-tube Boilers, "Transactions of the Institute of Naval Architects, 1894."

Whether this formula would apply to such small boilers as are required for our purpose I am unable to say, but I do not think it is materially incorrect. The weight per square foot of heating surface of this boiler is 12·1 lbs., which is vastly different from that of the Scotch boiler, but still not so good as the "Lifu," while the weight per I.H.P. is about 40 lbs.

From the data I have laid before you, which is that obtained as the results of many trials and tests, we can estimate with considerable accuracy the leading particulars of a boiler intended for automobile purposes on land. Taking 35 as the maximum I.H.P. we are to develop, and following the relation which obtains in the Thornycroft boiler as being a convenient mean between the heavy Scotch type on the one hand and the lightest water-tube boiler on the other, we find that we shall require, using steam at 200 lbs., about 115 square feet of heating surface, and hence the boiler will weigh 1,380 lbs., or ·62 ton. This is an extravagant estimate, and provides a power which would never be required in ordinary work, but only when climbing a 10 per cent. grade fully loaded. As there are no 10 per cent. grades even in this hilly district we thus have a large reserve of power. We might estimate on a different plan: On the level we know that the power wanted is, say, 28 for a speed of five miles, and against a resistance of 150 lbs. per ton. In actual practice the resistance in a well paved city would never exceed 60 lbs. per ton, while a speed of only four miles per hour is desired, the corresponding I.H.P. being but about 9. Thus an engine that will give off 25 I.H.P. would for all ordinary and practical purposes be ample, and applying the foregoing formulæ we find we could supply all the steam from a Thornycroft boiler containing 83 square feet of heating surface, and weighing but 1,000 lbs, or about ·45 ton.

As this boiler question is so important I perhaps labour it, but my object is to bring, in my own humble fashion, the experience and data of those who have had to make the construction of light and efficient boilers a special business to the notice of those who, having been untrammeled as to weight, have been in the habit of producing boilers that would deeply shock a naval constructor or torpedo-boat builder. I take up a catalogue, or six catalogues, of boilers and engines by different makers, and I find that a portable engine, giving off 30 effective B.H.P., weighs not less than 420 lbs. per B.H.P. or, say, 340 lbs. per I.H.P.—a wholly superfluous and unnecessary amount of weight. Hence it is not surprising that when these makers, wedded as they are to the traditions of the elders, and lavishly reckless in the use of metal, are asked to compete in building an automobile vehicle, giving off some 25 to 30 I.H.P. and to weigh under 3 tons, they decline, because this new practice is utterly opposed to all their well-worn canons of engineering. It is not so much to the builders of traction-engines that we must look for the practical solution of the problem set us by the Self-Propelled Traffic Association but to the torpedo-boat builders, such as Messrs. Yarrow and Thornycroft. Both these gentlemen, I need hardly remind you, are not only very distinguished engineers, but leading automobilists, Mr. Yarrow being an early pioneer in the movement.

Many automobilists seem to favour the vertical boiler, and hence a few words may be devoted to that. If we take the most economical type of vertical boiler, viz., the "Essex," made by Messrs. Davy, Paxman, and Co., we see that the relation between heating surface and H.P. is expressed by—

$$\text{H.S. per I.H.P.} = \frac{22}{\sqrt[3]{P}}.$$

The boiler having this amount of heating surface would weigh about 2·5 tons.

Of other types of boilers I should like to mention the Scotte and De Dion et Bouton. It is, however, so very difficult to obtain exact data. French manufacturers display an amount of reticence in these matters which must be, I should think, prejudicial in some respects. In these days all who have anything to sell have to imitate a distinguished statesman who lately visited you, that is, they must be their own "bagmen," and sing loudly praises of their own wares.

It may be of service to put in tabular form the relation between heating surface and weight of various types of boilers:—

	Weight per square foot of heating surface.
"Lifu"	6 lbs.
Thornycroft	12 „
De Dion et Bouton	23 „
"Essex"	47 „
Serpollet	53 „

Engines.—There are so many types of high-pressure fast-speed engines made now that we have quite a large field to select from. Objection has been taken to fast speed; but why? No one objects to fast-running engines for locomotives, or for electric-light plant, or for torpedo-boats, or for driving fans used for ventilating purposes. Why, then, should we object to such motors for automobile vehicles. The experience gained during the last 15 years, when high-speed engines have been so extensively used, is to the effect that, if well designed and well built, they will run for months together with the minimum of attention. We may take it that there is no valid objection to the employment of such motors for automobile purposes. MM. De Dion et Bouton, who possibly have a larger experience with road automotor-vehicles than anyone else, use motors running at 600 revs., and I was assured that no trouble was experienced during the many years that they have used such motors.

High-speed vertical compound engines developing up to 40 I.H.P. can be built on about 12–15 lbs. per I.H.P. That is using ordinary materials of construction. If, however, aluminium, bronze, or delta is used in place of cast iron and a good design adopted, the weight may well be got down to 10 lbs. per I.H.P. If, however, nickel steel and aluminium be adopted exclusively, we can get the weight down to 7–8 lbs. per I.H.P., or even less. From the foregoing we are quite justified in estimating at 45 lbs. per I.H.P. for the weight of boiler and engine; this comes to 1,485 lbs., say 1,500 lbs.

Gearing.—We now have to transmit this power. I suggest a two-speed gear involving the use of an intermediate shaft. I need not go into details about this as there is nothing special to remark except that the shafting would be hollow, the spur wheels of aluminium bronze; the motion would be transmitted to the rear axle by a steel stud-link chain. The weight of this gear together with the differential movement brake gear, levers, &c., would not, even at an extravagant estimate, exceed 1,200 lbs., this making the total weight of machinery to be 2,700 lbs. or 1·2 tons, which added to the 1·4 tons, the weight of the wagon, gives a total weight of 2·6 tons. The margin of ·4 ton or 896 lbs. would be expended on feed and bunker tanks, &c. As regards the quantity of feed-water to be carried, this, of course, should be as large as possible; that goes without saying, but a quantity that will suffice for at least three hours normal running should, I think, be the minimum. I may mention that traction-engines only carry a feed-tank capacity of 1½ hours.

Adhesion.—Before concluding, there is a matter which is of considerable importance to automobilists, and that is the adhesion of their vehicles on the roads. If the adhesion is insufficient, the vehicle will not start on admitting steam to the engine; or if climbing a gradient, and the adhesion is insufficient, the vehicle will stop or move backwards, notwithstanding that the engine is in ahead motion. In the discussion on the excellent paper by Mr. Worby Beaumont, read here at the beginning of the session, Mr. A. Holt alluded to this matter, and expressed the opinion that a want of adhesion would be experienced by heavy automotor vehicles under certain conditions. This opinion is corroborated by the experience of Sir D. Salomons, who, in his Society of Arts paper, mentions that on several occasions when hill-climbing the motor-carriage slipped bodily backwards, although the motor wheels were revolving for ahead motion. It is, therefore, important to consider under what circumstances slipping or insufficient adhesion will occur.

In moving any body along a plane surface, the least power required is some function of the weight or pressure upon between the body and the surface. Thus if a body rests upon a surface with a pressure of W lbs., then the pull, P, required just to move it will be—

$$P = \mu W.$$

That is, in order to produce motion the pull must be μ times the weight on the driving wheels. In other words, in order to maintain motion the adhesive power must exceed the tractive force. The value of μ varies, of course, with the nature of the surfaces in contact. In locomotives it is about $\frac{1}{7}$ to $\frac{1}{4}$. In road vehicles its value is about $\frac{1}{2}$ for iron wheels on macadam, but I can quite conceive that during rainy weather, when the streets are copiously lubricated with the familiar greasy mud, the value of μ would drop to $\frac{1}{4}$ or even $\frac{1}{5}$ on a hard granite road. Therefore, whether the adhesion is sufficient will depend upon the value of μ and the tractive force.

In order to find the tractive effort of an automobile vehicle in which, as is usually the case, the power is transmitted through gearing, we must first determine the velocity ratio between the motor and the driving-wheels; let this be n, say, that is, the motor-shaft makes n revs. for every rev. of the driving-wheels. Now, during one rev. of the motor, the vehicle advances $\frac{1}{n}\pi D$ inches; D is the diameter of the driving-wheel in inches. If P is the pull exerted in lbs., the work done during one rev. of the motor will be $\frac{1}{n}\pi$ DP inch-pounds. This must be equated to the work done in the motor cylinders in which the steam exercises a mean pressure of *pm* pounds per square inch, and since each cylinder is filled with steam twice during one rev., the work done by the steam will be $4 \cdot \frac{1}{4} \pi d^2 lpm$ inch-pounds, when d is the diameter of each cylinder, l the stroke, and *pm* the mean pressure. Hence we have

$$\frac{1}{n} \pi \, \mathrm{DP} = \pi d^2 lpm,$$

that is,

$$\mathrm{P} = \frac{nd^2 lpm}{\mathrm{D}}.$$

Suppose in a certain motor vehicle $n = 9$, $d = 5$ inches, $l = 6$ inches, and $pm = 80$ lbs., and D = 36 inches, then P = 3,000 lbs.

For compound engines we should replace d by d^1, and *pm* would be the sum of the mean pressures on the two cylinders divided by the ratio of the latter, and for D we should write 2D. The expression would then be—

$$\mathrm{P} = \frac{nd^2 lpm}{2\mathrm{D}}.$$

From the foregoing it follows that if μ be the coefficient of adhesion, then the least weight on the driving-wheels in order to prevent slipping must be—

$$\mathrm{P} = \frac{nd^2 lpm}{\frac{\mathrm{D}}{\mu}}.$$

Thus, taking $\mu = \frac{1}{2}$, the weight on the drivers in the example mentioned would be—

$$\frac{2 \times 9 \times 25 \times 6 \times 80}{36} = 6{,}000 \text{ lbs.}$$

So long as the vehicle was loaded, or partially so, the adhesion would be ample. If light, slipping would occur under favourable conditions, as the weight on the drivers would only be about one-half this.

Skilled Attention.—It has been objected that the use of steam boilers in automotor vehicles of other than the flashing type would necessitate the employment of skilled attendants, and this constitutes a reason for abandoning the use of all such vehicles. Now is this a logical or common-sense view to adopt? When this meeting concludes some of you will travel to your homes in your own luxurious carriages; others will proceed thither in the swift and dashing hansom, while others will go by train to their destination. Some of you cross the river, and others will patronise the democratic street car or omnibus. In all these vehicles a so-called skilled attendant is required. If you do not think a cabman or a bus driver is a skilled man, I would recommend any of you to make the assertion in the presence of one of these jehus, and I think his arguments to the effect that he *was* a skilled attendant would, at any rate, be satisfactory to him. If it be advanced that such an automotor vehicle as I suggest would require a skilled engineer then I venture to ask why?

In Egypt, in India, in Java, on the West Coast of Africa, up the Congo or Irrawaddy, you will see steam launches using high-pressure steam in charge of an attendant who, whatever else he may be, is anything but a skilled mechanic. Of course, in England we would be aghast at such things; we would raise the cry, the "safety of the public," the "lives of the workers," and such like claptrap. As a matter of fact, the skill that is exercised in driving an engine, whether this be an express locomotive or a steam crane, is of a very elementary kind. What is demanded of the men who drive engines is not skill so much as sound common sense. As fast as a new machine is perfected there is never any lack of so-called skilled attendants. I recollect that it was urged against the adoption of the Whitehead torpedo and the Maxim gun that they would require skilled attendants. If ordinary intelligence and common sense be skill, then the criticism is just. Skill is required in making a joint in a submarine telegraph cable, in compensating a chronometer, in adjusting a ship's compass, in making a pudding or ironing a shirt; but in driving a machine, whether a locomotive or the domestic mangle, little more than ordinary intelligence and common sense is wanted. I do not think that the reason against the employment of water-tube or ordinary boilers for automobile vehicles is that they require the service of skilled attendants holds good for one moment.

I now bring this long and I fear discursive paper to a close. My object in reading it has been to show, although imperfectly, that, notwithstanding the stringent and not altogether wise provisions of the Act, it is possible to comply with the wishes of those in whose interests the Act was *not* passed, and also to keep within, or rather to drive an automobile vehicle through, the Act itself.

A SERPOLLET TRAMCAR.

A TRIAL of a Serpollet tramcar, capable of carrying 50 passengers, was recently made in Manchester, speaking of which the *Practical Engineer* says:—"For one thing, the Serpollet car that was used, although far away an improvement upon, and in fact scarcely to be compared with, the hideous steam-cars at present in use on some tram lines in the immediate neighbourhood, was too much of a contrast with the light and elegant horse-cars that run over the Manchester lines, and would probably have to undergo considerable modification before it would be found acceptable in this district. The Serpollet car was of precisely the same type as those used in Paris, and of sufficient power not only to carry its own load of 50 passengers, but to draw also the trailing car, when required, with a smaller number of passengers. A self-propelled car of this type suitable to Manchester would undoubtedly have to be constructed on still more compact lines, and with the lessened driving power required this would no doubt be very readily accomplished, whilst other details as to more ornamental appearance and the arrangement of the gearing would also require special attention. The cost of running this self-propelled car with coke at 18*s*. per ton is estimated at 3·65 pence, or with oil at 3*d*. a gallon at 3·51 pence, per mile. The experimental test of the Serpollet car on the Manchester tram lines was successful in so far that it demonstrated its thorough efficiency for the work required, but in some other respects it can scarcely be said that it favourably impressed either the representatives of the corporation or the tramway company, who were present at the trial.

AUTOMOBILISM IN DUNDEE.

THE Dundee Tramway Company are seriously considering the expediency of adopting motor vehicles, with the object of developing the hiring department of their business, and, as a matter of fact, an order has been provisionally given to a firm of makers for one of these machines. Recently a deputation from the Company visited various centres in England and Scotland with the object of obtaining all information necessary on the subject of automobilism. As a result of this investigation they concluded that the motor and boiler made by the Liquid Fuel Engineering Company of Cowes, Isle of Wight, was the best one in the market. A van, lorry, or undercarriage suitable for any style of movable body, such as a 'bus, wagonnette, or covered van fitted with this motor, weighing under two tons, and constructed to carry a load of 30 cwts., could, it was stated, be supplied for £425. The deputation subsequently visited Birmingham, Nottingham, Sheffield, Bradford, Leeds, Newcastle, Glasgow, Hamilton, and Edinburgh. In Newcastle they saw the steam van and wagonette made by Toward and Co., St. Lawrence Ironworks, and at the Messrs. Stirling's works in Hamilton they inspected an oil-motor wagonette car seated for six people, the engine being a four-horse power one, and the weight, excluding passengers, under 19 cwts. A wagonette to seat six or eight people could, it was said, be supplied by the latter firm at a cost of £335. The deputation concurred that steam was the most suitable form of motive power for heavy traction, and that the improved Daimler motor, as applied by Messrs. Stirling, Hamilton, to the carriages built by them, was the best in the market for light traction. The deputation recommended:—That one vehicle of the wagonette type to seat eight persons, as manufactured by Messrs. Stirling, Hamilton, be ordered from that firm for light traffic; but that no vehicle for heavy traction be ordered at present pending further developments. In connection with this attitude of the Tramway Company towards automobilism the question naturally occurs, says the *Dundee Courier*, as to the manner in which they intend to apply it for traffic. In terms of the arrangement come to with the Town Council some months ago, the tramway system will fall into the hands of the city authorities in June, 1899. It is proposed, for example, to run a motor-car from West Park Road, the terminus of the car lines, to Invergowrie, and it is believed that a great deal of business would be the result of this scheme. It is also proposed that a motor-car should be run from Fairmuir to Downfield, and that another car should be placed on a run between Lochee and Birkhill. It is well known that, particularly in the summer months, there is a great deal of traffic between Lochee and Birkhill. The steep gradient in the neighbourhood of Camperdown policies is very trying to horse traction, and it is believed this is a route particularly suitable for a powerful motor vehicle, and that, having regard to the speed which can be attained by these vehicles, a very large number of persons would be carried to the country. It is also thought that it would pay the Company to acquire motor-cars for summer traffic between Dundee and Broughty Ferry on Saturdays.

ACCIDENTS WITH MOTOR-VEHICLES.

Petrol and Candles.—While repairing the oil-feed of a tricycle, at Chester, on February 10th, a young mechanic incautiously brought a lighted candle in close vicinity to the petrol tank, which must have been open. Result—outburst of flame, burning rather seriously, we regret to say, the young man, and damage to the machine.

Natural Antipathy.—A few days ago, in London Road, Thornton Heath, a horse attached to a cab took fright at a motor-vehicle, and galloped off towards Norbury. A coachman, who tried to stop it was knocked down, and a wheel of the cab passed over his thumb. His face was also badly grazed. The runaway was eventually stopped.

It Took Charge.—It appears from foreign advices that Prince Christian of Denmark, and his *fiancée*, Princess Alexandrine of Mecklenburg-Schwerin, had a narrow escape on the 2?th ult. They were taking an airing on a motor-vehicle between Grasse and Cannes, when the vehicle got out of control, ran down a hill, and landed the illustrious passengers in a deep gully. We are glad to say that they incurred no graver injuries than a few bruises.

Those Tram Lines Again.—Mdlle. Patrice, the actress, who is performing at the Lyric Hall, Oxford, met with a slight accident after the entertainment on Friday night, the 4th inst. She was proceeding to her lodgings in a motor-vehicle, accompanied by her husband and friends, when one of the front wheels of the vehicle caught in the groove of the tram line. The back wheels swung round, and one of the front wheels was wrenched off. The vehicle collapsed and the occupants were thrown into the road, but they all escaped with nothing worse than a severe shaking. The vehicle was, however, considerably damaged.

Insufficient Brake-Power.—On February 13th, while Mr. Lindfield, of Brighton, was driving a light oil motor-vehicle down a rather steep gradient at Purley Corner, on the Brighton Road, a bag fell out, and in putting on the brakes the steering gear gave way. The vehicle then began to run from one side of the road to the other, and eventually turned right round, running through a wire fence and striking an iron post, which caused the car to turn partly over and against a tree, catching Mr. Lindfield's leg between. He was thus pinned down and unable to move. At last two labourers came and released him. Unfortunately Mr. Lindfield succumbed to his injuries.

Motor-Car in Collision.—At Walton-on-the-Naze on the 28th ult., while a cart was returning from Walton to Clacton, it was met on the hill in the Kirby Road by a motor-vehicle belonging to Mr. J. H. Clamp of Colchester. The horse in the cart was frightened, and it tried to turn round; in doing so, the hind part of the cart was projected across the road. Those in charge of the motor-vehicle endeavoured to get past behind the cart, but from some cause they ran right into it, smashing off one of its wheels. The car was also much damaged, and the two men in charge of it were thrown out, but fortunately escaped with a shaking. The motor was taken on to Walton with damaged spring and axle, but was repaired next day.

THE LONDON GENERAL OMNIBUS COMPANY AND AUTOMOBILISM.

At the recent meeting of this Company, when a dividend of 10½ per cent. was declared, Mr. John Pound, the Chairman, gave the following particulars of the working of the Company:—The total receipts of the past half-year were £541,261, being an increase of £42,390; the expenses were £493,538, an increase of £50,589; and the profits on the working £47,723. To earn the £541,000 in the half-year they had run 1,151 omnibuses 13½ million miles, and carried over 86,000,000 of passengers; and although the receipts showed a satisfactory increase, yet the taking from each omnibus per day had been 4½*d*. less than in the corresponding period. With regard to the expenses, the cost worked out an increase of 11*d*. per omnibus per day. The excess on the road, yard, and general expenses was only ½*d*. per omnibus per day, which was more than accounted for by the increase in compensation. Half of the total increase had been incurred by heavier charges for provender and bedding, amounting to 5½*d*. per omnibus per day, and the balance was more than made up by the increase in shoeing of 1·4*d*. per omnibus per day. The maintenance was 2*d*. per omnibus per day, and stables and buildings 2·4*d*. Turning to the balance-sheet, he said the total trade profit stood at the commencement of the half-year at £889,000, and at the end of the year at £925,000, an increase of £36,000, of which they had expended £39,000 in new buildings, in addition to building 29 more 'buses and purchasing 425 more horses. A sufficient sum had been written off for depreciation, without encroaching upon their investments. From the profit and loss account they would see that the balance from last account was £13,265, the profit on the working of the half-year £47 923, and interest on dividends £5,000, so that they had £66,000 to deal with. Out of this they had placed £10,000 to reserve, bringing it up to £165,000; they declared a dividend for the half-year at the rate of 8 per cent., and a bonus of 25*s*., together equal to 10½ per cent. per annum, which would absorb £38,063, carrying forward £15 000.

In reply to a shareholder, the Chairman said that they were watching very closely the development of motor-vehicles, but as the prime cost of a motor-'bus would not be less than between £500 and £600, they did not see their way clear, at all events at present.

It transpired that this Company does not own the wheels of its 'buses, but hires them from another firm, the expense being £1,200 per month. The Chairman finds the policy a sound one, as it ensures the wheels being carefully looked after. Another useful item of information given was that the Company's horses are valued at £27 each, but cost between £30 and £50 apiece.

HOW TO EMPLOY ALL THE WHEELS OF AN AUTOMOBILE VEHICLE FOR PROPULSION.

As the application of motive power to road vehicles is so far confined mainly to those of light weight, considerable difficulty is experienced under certain conditions in obtaining the necessary adhesion. In nearly every motor-vehicle yet designed but two wheels only are employed in propulsion. On good macadam roads, with slight and easy gradients and a coefficient of about ·5, the adhesion is ample, but on paved roads, with steep gradients, and in muddy weather, the coefficient decreases and the adhesion becomes insufficient.* Could all the wheels be used for propulsion the adhesion, even under the worst conditions, would be ample. Unfortunately, it is difficult to design an arrangement which will be at once simple and efficient. The best arrangement we have yet seen is that devised by Messrs. Sydenham and Walkinson, of the "Crypto" Works, Clerkenwell. As will be seen, this design is extremely ingenious; not only can they use all the wheels for propulsion, but they can make the axes radiate to any point for steering. In order to accomplish these objects, the axle (which is driven in any convenient manner) is divided into four parts. The two middle parts are connected together at one end by differential gear (so that in turning the outer wheel revolves faster than the inner one), whilst their other ends are each connected to one of the outer parts of the axle by a universal joint.

* The theory of the subject will be found in the paper, "Some Points in the Design of Automobile Vehicles," in the present number.—ED.

Fig. 1 is a vertical longitudinal section partly in elevation of the axle and steering gear, and Fig. 2 is a plan. These figures show three of the four parts of the axle, namely, a, a^1, a^2, the fourth part, which is not shown, is to the right of the figures, and is similar to a.

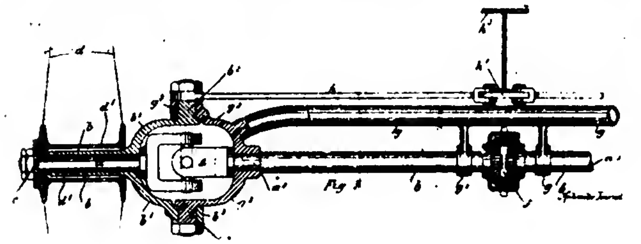

FIG. 1.

The parts, a, are free to turn in sleeves, b, and at their outer ends carry pins or cross-bars, c, engaging with slots on the hubs, d^1, of the wheels, d, so that the wheels turn with the axles. The inner

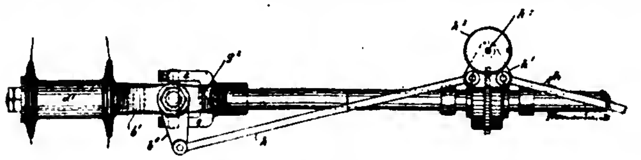

FIG. 2.

ends of the shafts, a, are connected by "Hooke's" joints, e, to the outer ends of the shafts, a^1, whose inner ends are connected by differential gear, f. The shafts, a^1, work in bearings, g^1, fixed to the

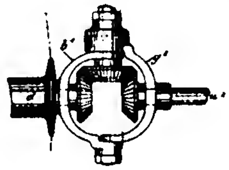

FIG. 3.

frame, g, of the machine. g^2 is a fork also fixed to the frame; at the top it carries a bearing, g^3, and at the bottom a stud, g^4.

The sleeves, b, have forks, b^1, at one end carrying studs, b^2, working in the bearings, g^3, and also bearings, b^3, to receive the

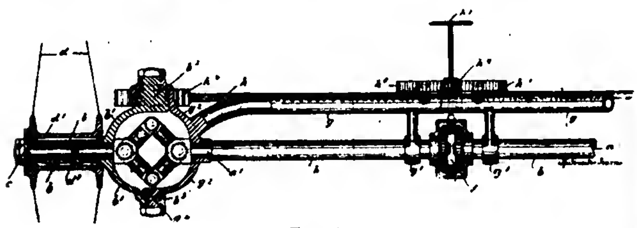

FIG. 4.

studs, g^4. b^5 are levers rigidly fixed to the studs, b^2, and connected by the rods, h, to the plate, h^1, which can be turned about a pivot, h^2, by the hand-wheel, h^3. This arrangement is not suitable when it is desired to turn the wheels through large angles, and in such cases

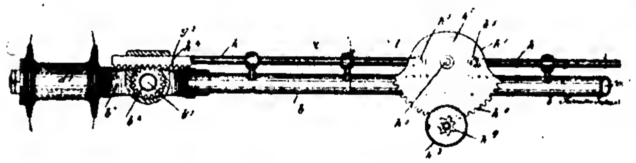

FIG. 5.

the Hooke's joint, e, is replaced by bevelled pinions as shown in Fig. 3, but the inventors prefer to adopt the arrangements shown at Figs. 4 and 5. Figs. 6 and 7 are a plan and side elevation of the carriage.

In this arrangement the Hooke's joint is replaced by a special form of universal joint, consisting of rods jointed together in the

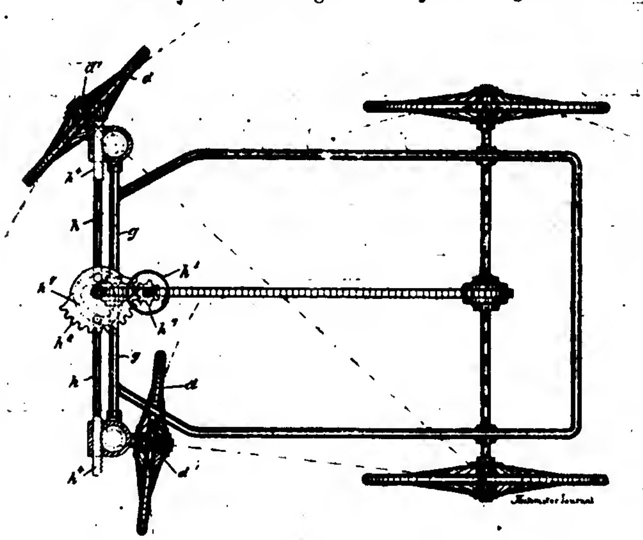

FIG. 6.

form of a parallelogram, each of the sides of which is made in two parts free to turn axially the one upon the other.

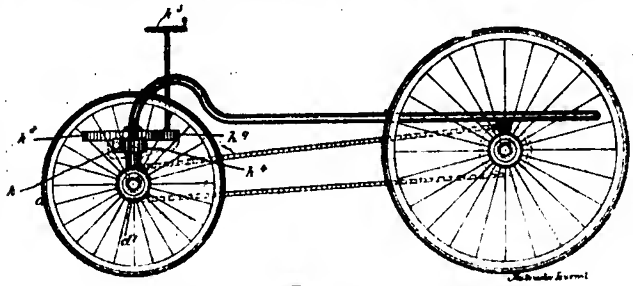

FIG. 7.

Fig. 8 shows an application of the latter arrangement to a tricycle. It will be gathered that much time and thought have been expended

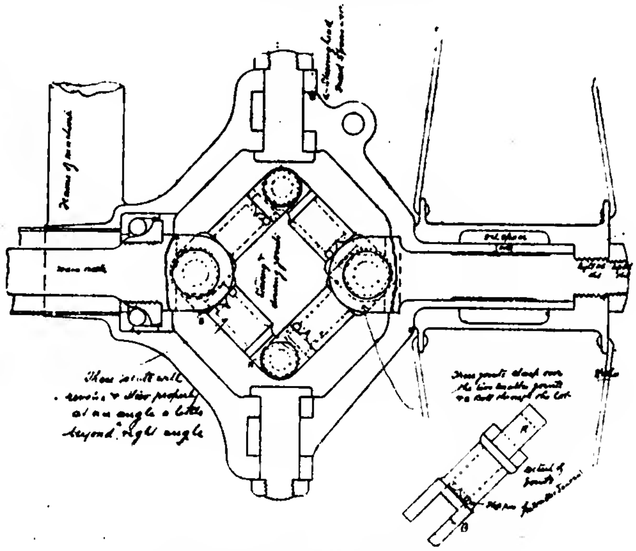

FIG. 8.

in working out these very ingenious details, and we have no doubt but that for light vehicles the proposed arrangement would be found advantageous.

NOTICES.

Contributions and articles likely to prove of interest to our readers will receive due attention, but in all cases the name and address of the writer must be given, not necessarily for publication.

All matter intended for publication should reach us not later than the 10th of each month, and be addressed to THE EDITOR OF "THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL," 62, *St. Martin's Lane, London, W.C. Stamped envelope must be sent if the manuscript is required to be returned. The Journal is published the middle of each month.*

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The Automotor and Horseless Vehicle Journal.

A RECORD AND REVIEW OF APPLIED AUTOMATIC LOCOMOTION.

MARCH 15TH, 1898.

DIARY OF FORTHCOMING EVENTS.

Notices to be included under this heading should reach the Office not later than the 12th of each month

[*For full programme and proceedings of the Self-Propelled Traffic Association, see p.* 205.]

1898.

March 19 to 26	National Sportsman's Exhibition, Exhibition Buildings, Earl's Court.
March 21 ..	Automobile Club of Great Britain, 4, Whitehall Court, S.W. Reading of a Paper on "Motor-Car Machinery," by Mr. Thomas Clarkson, A.M.I.C.E., at 8.30 p.m. The paper will be followed by a discussion.
March 26 ..	Ditto. Ladies' Night and Concert. Ladies will be admitted to the reception room and dining room. Evening Dress. A small orchestra, under the leadership of Mr. Louis d'Egville will play during the evening.
April 4 ..	Ditto. Third House Dinner, 7.30 p.m. Followed by a discussion.
April 7 ..	Ditto Start of Easter Tour; to end on Monday night, April 11.
April 24 ..	Paris Motocycle Critérium.
May 2, 9, 16, 23	Society of Arts Cantor Lectures—"Electric Traction," by Prof. Carus Wilson.
May 24 ..	Self-Propelled Traffic Association (Liverpool Centre) Heavy Vehicle Trials.
May 25 ..	"Concours de Fiacres," Paris. Organised by the Automobile Club of France.
June	International Italian Exhibition of Motor-Vehicles (Turin).
June 10 to 25..	Motor-Vehicle Exhibition, Paris. Automobile Club of France. Sections—(*a*) Automotor vehicles which have given proof of their practical efficiency; (*b*) Industries connected with automobilism; (*c*) Motors adapted for automotors; (*d*) Vehicles adapted for automotors.
June 15 to July 15	International Concours of Automobile Tricycles and Bicycles in connection with the Turin (Italy) Exhibition.
June 25 and 26	Brussels to Spa Race. Organised by the Automobile Club of Belgium.
July 3 to 11 ..	Race from Paris to Amsterdam, under the auspices of the Automobile Club of France.
1899	Race from Paris to St. Petersburg, under the auspices of the Automobile Club of France.
1900	Paris International Exhibition — Great Display of Automotor-Vehicles and Allied Trades.

ANSWERS TO CORRESPONDENTS.

J. M.—Aluminium bronze can in most cases replace cast iron, but all bolt-holes require very careful tapping.

A. FORREST (Manchester).—Try the Crypto steering gear. See our present number.

T. LAWTON (Newcastle-on-Tyne).—The best work on the subject suitable for the student is Grover's "Modern Gas and Oil Engines." It can be obtained from the Technical Publishing Company, Manchester.

A. JENNINGS (London).—Consult Professor Boverton Redwood's work on "Petroleum" (Griffin and Co., London).

JOHN P. ELLIOTT (Newcastle).—No, we do not think soldered joints suitable for petroleum tanks.

T. HUNTER (Manchester).—Much of the feed water in your district contains a good deal of lime salts, and these would quickly deposit out. Use plenty of soda.

H. WILKINSON (Southsea).—(*a*) Messrs. Clarkson and Capel's address is 34, Queen Street, Cannon Street, E.C. (*b*) We shall be pleased to have particulars of your new water-tube boiler when completed.

A. W. PERKINS (Bournbrook).—The address of the Brayton Oil Motor Company (Limited), is 74, Coleman Street, E.C., and that of the Hoffmann Manufacturing Company (Limited), King's Head Court, Beech Street, Barbican, E.C., and of Delacroix Motor Syndicate, 4, Wynyatt Street, Clerkenwell, E.C.

W. HILL (Liverpool).—The 1898 POCKET-BOOK has been sent you. We note your remarks *re* Patent Specifications, and as far as possible shall try to deal with them in the best way for our readers.

PALMER PRYKE (King's Lynn).—(*a*) Journal and POCKET-BOOK both dispatched. (*b*) The Irish Motor Company was abortive. *See* our reports of the liquidation and return of shareholders' money, No. 12, pp 506, 514, 521. (*c*) We do not know the present address. The last we heard was in Paris.

T. W. HARGREAVES (Burnley).—The motor which you inquired about has really, as far as we can ascertain, done no practical work, and we should certainly not recommend it at the present moment, except for experimental purposes.

THE EVOLUTION OF THE MOTOR-VEHICLE.

IN many respects the present position of automobilism on common roads resembles the early days of that other automobile, the railway engine. Now, as then, we have the same differences of opinion on such matters as dimensions, proportions, fuels, &c. One engineer finds, under certain conditions, one motor more suitable than another, while another engineer tries the same motor under the same conditions and promptly abandons it as ntterly unsuitable. We say that the conditions under which radically opposite opinions are formed by competent persons are similar; this, however, rarely, if ever, obtains in practice. Apart from mechanical considerations, the "personal equation," which is such an important factor in physical science, is no less important in mechanics. It therefore does not do to dogmatise too much, nor to say that conclusions arrived at by one engineer are necessarily final. However divergent may be the views of engineers on any given mechanical problem, it must not be forgotten that such problems are, in every case, determined by physical laws which may or may not be known; but which, nevertheless, must, in the nature of things, exist.

We are led to make these remarks as our present issue affords an excellent instance of divergent views entertained by some of those engaged in the evolution of the motor vehicle. We publish in this issue our concluding portion of the report on "Les Poids Lourds," and a paper by Messrs. Simpson and Bodman, which was recently read by them before the Liverpool Centre of the S.P.T.A., and which evoked a prolonged discussion, a *précis* of which we also publish. Speaking broadly, the conclusions reached by the highly competent Commission appointed by the Automobile Club de France, under whose auspices the trials were made, is utterly at variance with those arrived at by Messrs. Simpson and Bodman. The Commission in question included some of the most distinguished French engineers, and their investigations and analyses, also their conclusions, may be accepted as final for, of course, those particular conditions under which the trials were conducted. As will be seen by referring to our report, these French trials are absolutely conclusive; they have demonstrated not only that motor vehicles carrying up to two and three tons can be constructed to work regularly, but also that services of such vehicles can be profitably worked.

These French vehicles have been so fully described by us in previous issues that we need not say more than that they one and all possessed features that Messrs. Simpson and Bodman absolutely condemn.

Thus they all had transmission gear—none worked direct. Now these vehicles, and many similar ones, are used extensively, and little or no trouble is experienced with their gear; but such gear is, according to Messrs. Simpson and Bodman, "a horrible *bête noir* in practice." Again, all those French vehicles use the differential, or "Jack in the box," motion; so do the very successful vans of the "Lifu" Company; so do the Daimler, Roots, and most other motors; and although we admit such gear is an evil, as leading to cost and complication, it yet, if properly designed and made, works well in practice. According to Messrs. Simpson and Bodman, they avoided it "at all costs," as being "liable to fire," &c. With the boilers, too, we see the same difference of opinion. MM. Scotte and De Dion have succeeded in making perfectly safe boilers—at least safe so far as the very rigid French regulations can ensure safety. Their boilers are simple, and no difficulty is experienced with the feed, yet Messrs. Simpson and Bodman have made five boilers which were failures, and are now at work on a sixth*; they also have fonnd great difficulty with the feed.

So much for the French vehicles. Making another comparison, the Lifu Company make an exceedingly light, safe, and economical type of water-tube boiler. Now, without infringing any one's patent, a very good water-tube boiler can be designed; yet Messrs. Simpson and Bodman could not succeed in perfecting theirs. The Lifu boiler is fired with heavy petroleum, and although the burner is, we think, noisy, yet in other respects it is efficient, and liquid fuel is most extensively and successfully applied by the Lifu Company, not only to yachts and small craft, but also, as we say, to their vehicles. Now what is Messrs. Simpson and Bodman's view? Judging from their own experience, they say:—"We made a number of experiments to burn liquid fuel. The sole value of liquid fuel in goods work would be its convenience, and it is almost impossible to overrate the value it would have in that respect. It saves from 150 to 200 lbs. in the weight of the boiler case. It enables the boiler case to be one-third shallower in depth. It enables one to force the boiler under stress of load in an exceptional degree. It is not bulky to carry. It is easy to obtain *en route*. But its disadvantages, we came early to the conclusion, absolutely damn it as a fuel to burn on vehicles at present. Its noise, when burnt in any quantity exceeding one gallon per hour, is absolutely intolerable. Its absolute unreliability nnder the slightest change, often quite imperceptible of circumstances in atmospheric condition. The unpleasantness of handling it; and, finally, its cost."

We might fortify the practice of the Lifu Company, and condemn the experience of Messrs. Simpson and Bodman, by a reference to the extensive use of liquid fuel in South Russia, on the Caspian Sea and on the Volga, to the favourable opinion, based upon practice, entertained for it by British and American naval engineers, and lastly, but not least, to the extending use of it on the Great Eastern Railway. Did space permit, we might show that in many other matters the views of Messrs. Simpson and Bodman are not supported by the experience or knowledge of others who are working on the problem of the evolution of the motor vehicle. Thus Mr. J. D. Roots, in our correspondence column, makes some very pertinent criticisms. This latter gentleman, we need hardly say, is a leading authority on oil motors and motor vehicles.

We have pointed out some of the divergencies in the experiences of Messrs. Simpson and Bodman and other workers, as in the very long and not altogether relevant discussion which ensued upon the reading of the paper, they were not mentioned; indeed, a pessimistic tone prevailed, and it would seem that the audience seemed to think it a very good thing that the authors of the paper *had* been so unfortunate and unsuccessful. We quite admit that a record of failure is useful, but we do not think the conclusion should go forth that a reasonably perfect motor vehicle to carry five tons cannot be produced because Messrs. Simpson and Bodman have failed. At any rate, before coming to any decision, we trust that readers of these gentlemen's paper will also study the report of Les Poids Lourds trials. To us these latter are conclusive that the motor vehicle has reached a practical shape in its process of evolution.

* We illustrate this boiler in our present issue.

⁂ As a result of negotiations which have been proceeding for some time, we understand that shortly there are likely to be some important developments which should very favourably affect the future of the motor-vehicle industry. When we are at liberty we shall publish full particulars, and we shall watch with interest the *volte-face* which those scoffers and pessimists will make who have so continually sneered at and held up to ridicule the visible results which have so far been attained in this movement, and which before many years are past are likely to effect the greatest industrial revolution of the age.

THE FORTHCOMING LIVERPOOL TRIALS.

As will be seen elsewhere in our present issue, we are enabled to furnish a good many particulars relating to the trials of the heavy traffic motor-vehicles which are to take place next May in Liverpool; under the auspices of the Self-Propelled Traffic Association. The arrangements are nearly completed, and, providing a sufficient number of vehicles are entered, the trials will be not only very interesting in themselves, but they will afford much valuable data, and will, further, enable definite conclusions to be reached on varions points upon which at present there is considerable difference of opinion. The judges have been selected with great care, and they may be relied upon, from their known position and character, to judge impartially. Sir David Salomons is too well known in the scientific world to need any reference from us; Professor Boverton Redwood is the great authority on petroleum; while Professor Hele-Shaw is the Professor of Engineering at Victoria University, Liverpool. Mr. Brodie is the Liverpool City Engineer; Mr. Calthorp has been largely connected with light railway construction in India, &c., and is now in consultation with the Colonial Office on the question of light railways for the West Indies;

Mr. Cottrell is the Engineer for the Liverpool Overhead Railway; and Mr. West is a well-known consulting naval architect and marine engineer.

The subscription fund was opened on March 1st, and already a large proportion of the required amount has been collected. Mr. E. Shrapnell Smith is the honorary organising secretary, and he may be depended upon to do everything not only for the comfort of the foreign guests from the Automobile Club de France, of whom we hope to see a good many, but also for the many engineers, capitalists, and others who will attend these trials with more than ordinary interest. We have not yet seen the arrangements for testing the vehicles, but we hope these will include brake, horse-power, and dynamometer tests. We also think that sketch maps might be prepared, showing routes, gradients, distances, &c. These trials will, as we say, be interesting enough, but those competitors who obtain the approbation of the judges will find their efforts repaid by abundance of orders.

THE POWERS OF LOCAL AUTHORITIES.

With the extension of local self-government there has been a desire manifested by not a few local authorities to obtain power enabling them to make bye-laws at their own pleasure, such bye-laws often conflicting with the law of the land. The granting of local self-government is no doubt a good thing in itself, but like so many good things it is open to serious abuse, and unless great care is exercised in Parliament we shall in a few years be confronted with the anomaly of each parish being practically a law unto itself. At this time of the year Parliament is asked to sanction very many Acts for the improvement of various districts, towns, &c. These measures being, as a rule, of purely local interest and non-political are relegated to a Committee of the House. After examination and the hearing of various "parties to the Bill" under discussion, the Committee report and, as a rule, the Bill becomes law. There is usually so much of this kind of legislation going on that it does happen occasionally that powers are granted to the local authority which enable it to make bye-laws, as we say, conflicting with the ordinary law of the land. This what we may term parochial law-making is in the majority of cases little more than a legal means of gratifying the predominant local prejudices. Hence, too great care cannot be shown in granting such powers. A case which illustrates the desire on the part of a local authority to legislate for everything and everybody within its jurisdiction is the Paignton Improvement Bill. Paignton is a watering-place in Devonshire, and its local authority is naturally enough desirous of improving the amenities of the district. To this end it is promoting a Bill in Parliament in order to obtain the necessary legal sanction to make improvements. To this no one will object. but it is to matters affecting personal rights that objection will be taken to the Bill. For example, the Council seeks power to make bye-laws regulating such matters as the length of bathing drawers and costumes. Surely such things may be left to the natural good sense of the community. In short, the Council, typical, no doubt, of the local authority everywhere, seeks powers to make bye-laws affecting nearly everything. Does a little boy wish to make a sand castle on the beach there is a bye-law regulating "the user of the seashore." We should not like to live at Paignton.

What, however, more concerns our readers is not the regulations that the Council of Paignton—no doubt very worthy and respectable persons—may make as regards bathing, but their attitude as regards motor vehicles. In the Preamble the word cycle in the Bill "includes bicycle tricycle motor-car or other similar carriage whether propelled by mechanical means or otherwise"—the "or otherwise" is good. Turning to Clause 83 (by the way, what a large Act is required for such little towns as Paignton), we find that "the Council may from time to time for the prevention of danger (of course) from the use of cycles and traction engines make and enforce bye-laws preventing the rate of speed beyond which cycles and traction engines may not be ridden upon any highway or on any street or public place within the district and for *otherwise regulating* the use of cycles and traction engines upon any such highway street or public place as aforesaid."

For a small place this is not bad. As will be seen, the Council seeks to discriminate against the motor vehicle by limiting the speed, and by *otherwise regulating*, it can effectually and practically prevent automobilism within its borders as well as did those local authorities of Cheltenham hinder Gurney some sixty years ago. The presumption of some of these petty local bodies is astounding. Parliament sanctions automobilism, and a petty body of residents of some obscure village at once seek powers to regulate in *their* manner what has already been sufficiently regulated. Here now is a good opportunity for the Self-Propelled Traffic Association, the Automobile Club, and the Cyclists' Touring Club, to render a service to the large and growing public that believes in horseless vehicles. These bodies should exert every effort against this Bill, which has already passed its second reading, and get, at any rate, this obnoxious clause expunged. While on the subject we would suggest, both to cyclists and automobilists, the expediency of forming a Joint Committee, which should examine all Bills promoted by local authority, and if necessary appear in opposition to them.

DISFIGURING THE THAMES EMBANKMENT.

All vehicles, of whatever description, have their natural environment, in which they appear harmonious adjuncts to the scenery. A carriage and pair is—or, rather, was—the complement of a scene in Mayfair, now it is the handsomely-appointed motor-carriage. Both would look extremely out of place in, say, the Mile End Road; similarly a coster's barrow is just the thing which imparts the touch of realism to a scene in the New Cut, but in Park Lane it would be a most horrible blot upon the surrounding features. There are certain districts and streets in which certain types of vehicles are suitable, but the Thames Embankment is *not*, we submit, the place for horse tramcars. To disfigure the most magnificent boulevard in Great Britain, if not in Europe, by the hideous, obsolete, horse-drawn street car is an absolute outrage upon the community. One does not need to be an artist or an art critic to see the truth of this. Every one, with any sense of the beauty attaching to noble structures situated amid scenes of considerable natural beauty, will, we are sure, agree with us in our contention. Why should we make one of our very few handsome thoroughfares as depressingly ugly as, say, the Walworth Road or the Commercial Road? Rather let us beautify where we can; our streets need it badly enough. The reason for this attempted desecration of the Embankment is merely, to employ the familiar platform jargon, "to give facilities to the teeming population of South London to reach their employment in town." This is, we quite admit, a laudable enough intention on the part of the County Council, but is nevertheless no justification for the æsthetic outrage complained of. The only vehicles, in our opinion, which should be permitted to use the Embankment, or which can use it without jarring upon one's sense of the fitness of things, are high-class motor-carriages (not vans), pair-horse carriages, private cabs, and cycles; all other vehicles constitute an eyesore and are an offence. The London County Council is promoting a Bill in Parliament to enable them to run tramcars over Westminster Bridge and along the Embankment. This has aroused a vigorous opposition, and the Bill will be contested point by point. The Automobile Club is, we are glad to say, using its not inconsiderable influence in opposition to the scheme, and has contributed to the funds necessary. Of course we, and all who oppose the measure in any way, will be told that we are pandering to the luxuries of the classes rather than improving the means of travelling for the masses. This is not so, because the object to be attained can be effected by other means. The new underground railway will provide a cheap and efficient passenger transit, while the Thames offers a much better thoroughfare. Let the London County Council develop a proper service of water automotors, they will in this have the support of all classes, but to wantonly disfigure the beautiful Embankment is to give needless offence and to still further enhance that feeling of hostility with which the Council is regarded in so many quarters.

A CHARACTERISTIC FACTOR IN THE POWER OF PETROL MOTORS.

The following is a free translation of a useful article by that well-known authority, M. E. Hospitalier, and which appeared in our contemporary *La Locomotion Automobile.* We reproduce it here, as the actual data relating to the petrol motors usually employed are scarce, while well authenticated trials are still more so. The following information will, we think, be much appreciated by many of our readers as it will enable them to judge the capabilities of motors submitted to them :—

In comparing impartially the movements of automotor-vehicles in racing every one at the present time agrees that speed alone is an insufficient factor. as it only really represents mere power. The first care is usually to determine in which formula of allegence* the motor power appears best, but the determination of this factor presents difficulties upon which it is useless to lay stress. We can only refer somewhere else to the value of the disclosures of builders or competitors, as it is the rule in a meeting to verify all the points in a statement, and this is precisely the fundamental objection made to races that only permit of one controlling factor—speed.

In studying the principal elements of the construction and working of a certain number of motors driven by petroleum, and in comparing certain specific factors, these should be the same theoretically for motors worked on the same cycle, we have noticed that one of these specific factors (we are going to explain it definitely presently) was invariable at nearly 20 per cent. for the eight motors compared, in spite of the difference in proportion, system, and power, &c. There is then a factor that continues, so to speak, steady for all motors worked by petrol, and it is this factor that we propose to utilise by deducing from it the power of the motor that ought to figure in the formula of allegence. This factor is the specific displacement of pistons, calculated, as we are about to show, from experiments made in motors, of which the following data are known :—

Number of cylinders ;
Diameter of pistons in millimètres ;
Stroke of pistons in millimètres ;
Normal angular speed in revolutions per minute ;
Available free power on shaft or brake in H.P.

Principal Elements of Construction and Working of some Petrol Motors.

	De Dion et Bouton Tricycle.	Daimler-Panhard, 2½ H.P.	Daimler-Panhard, 3¾ H.P.	Phœnix et Causlart, 4 H.P.	Phœnix-Panhard, 4 H.P.	Peugeot (Horizontal), 4 H.P.	Phœnix-Panhard, 6 H.P.	Peugeot (Horizontal), 6 H.P.
1. Number of cylinders	1	2	2	2	2	2	2	2
2. Diameter of piston in mm. ...	62	72	76	90	80	84	90	98
Diameter of piston in inches ...	2·44	2·83	2·99	3·54	3·14	3·30	3·54	3·85
3. Area of piston in square mm.	302	407	454	636	503	554	636	754
Area of piston in square inches	4·67	6·29	7·03	9·84	7·74	8·55	9·84	11·64
4. Stroke of piston in mm. ...	70	126	146	120	120	126	140	144
Stroke of piston in inches ...	2·75	4·96	5·74	4·72	4·72	4·96	5·51	5·67
5. Volume of cylinder in cub. centimetres	211	513	663	763	604	698	890	1,086
Volume of cylinder in cubic inches	12·86	30·78	39·78	45·78	37·21	41·88	53·40	65·16
6. Speed, revs. per minute ...	1,400	750	750	750	750	750	750	750
7. Displacement of pistons in litres per second* ...	9·85	25·6	33·2	31·8	30·2	34·9	45·0	54·3
Displacement of pistons in cubic feet per second ...	·344	·896	1·163	1·113	1·057	1·221	1·575	1·90
8. H.P. of motor on brake ...	1·25	2·5	3·75	5·5	4·5	4·9	6·5	7·1
9. H.P. of motor in poncelets † ...	0·95	2·0	2·8	4·12	3·4	3·7	4·9	5·3
10. Specific displacement of pistons in litres per second and per poncelet	9·36	12·8	11·7	7·7	8·9	9·4	9·2	10·3

* Cubic feet = litres × ·035.
† Poncelet = H.P. × ·763, or ·981 kilowatt.

With these data we can easily calculate the area of the piston and the volume of the cylinders, then, knowing the normal angular speed of the motor and the number of cylinders, it is equally easy to deduce the displacement of pistons expressed in litres per second ; a displacement being equal to double the volume of the cylinder (out and instroke), multiplied by the angular speed of the motor in revolutions per second, and by the number of cylinders.

Knowing the power of the motor in poncelets, and the displacement of pistons in litres per second, we deduce from it, by dividing the second by the first, the specific displacement of pistons, which is found expressed here in litres per second and per poncelet. Now the comparison of eight motors, of which the principal elements of construction and working are summed up in the above table, show us that this factor is sensibly steady, the dimensions explain themselves easily by the variations of the factors multiplied, which unite in the production of motor power. We can then admit, without obvious error, that practically "The quotient of the displacement of pistons of a motor worked by petrol, by its power is a constant quantity, or that the power of a petrol motor is practically proportionate to the displacement of pistons."

Now, if we compare the figures obtained and summed up in the table we see that the specific displacement varies between 8 and 10 litres per second and per poncelet. We do not commit a very big error in saying that the normal power of a motor driven by petrol (expressed in poncelets) is equal to the tenth of the displacement of pistons, expressed in litres per second. Then having a measure, a counter of revolutions, and a chronometer, these are sufficient to determine the real or probable power of a motor, a power of which the value can be thus figured out in the formula of allegence. If the angular speed of the motor leaves any doubt it is sufficient to calculate it after the race by, of course, taking note of the average speed and discounting stoppages.

If the characteristic factor that we propose is not utilised in races it can always be used for the general information of builders, and furnish them with a first approximation in a question where precise particulars are still very rare.

AUTOMOBILE CLUB BELGE.

The Secretary-General, M. le Comte de St. Pierre, asks us to state that the great Automobile Race organised this year by this club will take place between Brussels and Spa on June 25th and 26th. The proposition to have a race between Namur and Spa has been abandoned. We hope to publish further details in time for intending visitors.

A Note to the London Fire Brigade.—The Fire Commissioners of Hartford. Conn., are looking about for a motor hose-cart, so satisfactory. says the *Horseless Age*, is the record of the self-propelled fire-engine they have had in service for several years. While investigating this matter they have run across a novelty in fire-engines which interests them greatly. The engine is a storage battery affair and can be run out at short notice and go at high speed. It is lighter by the weight of a boiler than a steam fire-engine, for it does not depend upon its own power for pumping after it reaches the scene of duty. It is intended only for duty in the city territory, where there is electric service. and on arriving at a fire simply connects with an electric wire and runs its pump as a trolley-car runs its motors.

Messrs. Simpson and Bodman's Paper.—On February 22nd a very interesting paper was read before the Liverpool Centre of the Self-Propelled Traffic Association, by Messrs. D. H. Simpson and W. L. Bodman, narrating experiments which they have carried out. These gentlemen appear. says *The Engineer*, to have been peculiarly unfortunate in the matter of boilers. They have failed to find a satisfactory gauge glass, and vibration has shaken the tubes out of the tube plates. With oil-fuel they have had such difficulties that they unhesitatingly reject it. They have been curiously unlucky in their experiments. These, however, refer mainly to vans and vehicles much larger than any likely to be used as pleasure carriages, and so nothing that they have discovered in their practice has much bearing on what we have just written. It may perhaps be worth while to point out that the jarring trouble may be almost entirely got over by carrying the boiler on lugs, resting on thick indiarubber rings interposed between the lugs and the frame of the vehicle. These will completely avert the small vibrations which are so mischievous.

* "Characteristic formula" would convey a more definite meaning to English engineers.—Ed.

NOTES OF THE MONTH.

THE Dunlop Company think that the motor-vehicle is in comparison with the cycle much better and more efficient.

HIS Royal Highness the Duke of York is an automobilist, and has been taught the "nobler art" by the same driver that has taught Lord Iveagh and other noblemen.

THE Royal Engineer Committee of the War Office has appointed a sub-committee of its members to consider the adaptability of motor-vehicles for purposes of army transport.

THE Liverpool Overhead Railway, in view of increasing speeds and weight of cars, are laying down Muirhead's steel railway chairs. They are the first electrical railway to have done so.

THE Lighting Committee of Bournemouth have recommended that the surveyor be instructed to advertise for designs and tenders for motor-vehicles for the collection of house refuse. The official invitation for tenders appears in our advertisement columns.

ACCORDING to an amusing account of the "Lifu" mail van, which is rendering such an excellent account of itself, the driver is an American who came over specially to take part in the classic race of horseless miscellanies from London to Brighton on November 14th, 1896, and he won.

A NEW broadsheet, entitled "Advice to Boiler Attendants," has been issued by the Manchester Steam Users' Association, of 9, Mount Street, Albert Square, Manchester. The hints and warnings given have been judiciously drawn up, and if generally acted on would go far to entirely abolish boiler accidents.

THE two motor-cars which were put on between Sandbank and Dunoon have been largely patronised, and have attracted considerable attention. The cars are the property of the Glasgow and West of Scotland Motor-Car Company, and they intend to put on seven additional cars, beginning in June.

THE first motor-car for hire in the streets of Glasgow has been licensed by the magistrates of that city after having been formally tested by the Chief Constable. The car is owned by Stirling's Motor-Carriages Co. (Limited), and is now running on the streets of Glasgow, others are to be added as the demand increases.

AT a recent meeting of the Rhyl Town Council a letter was read from the Motor Touring Company, Llandudno, applying for sanction to station two or three of their motor-cars at Rhyl. The clerk was directed to enquire what rent the Company would offer for a station on the Market Ground, and what would be the fares for the public. If the replies are satisfactory the committee are disposed to favour the application.

IT is said that Mr. G. W. Clark, of Rochester, is constructing a steam triplet to be used for pacing purposes which is expected to attain a speed of a trifle less than a mile a minute. When fully equipped it will weigh about 400 lbs. The two men behind the steersman sit side by side over the rear wheel. A peculiar feature of the triplet is a contrivance by which two auxiliary wheels are lowered to hold the machine upright until speed is attained.

MR. COUNCILLOR CALCOTT, on behalf of the directors of the Midland Cycle and Motor Exhibition, recently held in Birmingham, has handed over a cheque for £50 to the Coventry and Warwickshire Hospital, being a portion of the sum allocated by the board for charitable purposes out of the profits of the enterprise.

THE provost, magistrates, and commissioners of Dunoon inspected the motor-vehicles of the Glasgow and West of Scotland Motor-Car Company (Limited) lately, and after a very successful run to Sandbank and back expressed themselves thoroughly satisfied with the machines, and granted licenses for these to ply for hire. The cars started in regular brake service on the 4th inst.

LECTURING recently at Wolverhampton, Professor Sylvanus Thompson, in the course of his remarks, said the use of horse-power on the world's tramways had greatly declined between 1890 and 1897, the mileage being reduced from 5,000 to 900, while the mileage of electric tramways had increased from 1,262 to 13,000. The province of Ontario had 900 miles of electric tramways—more than in the whole of Europe.

THE man who invented the phrase, "—— is still in its infancy," probably never had an idea to what iteration it would be subjected. Every public improvement is to some people still in its infancy. Thus to many people "the electric light is still in its infancy," and now a *Manchester Guardian* man, evidently a nautical automobilist, commences and ends—and, let us add, spoils—a most interesting article with this abominable phrase.

PRIZES for motor-cars are to be offered in connection with the Turin Exhibition announced for opening next summer. They include £160 for the vehicle judged as best constructed and most efficient in performing the journey from Turin through Asti to Alessandria and back, 200 kilometres; £120 for the vehicle, of Italian make, showing best construction; £80 for the one that does the journey in the quickest time; £40 for the simplest and cheapest; and £20 for the best motor-cycle.

THE Schoen Pressed Steel Company, of Pittsburg, has secured a contract for the manufacture of five steel coal cars, with a capacity of 50 tons each, for the Pennsylvania Railroad. These cars will be the largest ever built, and will be experimented with on the Pennsylvania Railroad in the coal regions. They will be flat-bottomed, 30 feet long, and 10 feet high from the rail, and they will be made of heavy plate steel. Five steel sample ore cars are also being built for the Butte, Anaconda, and Pacific Railway of Anaconda, Montana.

AT a meeting in the Inverness Town Hall on the 3rd inst. a proposal was submitted for the introduction of a motor-vehicle service in Inverness. Mr. William Burns, solicitor, presided. It was proposed the car should run from Drummond to the town, from Millburn to the town, and also from Kessock Ferry to the town. The Chairman stated that a 'bus to carry from 15 to 20 passengers could be obtained for £600. It was agreed to defer further consideration of the scheme until a future meeting.

THE whole of the men at Crewe and Carlisle employed at the extensive works of the London and North-Western Railway Company commenced to work full time from Monday last, the 28th ult. The total number employed is from 7,000 to 8,000 men. It is five years since full time was worked at these places. In several of the shops the men are required to work overtime, as business is so pressing. This is another indication of the great activity in the engineering trades of the country, an activity all the greater by reason of the long stoppage.

Commenting on the tramway problem in Newcastle-on-Tyne the *Newcastle Chronicle*, in its issue of the 3rd inst., says:—"The ideal public carriage is one which is self-contained, which can travel on any part of the road, which, therefore, does not need to have a monopoly of the centre of the street accorded to it, and which does not bring traffic to a standstill when it breaks down. Such a carriage is now within the sphere of practical engineering. The argument for the tram-line, which of itself is an unmitigated nuisance and a danger as well, has been that it affords smooth riding.

The number of applications for patents during the year 1897 was 30,936, as compared with 30,194 in 1896 and 25,065 in 1895. Although the number of patents applied for illustrates the progress of inventive activity, it does not, says *Knowledge*, afford any reliable criterion as to the number which arrive at maturity. Out of the 30,194 in 1896, for example, only 13,360 were completed, the rest being allowed to lapse after the nine months' protection. Not a few of the applicants for patents are women, of whom there were about 700 in 1896; some 150 of these inventions relating to dress.

The secretary of the Motor-Car Club has, as he writes to a contemporary, been refused an amateur license because on motor-car day he rode in an exhibition race on motor-cycles against a professional at Sheen House. This is a curious case, and judged from different standpoints presents different aspects. From one point of view, says the *Athletic News*, steering a motor is not cycling or any other athletic exercise, so riding against a professional cyclist does not disqualify a man any more than playing at billiards, cricket, or football with him. I know a professional jockey who has competed under A.A.A. rules. If, however, the committee regard "motoring" as cycling, they are perfectly right in upholding the amateur definition.

It is proposed to establish a service of motor-vehicles between Lowestoft and Yarmouth. These motor omnibuses, being capable of a speed of 12 miles an hour, will render practicable the journey by road between these two important towns in three-quarters of an hour; and inasmuch as motor-vehicles are incapable of fatigue each omnibus could accomplish, in a 12-hours day, four journeys a day each way. The type of motor employed will be Daimler petrol engines, of from 8 to 10 H.P., supplied by the Motor-Carriage Supply Company (Limited), of London. The motor omnibuses running direct from Lowestoft to Yarmouth and back would be serious competitors with the railway, for whilst the distance by road would be practically half that of the rail *viâ* St. Olaves, the motor-omnibus would run for almost the whole way in view of the sea, and would drop its passengers anywhere along the route, or take them actually to the beach at either end.

"Riding the road-skate to the common danger" constitutes the latest police-court charge. The road skate, however, is nothing in the nature of a skate. It is defined as "a pair of small bicycle wheels with wooden supports for the legs." It is, in fact, the nearest approach to the human form divine made bike that has yet been seen. When ridden by a well-dressed lad from Hammersmith to the City it is said to have "beaten the underground trains." If it can do no more than that, it would not appear to be anything very fiery and untamed. Nevertheless, it came so sharply into a City police-constable as nearly to knock that officer down—so, at least, he deposed. On the other hand, the well-dressed boy part of it declared that it was going at a walking pace, and that it was the policeman who knocked *it* down. There being evidence to bear out this latter statement, the magistrate dismissed the summons, and merely cautioned the road-skate not to get knocked down by policemen for the future.

According to a report made by the United Traction Company, of Pittsburgh, to the *Street Railway Journal*, the average life of its wheels is 35,000 miles, and it estimates that about one-third of this life is secured by prompt grinding of the wheels when flat spots are developed. The Consolidated Traction Company, of the same city, buys its wheels on a mileage basis, the manufacturers guaranteeing a life of 30,000 miles for each wheel, replacing those which have a shorter life, and obtaining credit for those which have a longer life. The general manager of the United Traction Company, of Pittsburg, is somewhat less precise, and reports the average life of motor gears on his line as two years, and the average life of pinions nine months. The latter service is an exceedingly severe one, on account of the many grades on the line. The average life of trolley wheels of this company is 1,000 miles, and the conditions under which they operate are quite severe, as the company has on its main line 18 railroad crossings. A tempered copper wheel is employed.

A gas traction plant of tramcars has been started between Lytham and Blackpool. The Blackpool, St. Anne's and Lytham Company was the first to adopt gas traction in this country. There is nothing in the external view of the car to give any idea of the motive power employed, and it is only by opening the doors let into the side that the motor can be found. The engine, which is continually running, even when the car is stopped, is controlled by the driver from the front platform. It is one of 15 H.P., and is placed under one of the side seats. The ignition is effected by the electric spark. A governor changes the speed from 80 to 260 revs. a minute, and the Board of Trade Regulations restricts the speed of the car to eight miles an hour, but the engine is capable of driving it much faster. There are two charging stations, one at the Blackpool end and the other at Ansdell end of the system, and the temporary tram-shed and station are at Stoney Hill, South Shore. The Parliamentary estimate of the cost of the line was £52,038, but this was reduced by £18,000 owing to the Blackpool Corporation constructing the line within the borough and leasing it to the Company.

THE AUTOMOBILE CLUB OF GREAT BRITAIN.

The Second House Dinner of this Club was held on the evening of the 7th inst., at the Club premises, 4, Whitehall Court, when the chairman for the occasion was Sir William Abdy, Bart. Amongst those present were the following:—Messrs. W. Worby Beaumont, E. H. G. Brewster, Frank Butler, R. M. Buttemer, Herbert C. Capel, J. Clarkson, Captain Cunningham, Messrs. S. E. Edge, T. W. Staple Firth, F. H. Fraser, K. Hodges, W. W. Hodges, A. Hening, Ernest M. C. Instone, C. Johnson, Shaw Kennedy, S. H. Lane, Colonel Lee, Messrs. W. J. Leveburo, W. J. Leonard, P. McManus, J. McManus, C. Harrington Moore, Arthur Mulliner, J. W. Parr, Forster Pedley, T. J. Perrett, Captain Sampson, Messrs. L. Sampson, Frederick R. Simms, G. H. Thrupp, Sir J. R. Somers Vine, C.M.G., and Mr. A. J. Walter.

Before leaving the dining-room the Chairman said:—"At a discussion that was held here on Saturday last a proposal was made and subsequently adopted by the Tour Sub-Committee as to the Easter tour. It is proposed to start from the Club at 3 o'clock on the Thursday before Easter, to sleep on the Thursday night at Guildford, and to delay the start on Good Friday until noon in order to give members who may not be able to start on the Thursday an opportunity of catching up the party by starting early on Friday morning. The tour will then proceed to Winchester, where Good Friday night will be spent. On the Saturday the party will go through Southampton to Chichester, where they will stop the night. On Easter Sunday it is proposed to run to Arundel, and after having seen the Duke of Norfolk's Castle and the beauties of Arundel Park, to go to Littlehampton for mid-day dinner. In the afternoon the party will proceed to Worthing, and members will have the option of remaining there for the afternoon or running to Brighton and back. The Sunday night will be spent at Worthing, and on the Monday those who are anxious to return at once to town may proceed to London direct, whilst others will go through Lewes over Crowborough Head to Tunbridge Wells, where Easter Monday night will be spent, and on Easter Tuesday the journey will be made through Sevenoaks to London, where members will re-unite at the Club on the Tuesday evening. This promises to be an extremely interesting and picturesque tour, seeing that it will pass through some of the prettiest country in Surrey, Hampshire, Sussex, and Kent.

"It is particularly hoped that those members who have not motor-carriages will accompany the tour on bicycles or by horse vehicles, and that those who are unable to follow the tour throughout will make a point of joining it even if it be only for one of the nightly club dinners at one of its stopping places, all of which are easily accessible by rail.

"I wish to draw the attention of members to the maps which the Committee have recently purchased and placed on the Club walls. These maps are so mounted that they may be removed from their frames for measuring purposes; they are on the scale of ¼ inch to a mile, and are coloured to show the various altitudes. These maps should prove invaluable to the travelling portion of the members.

"Concerning the proposed tramway for Westminster Bridge and along the Thames Embankment it is certainly one of the functions of this Club to oppose this measure, and the Committee have already subscribed five guineas towards a fund being raised to oppose the Bill.* It is hoped that members will also subscribe to this fund. But there is another way in which they may materially help the opposition of the Bill, viz., by using all the influence that is in their power to induce members of Parliament with whom they may be directly or indirectly associated to attend and vote against the second reading of the Bill, which is fixed for Thursday next, the 10th inst., at three o'clock.

"The last point on which I have to speak is to remind members that on Saturday the 26th of this month—that is to say, next Saturday fortnight, a concert is to be given at this Club to which ladies will be admitted. The programme is not at present fixed, but I am told that a very excellent little orchestra consisting of ladies and gentlemen, some of whom are undoubtedly amongst the best amateur musicians in London, will play some most charming dance music, and that two or three good vocalists have already promised to assist in the concert. There will, on this occasion, be no charge for admission of members' friends, and it is hoped that advantage will be taken of this opportunity to introduce many visitors to the Club with a view to making it widely known and to increasing its roll of members."

Subsequently an interesting discussion took place on "The Bearing of Past Inventions on Future Motor-Car Design," the opening discourse, illustrated by some 40 lantern slides, being given by Mr. Worby Beaumont.

Mr. THOMAS CLARKSON said that Mr. Beaumont had shown that the history of the past motor-car inventions was mainly the history of their boilers, as in other respects they differed but slightly. Important as the boiler design unquestionably is there is for the modern steam-car designer a more difficult problem in the heating arrangement for the steam generator, for, as Mr. Beaumont had pointed out, the public would not be satisfied with the arrangements that were put up with 60 years ago, and Mr. Clarkson could speak from wide experience that the burner question was, in the fullest sense, the "burning question" in steam-car design. It also appeared to him that one of the important points in successful motor-car design must be combination with the coachbuilder. A carriage builder at present was not able to give any satisfactory design, as if asked for a design he generally gave either a box on wheels or a platform on wheels. The reason of this is that he does not appreciate the essential functions of the different parts of the machinery which have so important an influence upon the location of the several parts upon the car. The question then arises: Should the coachbuilder make himself acquainted with what are the essentials in a motor, or should the motor designer make himself acquainted with what are the essentials of a carriage? Mr. Clarkson was of opinion that it was easier for the engineer to learn the essentials of carriage building than for a carriage builder to learn the essentials of a motor, and only in this way does it appear to be possible to secure that unity of conception which is so necessary for the production of a really satisfactory design of vehicle.

Sir SOMERS VINE, who has recently been elected a member of this Club, said that although he had but a small knowledge of the technical side of the motor-carriage question, he had been interested from the outset in the introduction of the principle to this country. He had a firm belief that automobilism had found a place in this country, and would prove to be one of its great industries; and during his recent travels throughout the length and breadth of the Australian continent, he had been convinced that there was a great opening for transport by means of motor traction in Australia and other Colonies. In the Colonies they had not the network of railways which existed in the home country; the trunk roads were fairly metalled and in good condition, and necessarily so, seeing the large amount of road transport which took place over them. He had only recently seen a procession of trolleys each bearing some 6 to 8 tons of wool, and each drawn by from 12 to 16 draught horses, taking the wool from the outlying sheep stations to the railway or to the coast, and he believed that there was a remunerative opening for the industry in Australia and elsewhere among the dependencies of the Empire.

Mr. E. T. HARRAP said:—It has been stated that the heavier motor-wagons would hardly find an application in this country, but having carefully considered this matter with the motor-car makers I am advising, I am certain there will be a very big field indeed where weights of 2 to 5 tons have to be carried distances under 30 to 40 miles. A wagon carrying such weights has already been made, and a number of orders given on the results of its running. The great saving in time and labour due to their being no loading in and out between the ordinary dray and the railway trucks is a matter of very considerable importance. Under such circumstances the motor-wagon would compete favourably with the railways.

Mr. R. W. BUTTEMER said:—In connection with the subject of the influence of past design on present construction of motor-cars, I wish to call attention to its bad influence, as shown in the survival of useless parts, degenerate representatives of parts necessary in horse-drawn vehicles. Instances: the dashboard, still existent on some types, in spite of fact that no horse is in front to kick up mud, and no reins to be supported; the ends of longitudinal bearers of carriags, often terminating in hooks for the attachment of non-existent traces. The engineer should certainly be the predominant partner in the construction of motor-carriages; but if he has it all his own way the result is not a comfortable car, though probably a fast one, *e.g.*, the Bollée. With regard to other remarks, a clinometer is a most useful accessory. Few of those who talk glibly about a gradient of 1 in 6 or 8 know what such a hill really is. I have experimented with several forms of clinometer: a curved tube containing coloured glycerine which, though dead-beat, was too slow in responding; a suspended pendulum, which was too much affected by vibration; and, finally, have found a mercury gauge the best, an arrangement which was, I believe, put on an autocar about 1870.

Mr. Killingworth Hedges, Mr. T. W. S. Firth, and Mr. P. McManus were also among the speakers, and the following letter from Mr. Theodore F. S. Tinne was read by the Chairman during the evening:—

Hawkhurst, March 5th, 1898.

The Secretary, Automobile Club.

DEAR SIR,—A prior engagement having prevented my attending the meeting at which "Inventions" are to be discussed, I beg to submit the following remarks:—

Having designed a steam-driven motor-car "in the sixties," having always been keenly interested in the subject, having watched the race to Brighton and the procession to Richmond, and being now the owner and driver of a "Daimler" victoria, the several points I now enumerate seem to me to need the attention of inventors.

The motor should be capable of being *started* (as well as stopped) from the seat. It is not only inconvenient and, at times, dangerous to have to get down to start the motor, but it has an undignified and even ridiculous look, as well as, in wet weather, risking the muddiness of the tails of one's great-coat!

It would be better far if we could have a "self-starter," by which the pressing of a knob or moving of a lever should start all off.

Then all fittings should be capable of being reached "from the deck," instead of, as at present, its being necessary to lay down a sack in the mud and lie on one's back under the car.

There should be, in view of the driver, an indicator to show exactly how much oil fuel he has in his tank; and, for electrically ignited, or driven, carriages, how much electricity he has left.

A self-*recording* speed indicator should be easy to design, and might save a driver from the astounding judgment of some policeman, in cases of disputed speeds, if he could show, say by a pencil line on a revolving drum covered with paper, the exact speed he was running at any time on his trip.

* This fund has been further increased by a donation of £5 5s. from Sir Wm. Abdy, contributed through the Automobile Club.

A clinometer could be easily fixed on the car, by which would be indicated, without question, the angle of the slope up or down which a car is going.

For very hilly country a pair of "slippers" could be arranged to drop under the hind wheels at a moment's notice by "touching a button" from the seat, even if it involved the necessity of getting down to pick them up again at the bottom of the hill.

These last, however, are refinements. What has been impressed on my mind most in introducing my autocar to the notice of many friends is the necessity of simplifying all the mechanism to the utmost—to have as few details as possible requiring manipulation, attention, adjustment, and repair—so as to put the whole management of a self moving carriage well within the powers of an ordinary unskilled and unmechanical person. At present, the multiplicity of things to be done, and the almost certainty of being very dirty when you have done them, are great deterrents to many who would be only too ready to possess an autocar if they could do so without incurring an undue sense of insecurity and worry.

I am, Sir, yours faithfully,

Theodore F. S. Tinne.

The Secretary of the Automobile Club has issued a circular giving particulars of the Easter Tour organised by the Club. In it he states:—

It is hoped that every member of the Club will make an endeavour to participate in this tour, if not on a motor-vehicle—on a bicycle, or by horse-vehicle, or by joining the tour at one of its stopping places, all of which are easily accessible by railway.

Ladies and non-members accompanying members will be welcomed to the Club luncheons and dinners on the tour.

I shall be happy to provide you with all possible information as to hotel accommodation, but members will engage their own rooms and places at table.

It is strongly urged that, in order to avoid disappointment, members should engage bedrooms immediately.

The following members of the Tour Sub-Committee will take part in the tour, and will be happy to assist members in every possible way:—Mr. Frederick R. Simms, Mr. Frank Butler, Mr. C. Harrington Moore, and the Secretary.

Members participating in the tour who use photographic cameras are invited to take photographs, and to contribute prints for the Club album.

Members having knowledge of hotels, coach-house accommodation, petrol stores, &c., on the route are requested to kindly give as full information as possible.

The following is a general synopsis of the tour:—

Thursday, April 7th.—1 p.m., luncheon at Club; 3 p.m., start from Club; 8 p.m., dinner at Guildford. Sleep at Guildford.

Good Friday, April 8th.—12 noon, leave Guildford; 1.30 p.m., luncheon at Farnham; 7.30 p.m., dinner at Winchester. Sleep at Winchester.

Saturday, April 9th.—10 a.m., leave Winchester; 2 p.m., luncheon at Fareham; 7.30 p.m., dinner at Chichester. Sleep at Chichester.

Easter Sunday, April 10th.—10 a.m., leave Chichester for Arundel; 1.30 p.m., dinner at Littlehampton; to Worthing (Worthing to Brighton and back); 8.30 p.m., supper at Worthing. Sleep at Worthing.

Easter Monday, April 11th.—9.30 a.m., leave Worthing; (*a*) Direct for London; (*b*) For Tunbridge Wells; 1 p.m., luncheon at Uckfield; 7.30 p.m., dinner at Tunbridge Wells. Sleep at Tunbridge Wells

Easter Tuesday, April 12th.—10.30 a.m., leave Tunbridge Wells; 1 p.m., luncheon at Sevenoaks; 7 p.m., dinner at the Club.

Accompanying the circular is a useful detailed diary and itinerary for the entire tour.

E.P.S. Batteries.—Mr. J. W. Barnard informs us that his engagement as secretary of Electrical Power Storage Company (Limited) having terminated, the Company have appointed him their sole agent in the United Kingdom for the sale of their Q and V types of storage cells. It will be remembered that these types of E.P.S. cells are intended specially for use in connection with carriage, cycle, miners', domestic hand-lamps, phonographs, electro-medical appliances, &c. Mr. Barnard has secured offices at 4, Great Winchester Street, E.C., where he will have every opportunity of meeting the numerous customers of the Electrical Power Storage Company who are interested in this particular branch of its manufactures.

THE PROGRESS OF AUTOMOBILISM.

The Yorkshire Motor-Car Company (Limited), of Bradford, are not wasting time and money in so-called experiments but are developing a steady business, and, if we may be pardoned a "hull," are pushing the motor-vehicle with most satisfactory results to all concerned. They have just completed a very handsome Daimler delivery van for express parcel service for use in Bradford. They are also doing good business in the hire and purchase system with motor-tricycles and sociables.

THE SIMPSON AND BODMAN BOILER.

In our present issue we publish a paper read by Messrs. Simpson and Bodman, on Motor-Vehicles, before the Liverpool Centre of the Self-Propelled Traffic Association. In this paper, which, by the way, is well worth careful study, these gentlemen detail their experiences

Fig. 1.—Simpson and Bodman Boiler.

with various types of boilers, and at length they have designed a type of water-tube boiler, which we illustrate herewith, and which seems to us to possess many good features. The general appearance of the boiler is shown in Fig. 1, while Fig. 2 is a general elevation. The boiler consists of 22 elements, each element being an indented "Royle" tube. This form of tube gives a relatively larger surface per unit length. These tubes are connected up in series, much as in the Serpollet system, but Messrs. Simpson and Bodman employ a differential screw joint union. The generator so formed has a very large amount of heating surface, and, at the same time, is not heavy. The following are the references to the lettering in Fig. 2:—*FWT*, feed water tank; *PS*, pump suction pipe; *HSP*, hand starting pump; *EP*, engine pump; *PD*, pump delivery pipe; *SRV*, spring relief valve; *ISV*, injector stop valve; *FHT*, feed heating tube; *BFP*, boiler feed pipe; *G*, generator; *SP*, steam pipe; *ID*, injector drum; *MSP*, main steam pipe; *MSV*, main stop valve; *FB*, firebox; *F*, funnel.

We hope to give in a future issue the results of trials with this boiler, which is a most ingenious construction.

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FIG. 2.—SIMPSON AND BODMAN BOILER, GENERAL ELEVATION.

Automobilism in Belfast.—The *Belfast Evening News* understands that a number of motor-cars for passenger and vehicular traffic will be inaugurated in that city early next month. The first experiment for passengers will start from the Bank Buildings to Newtownards and Portaferry, and afterwards to other northern towns, including Ballynahinch, Newcastle, Castlewellan, &c. It is anticipated this novel undertaking will prove a great success, and undoubtedly will be highly appreciated by tourists and the public generally.

Storage Battery Traction.—The equipment of the Ostend railway is on the electric accumulator system, the plant being established in the depôt of the local railway. The line, which was recently described in *L'Electricien*, is 3·1 kilometres long, and is virtually a circular road connecting the Kursal Boulevard, Rogier Station, and the Harbour. The plant includes one compound engine direct-connected to a Westinghouse dynamo, generating 135 ampères at 280 volts, and operating at 650 revolutions. The switchboard is of three white marble sections, with the usual instruments, and commands four accumulator-charging circuits with pressures varying between 240 and 270 volts. The charging of the accumulators is done upon a central track, so that the handling, both loading and unloading, is extremely easy of accomplishment. The complement of each car comprises 12 boxes of nine elements, having a capacity of 140 ampère hours at a 50 ampère rate. The charge lasts from three-quarters of an hour to two hours, according to the demand made upon the battery. As constant use gradually disintegrates the active matter of the positive plates, this is carefully saved in a tank, and eventually used for renewing the battery. This process is several times repeated before the frame finally becomes worthless, when it is recast. Each element is contained in an ebonite vessel, the nine elements being enclosed in a wooden trough, having two bands of copper for contacts. The carriages weigh 7,500 kilogrammes without accumulators or passengers, and have a capacity of 24 seats and 26 standing places. They have no imperial or deck seats. The carriages are lighted by six 16-candle-power lamps each, and are provided with two 18-kilowatt Westinghouse motors, each connected to an axle by reducing gears of one to five. The motors are regulated by a series-parallel controller with spark extinguisher. According to data obtained for three months of active service, the management claims that the expense of this line will be very much below anything so far known in this form of traction, the consumption of coal being shown to be but 1·45 kilogrammes per kilometre-act.—*Electrical Review.*

CONTINENTAL NOTES.

In Austria alcohol-motors are finding increasing favour.

The Paris-Amsterdam race will start on July 3rd, and return on the 11th. The total distance traversed will be 1,104 miles.

The latest Roser-Mazurier omnibus weighs, in working order, 5,280 lbs.; this includes 11 gallons of petrol and a box of tools. The vehicle will carry 15 persons.

The well-known engineering firm of Decauville has decided to engage in the manufacture of automotor vehicles. It has purchased the patents relating to the Guidon motor.

A Company has been formed at Nuremberg, with a capital of 200,000 marks, to work the Lutzki motor patents. The Company is entitled Gesellschaft für Automobilwagenbau.

The Compagnie Générale des Automobiles Livreurs, with a capital of £8,000, and La Société Commerciale d'Automobiles, with a capital of £24,000, have recently been formed in Paris.

The duty or tax upon automotor vehicles in the province of Liége has been fixed at 75 francs for vehicles of four places, 60 francs for vehicles of less than four places, and 10 francs for motor-cycles.

The Compaguie Française de Voitures Electromobiles has been formed under the auspices of La Banque Internationale de Paris and La Compagnie Générale des Voitures. The office of the new Company is at 20, Rue Tailhout.

Messrs. G. Barthélemy and Co. have taken a large place near Place Periere, 13, Rue Descombes, Paris, for the benefit of those who possess automobiles, and the charging of electric batteries can also be effected there. Coach-houses exist, and all is ready for repairing and cleaning.

The Automobile Club of France invites tenders for the supply of speed and distance measuring apparatus, to be supplied to vehicles competing in the various contests the Club is going to organise during the present year. The last day for receiving tenders is April 30th, so inventors must put their best foot foremost.

M. Le Comte de Dion has reported to the Commission of French Customs (Douanes) in favour of imposing a duty on the export of motor-vehicles, because he fears the industry would be transferred from France to this country. He also objects to the publication of patent specifications, because foreign makers will copy ideas.

A future automobilite of distinction will be M. Pierre Hospitalier, the son of the distinguished writer and engineer of that name, a translation of one of the latter's articles appearing in our present number. Young Hospitalier, although only 11 years, can already handle the steering and starting gear in a way which excites the admiration of even experienced *chauffeurs*.

Motor-omnibuses are now used on the road between Mantes and Vetheuil, and between Mantes and La Roche-Guyon, the run between each of the two places occupying 45 minutes and one hour respectively. One of the vehicles is a De Dion and Bouton steam omnibus, which carries 18 passengers, weighs about 4·8 tons, and is provided with an engine of 30 H.P. A petroleum motor-omnibus, constructed by M. H. Tenting, of 46, Rue Curial, Paris, is also engaged on this service. In this omnibus the motor is fitted under the front instead of the rear of the vehicle. The motor, which has, in this case, four cylinders, is capable of developing 16 H.P., the weight of the carriage, complete with its load of 18 passengers, being about 6 tons.

The French Chamber has sanctioned the imposition of the following taxes upon automobile vehicles. In Paris vehicles for two seats pay 60 francs; vehicles of more than two seats 100 francs; in the communes of more than 40,000 inhabitants, 40 and 75 francs; in communes of 20,000 to 40,000 inhabitants, 30 and 60 francs; in communes of 10,000 to 20,000, 25 and 50 francs; in communes of 5,000 to 10,000, 20 and 40 francs; in communes of 5,000 and below, 10 and 20 francs.

The Marseilles-Nice race, although most carefully planned, yet suffered much from the weather, and the concluding portion of the competition, which took place on the 7th, was run in a perfect downpour of rain which had fallen almost continuously for 48 hours. The roads were consequently very heavy and slippery, and tried the machinery of the different systems very rigorously. Fewer than 38 carriages and 10 motor-cycles faced the starter at Marseilles on the previous day, a motor-cycle and a carriage being despatched together at intervals of half a minute. The first day's halt was at Hyères, a distance of 71 kilometres. The competitors left Hyères on Monday morning at nine o'clock for Nice, a distance of 159 kilometres, with very steep gradients, especially between Hyères and Fréjus. A huge crowd had assembled at Nice on the Promenade des Anglais, especially in front of the Méditerranée Club. The following is the result of the race:—1. M. Charron, in a carriage by Panhard-Levassor; 2. M. Bourgières, same maker; 3. M. De Knyfe, same maker; 4. M. Giraud, same maker; 5. M. Koechlin, in a carriage by Peugeot.

COST OF ELECTRIC TRACTION.

According to the *Railway World* the following are the prices for producing current for sale to tramway companies:—

	No.	Average cost (pence).
I.—*Local Authorities.*		
(*a*) Selling over 1,000,000 units per annum	4	1·63
(*b*) Selling from 500,000 to 1,000,000 units per annum	4	1·95
(*c*) Selling less than 200,000 units per annum	20	3·51
II.—*Companies.*		
(*a*) Selling over 1,000,000 units per annum	1	2·44
(*b*) Selling between 500,000 and 1,000,000 units per annum ..	3	2·28
(*c*) Selling less than 200,000 units per annum	12	4·26

Commenting on these figures the *Electrical Review* says:—"We are thoroughly in accord with our contemporary in considering such tariffs as 3*d.* and 4*d.* per car mile or per unit for tramway current to be simply prohibitive under average conditions; the maximum rate fairly chargeable ought not, so far as we can at present say, to exceed 2*d.* in view of the long hours of demand coupled with steady use of current. The momentary variations from zero to maximum, which are sometimes characteristic of a line with sparse traffic, doubtless affect the instantaneous governing powers of the engines, but can hardly be said to make much difference to the steady jog-trot of the recording watt-meter that helps to draw up the bill for current delivered. Nor should they necessarily imply the provision of expensive duplicate plant with greater capital outlay and consequent higher cost, in so far as that is concerned, of current delivered."

According to some comparative calculations of all the costs of installation and operation required by animal, oil-motor, and electric traction, made by the Société des Voitures Electriques, which operates on the Krieger system, it seems that all the advantages as regards economy lie with the electric system. For daily cost of operating cabs this Company gives the following figures:—

For animal traction	15·44 francs.
For a petroleum automobile	13·20 „
For an electric automobile	8·13 „

DOINGS OF PUBLIC COMPANIES.

THE Madelvie Motor-Car Company (Limited), of 67, George Street. Edinburgh, a private Company recently launched in Edinburgh, with a capital of £25,000, for the manufacture of motor-vehicles, cycles, &c., has secured ground to the extent of 5 acres, at Granton, for works. Mr. William Peck, F.R.S.E., &c, is the Managing Director.

New Beeston Cycle and Motor Co. Reconstruction.

THE statutory meetings of the Beeston Cycle Company (Limited) and the Beeston Motor Company (Limited) were held on the 26th ult. at Coventry, Mr. Rowland Hill presiding, there being also present Dr. Iliffe and Mr. S. Gorton (directors), Mr. E. F. Peirson (secretary), and a few shareholders.—The CHAIRMAN recalled to the mind of the meeting of the Cycle Company the steps which were taken last autumn to reconstruct the New Beeston Cycle Company (Limited), and for the formation of two separate Companies—a Cycle and a Motor Company—one object being to get rid of a large number of vendors' shares in the possession of the promoters of the original Company. The capital of the present Cycle Company was nominally £100,000, of which £68,000 was issued. To that had to be added debentures amounting to £35,000, making a total of £103,000; and whereas, at the present time, nearly all cycle companies entered large items for goodwill in their assets, here no such thing was done. The buildings, plant, and stock-in-trade, together with the book debts, cash in hand, and 3s. per share provided by the shareholders, amounted to the total of something over £90,000. He wished the shareholders to understand the great advantages which had been obtained by the arrangements now carried out. The trade had well received the Company's machines, and, with fine weather, he believed the season would prove a good one. The demand for motors continued to increase. He alluded to the recent launching of the Beeston Cycles (Continental) Company, and said the directors thought there was a good opportunity for extending the business in this way, and that they would have been unwise if they did not take advantage of the opening. He acknowledged the loyal way in which the shareholders had stood by the Board, and thus assisted them in rescuing the Company from a position in which success was practically impossible.

At the meeting of the Beeston Manufacturing Company, the CHAIRMAN stated that the nominal capital of this concern was £110,000, of which some £69,000 was absorbed by members of the old company. The vendors of the old Company took £35,000 4 per cent. debentures. The 3s. liability should yield a working capital of £10,000, which the directors considered would be ample for the purpose of the business. The business was of an encouraging character; for whereas during the greater portion of the New Beeston time the motors made were the best that could be turned out under the circumstances, they now had their own works devoted exclusively to the manufacture of motor-cycles. There was now a regular weekly output, and he thought the total volume of trade was likely to be a large one in future. The directors were more confident than ever that there was a great future for the Company.—The shareholders present at the meeting, before leaving, inspected the factory.

G. R. Blot and Co. (Limited).

AT the statutory meeting of this Company, held on the 14th ult., the CHAIRMAN (Mr. Thomas Parker, J.P., F.R.S.E., M.I.C.E., &c.), after the Secretary (Mr. William Aubanel) had read the notice convening the meeting, in addressing the shareholders, said:—The future of the Company is well secured, owing to the fact that they have orders in hand and in view, and a very effective staff to carry out the requirements of the Company. The capital of the Company has been largely subscribed by English and French shareholders, and there are amongst both some very influential people. The Company, therefore, has at its command the capital necessary to meet its requirements. I am glad to be able to say that the French Company, La Compagnie des Accumulateurs Electriques Blot, has been very successful, and has just received an order from the "Secteur" of the Champs Elysées for a battery of 10,000 ampère hours, discharging at the rate of 2,000 ampères per hour—one of the largest batteries in the world, if not the largest. Those who know something of accumulators will understand the magnitude of this one, and I question if there is so large a one at present built. The Company has 15 tons of plates to handle per week, so that we have every reason to hope that we shall do quite as much at our factory at Wednesfield. Your directors are proceeding as quickly as possible with the erection and fitting out of our new works near Wolverhampton, and in a few weeks will be able to commence delivery of accumulators on a large scale. For my own part, I have been connected with accumulators since 1881. There was a notice of my first effort in this respect in the *Electrician* of February 7th, 1882. From this time, as managing director of Ellwell-Parker (Limited), up to 1889 I have developed a very large accumulator business in Wolverhampton. In 1889 I ceased to be a manufacturer of accumulators, but have since that date been largely connected with enterprises in which accumulators have played an important part, and I welcome this Company in their efforts to establish a business in England, and, I believe, upon lines which will be successful. The new Company has everything in its favour—works admirably situated, with every facility for cheap transport by canal, railway, and the like. The freights being so reduced and rent so cheap, it is more than probable that handsome dividends will soon be paid. Situated as our works are, right in the very heart of the electrical world, there is every reason to hope for a favourable result, and I trust that at our next annual meeting we may be able to tell you that we are well and securely on the road to this end, and I hope we shall thoroughly satisfy those gentlemen who have taken an interest in the Company.

Mr. J. COLLEY having thanked the Chairman for the very able manner in which he had conducted the meeting, the proceedings terminated.

London Electric Omnibus Company.

AN extraordinary general meeting of the above Company was held on the 4th inst., for the purpose of receiving the report of the committee appointed at the meeting on December 31st last, Major Flood Page (the chairman of the Company) presiding.

The notice convening the meeting having been read, the Chairman said that at the annual meeting held on December 31st last he, on behalf of the board, proposed a resolution for the appointment of a committee. He would therefore at once call upon the chairman of the committee to address the meeting.

Lieut.-Colonel THOMAS TURNBULL (chairman of the committee) then read the report of the committee, which is as follows:—

"The first business discussed was the Company's present unsatisfactory position, which, in the opinion of the committee, results from the following causes:—(a) By the board having gone to allotment on too small a firmly-subscribed capital; (b) by the payment to the vendors of £6,183 10s. in cash, when the Company had such a very small available working capital; (c) by the board having made an agreement on July 29th, 1896 with Mr. Marshall, one of the vendors, who was also a director of the Company, that only one call of equal to 2s. per share should be made prior to July 31st, 1897. This agreement deprived the Company of the power to raise the capital necessary to work the business; (d) by the loss of capital—firstly, through the failure of Mr. Marshall and his associates ultimately to pay their calls, amounting to £9,737 10s.; and, secondly, to that of other shareholders, amounting to £5,696 19s., making a total deficiency of working capital of £15,434 9s.; (e) by the excessive expenditure upon general charges as shown in the annual report; a portion of this, may, however, have been indispensable in the establishing of this new industry; (f) by the large expenditure in connection with the development of the Sola Accumulator. With an increased working capital of not less than £15,000, and under economical and careful management, expending said capital in building and properly equipping omnibuses, the committee is satisfied the Company has a splendid future before it, with a large earning capacity. Provided the above capital is secured to work the Ward system and Schanschieff Sola Accumulator agreements, which are both valuable, the position of the Company is much better than was represented to the public previous to the annual general meeting. Mr. Ward has agreed with the board and committee to extend his licenses to the whole of the United Kingdom; he to be paid 10 per cent. in cash or shares on any gross amount the Company may receive from the sale of the same in the United Kingdom outside of England, the Company already possessing the licenses for England; the Company also to have the benefit of any and all improvements Mr. Ward may make in relation to electric accumulator traction in omnibuses, cabs, stage coaches, and other public vehicles other than vehicles used on tramways. Mr. Schanschieff's agreement conveys the exclusive right to use his patents for accumulators for omnibuses and cabs for London, with the additional privilege of granting sub-licenses for all public carriages, excepting tramways, for all England, and a right to use any improvements and discoveries that may be secured by the patentee, provided the Company pays cost of securing the patents. Also, the patentee undertakes to supply accumulators for 300 omnibuses at actual cost, and, should the Company decide not to manufacture accumulators, to supply all future orders at a royalty to be fixed by arbitration, the price net to exceed what is usually paid to other accumulator companies. Mr. Spagnoletti attended one of the meetings, and expressed his opinion that the 'Sola Accumulator was most suitable for street traction, because it was lighter and cheaper than the average accumulator, and more economical to manufacture and work.' The committee requested the board to make a practical test of the running of the omnibus, resulting in a trial made on the 5th inst. The entire arrangements for this test were made under the direction of the board, who requested Mr. Spagnoletti and Mr. Schanschieff to take observations, and Mr. Ward to act as engineer. The omnibus carried 17 passengers, and ran out to Hammersmith Broadway from Trafalgar Square and back to Whitehall, a distance of 14 miles, going and returning by circuitous routes. On the outward journey the route lay up Haymarket, one of the steepest grades in London, and the omnibus maintained a uniform rate of speed on this grade. The steering was perfect in every respect, and the control in starting and stopping was thoroughly successful, the omnibus threading its way through the crowded traffic with perfect facility. Mr. Spagnoletti concludes his report thus: 'The result of this trial trip I consider most encouraging and very satisfactory indeed.' The committee find a contract is in existence with the Electric Street Car Manufacturing Syndicate (Limited), of Wolverhampton, its main object being the building of suitable omnibuses in an expeditious manner for this Company. Provided these are secured on advantageous terms, this contract should prove to be to the interests of the Company. The committee having carefully examined the articles of association, are of opinion that these should be suitably amended. The Company has at present at its disposal 119,993 shares ordinary stock unissued. The issue of deferred shares is 80,000 shares of £1 each; these were all given to the vendors. The committee recommend that, provided the consent of the holders of the ordinary stock is secured, some satisfactory arrangement should be made with the deferred shareholders which would have the effect of reducing the capital stock of the Company very materially. This, in conjunction with the securing of the additional capital, would be an important factor in the future prosperity of the Company. In the meanwhile this Company has secured a prominent lead in the great question of electric traction for omnibuses, &c., and the committee feel assured that within a very short space of time this Company's method of accumulator traction will entirely supersede that of horse traction. The committee have gone into facts and figures, and given careful consideration to the probable results from an investor's point of view, and are satisfied that if properly equipped omnibuses are placed on good thoroughfares in London and elsewhere, with regular services, the returns will be satisfactory on money invested, and will bear out the figures as to profits given in the original prospectus. A reduction of expenditure is necessary, and towards this it has been proposed, by the directors themselves, that they should be entitled to only two-thirds of the fees fixed in the articles of association until such time as the Company has paid an annual dividend of 7 per cent. Mr. Ward has voluntarily reduced his annual salary one-half until the Company is able to pay a 7 per cent. annual dividend to its shareholders, when he may resume his former salary, provided the said dividend is arrived at within the limit of his agreement. Mr. Ward has also relinquished his seat at the board. It has been unanimously decided by the board and committee jointly that a sum of at least £15,000 working capital is required for the immediate development of the Company's business. It is proposed to construct 12 omnibuses, and place them on a desirable route, or routes, to be decided. It is estimated that these omnibuses will cost, with complete equipment, the sum of about £9,000, leaving a balance for fixed charges, omnibus stabling, wages, &c., of about £6,000. In the event of providing a station and electrical appliances, so that this Company might supply its own electricity, it is estimated that a further sum of about £5,000 would be required. Though arrangements can at present be made to purchase electricity on fairly reasonable terms, it is thought advisable that this matter should be taken into consideration as soon as the necessary capital is available. The immediate appointment of an assistant engineer is absolutely necessary; this will receive the board's attention. The Company has the right to dispose of the forfeited shares, upon which 10s. has already been paid, or credited as paid. This should prove a valuable asset, and the committee recommend that these shares should be offered (1) to the original shareholders who have defaulted; if so taken up the Company would receive the sum of £15,000; and (2) to the present shareholders as fully-paid shares for the sum of 10s. each, which would yield the sum of £15,935; and (3) in block to any person or persons who would be willing to purchase at a price to be named, or who would advance a sum sufficient for the Company's immediate requirements. Provided the amount required is realised from the forfeited shares there will remain 119,993 unissued shares of ordinary stock, which the proposed development under the expenditure of the £15,000 should also become an asset of considerable value to the Company. The committee feel assured that the future prosperity of the Company, carried out on the proposed lines, will lead to great financial success, and trust this policy will be heartily endorsed by the shareholders."

Lieut.-Colonel TURNBULL, in moving the adoption of the committee's report, said he thought there had been mistakes of judgment on the part of the board; but they also recognised the great difficulties the directors had had to contend with, owing to the small capital they had at their command, and through the shareholders not having met their calls. It was important that the Company should be run on business principles, and the first thing necessary was to provide sufficient capital to build omnibuses. There was a contract in existence with the Street Car Manufacturing Syndicate, of Wolverhampton, which the committee thought could do the work necessary in a satisfactory manner. The Company possessed a good system of steering in the Ward system, and a good accumulator, lighter and cheaper to manufacture than any other.

Mr. J. ELLIOTT CONDICT, in seconding the resolution, said the action of the board in their development of the Sola Accumulator had been very satisfactory, and he did not think that they had spent an unnecessary sum of money in that direction. The Sola Accumulator was half the weight of any other accumulator in the market. The test of the omnibus lately was a most satisfactory one, because they were able to find the exact amount of voltage and the number of ampères used on the track. Having this data before them, and knowing that they could purchase the current from electrical companies at the rate of 2*d.* per unit, they were able to verify all the statements that had been made in the prospectus. They were consequently able to feel that in this omnibus business they were standing on good solid ground.

The CHAIRMAN expressed satisfaction at the report of the committee. With regard to the agreement made with Mr. Marshall, the promoter, not to make a call, the board did not know much about his financial position, but from the representations that were made to them they felt they were justified in making this arrangement. He could bear testimony to the large amount of work done by the committee, and it was a matter of satisfaction to him that the committee had given the cachet of their approval to what the directors had done.

The resolution was then put to the meeting, and carrie unanimously.

On the motion of Mr. Brooks a sum of £100 was voted to the committee for their services, and the proceedings terminated.

The report of the committee of this Company forms, says the *Electrical Review*, pretty reading, and the practical test which Mr. Spagnoletti considers most encouraging and very satisfactory only goes to show he must be very easily satisfied. Mr. J. Elliott Condict, too, boasts of the satisfactory nature of last month's test, because, forsooth, they were able to find *the exact amount of voltage and the number of ampères used!* Can it be possible that these figures have never been ascertained previously? The results obtained with the 26-passenger 'bus, carrying, however, only 17, have been submitted to us, and, briefly stated, are as follows:—The vehicle ran from Trafalgar Square to Hammersmith Broadway, and back to Whitehall, a distance of 14 miles, in 1¾ hours, inclusive of a 17 minutes' wait at Hammersmith. The day was perfectly dry, the roads clean, and with one exception, viz., Haymarket, the route to Hammersmith is fairly level. The return was made on a road still more favourable for the 'bus, but had the day been wet, with greasy streets, it is doubtful whether it would have reached home without assistance. Readings of current and voltage were taken every 5 minutes, the ampères averaging 39 and the volts 230, or an average of 12 H.P. electrical. It is stated that at the end of the run enough electrical energy remained in the battery for 11 miles further, but we need not, at the moment consider this. The question is, whether there is not a great loss of electrical energy somewhere; 13,000 watt-hours taken from the battery during a trip of 1¾ hours means no less than 9 units per hour, a result which speaks for itself.

This Company's return was filed on January 21st. The capital is £250,000 in £1 shares (80,000 deferred). All the deferred and 17,818 ordinary have been taken up, and the deferred are considered as paid; 19*s.* 6*d.* per share has been called on the ordinary, and £33,274 2*s.* 6*d.* has been paid (including £17 15*s.* paid in advance); £15,500 9*s.* is in arrears, and £16,520 8*s.* 6*d.* has been received on 32,189 forfeited shares.

The Epstein Electric Accumulator Company (Ltd.) (in Liquidation).

MR. P. W. NORTHEY, liquidator, receiver, and manager of this Company, has issued the following circular from 28, Victoria Street, Westminster, S.W.:—"As you are probably aware, an action was instituted in the month of July last on behalf of the first debenture holders, and in such action I was appointed receiver and manager, and have in that capacity continued to carry on the business of the Company. Subsequently, an order was made for the compulsory winding-up of the Company, and I was appointed liquidator in such winding-up. An offer has been made for the purchase of the Epstein Company's assets by a new Company, which proposes to take over the business as a going concern. The terms of purchase, while not immediately satisfying the entire claim of the first debenture holders (£6,000), give them such interest in the new Company, coupled with a guarantee of minimum working capital, that the offer is likely to receive favourable consideration on their part. As to the owners of the second Epstein debentures, these will have the option of applying for fully-paid ordinary shares in the new Company, not exceeding in face value the amount of their present holding in second debentures at a discount of 50 per cent. Any such options not exercised by owners will be held at the disposal of other second debenture holders who wish to participate in the new scheme beyond their present holding. The actual assets of the Epstein Company, after collection of outstanding accounts, will be approximately £2,000 in cash, besides:—

	£	s.	d.	
Plant ..	8,164	17	5	as nominally valued in books on January 1st, 1898.
Stock ..	3,296	17	11	
Patents ..	70,050	0	0	

While the before-mentioned offer is under consideration, I desire to invite competitive proposals which may be productive of better results, and I shall be glad to give any desired information with a view to the receipt of ulterior proposals before closing with the one received, which will be open for acceptance till February 26th."

We believe this proposal is still open.

New Companies Registered.

[Under this heading we give a full list of new Companies registered which take power to make, deal, or become interested in any manner in automotor vehicles.]

	Capital.
Automotors, Ld. (40, Holborn Viaduct, E.C.)	£100
Beeston Cycles (Continental), Ld. (Quinton Works, Cheylesmore, Coventry)	15,000
British Wagon Co., Ld. (22, Moorgate Street, Rotherham)	700,000
Coventry Accessories, Ld. (Triangle Chambers, Martineau Street, Birmingham	5,000
Gloria Cycle Co., Ld.	100
Hopkins, Taylor, and Co., Ld. (Birmingham)	2,000
International Engine Patents Developments Co., Ld. (33, St. Swithin's Lane, E.C.)	3,750
Langdon-Davies Electric Motor Co., Ld.	70,000
Manchester Acetylene Gas and Carbide Co., Ld. (St. Simon Street, Salford)	40,000
New Coventry Co., Ld., (Quinton Works, Cheylesmore, Coventry)	15,000
New Power Syndicate, Ld.	15,000
Pneumatic Beer Pump Co., Ld. (2, John-Dalton Street, Manchester)..	5,000
Self-Charging Electric Traction Co., Ld. (40, Holborn Viaduct, E.C.)	100
Taxameter Syndicate, Ld.	20,000
Windsor Cycle Co., Ld. (3, Great Turnstile, High Holborn)	1,500

REVIEWS OF BOOKS.

"Transactions of the Liverpool Engineering Society." Vol. XVIII. Edited by R. C. F. ANNETT, Assoc. Inst. C.E.

THE Liverpool Engineering Society, we need hardly say, is one of the most important and flourishing provincial professional bodies, and hence the papers read by the members on various engineering matters, and which constitute the Transactions, are not only of interest but of considerable practical value. The present volume is no exception to this rule. In the Presidential address, by Mr. S. B. Cottrell, on Railways, the following passage occurs; we reproduce it here, as it illustrates the attitude with which many people even now regard automobilism:—"What strikes us at this date (1825) as most remarkable is the difficulty met with in persuading the public that the idea of railways was more than hallucination of insanity. Thomas Gray, of Nottingham, on seeing a train of coal wagons propelled by steam along a railroad track in the North conceived the idea of applying the invention to the purposes of locomotion generally. From that time he persistently agitated the subject in spite of every discouragement, with the common opinion that he, poor fellow, was not quite himself. It was undoubtedly a result of this agitation that when the business men of Liverpool and Manchester turned their attention to a means of transit other than the canals, the railway at once suggested itself. Even then, except by the promoters, among whom appear names highly honoured in Liverpool, the project was laughed at. Such was the feeling in the country districts, when the affair became known, that George Stephenson had to make his first surveys for the line by stealth. On one occasion the mob attempted to 'duck' him. Landowners fiercely warned him off. It is not surprising in these circumstances that his surveys did not prove quite accurate; and on this pretext the Bill was thrown out, and the inevitable slightly delayed. There was a fierce fight, too, with the vested interests of the Canal companies, who naturally played upon public prejudice. The contest was obstinately renewed over every fresh scheme of railway enterprise. The Great Western Bill, introduced in 1833, was opposed by the authorities of Eton as injurious to the discipline of the school and dangerous to the morals of the pupils; and when the Bill was lost, public meetings were held at Oxford and elsewhere to celebrate its rejection. The opposition, however, received a terrible shock from the success of the Liverpool and Manchester enterprise. The assembled thousands who came from all parts of the country to witness the preliminary trials at Rainhill, gazed on the 'Rocket' and the 'Novelty' with a wonderment which became something akin to consternation when the 'huge bulks' were seen moving at a speed which, according to a witness of the affair, 'wearied the eye and excited the brain.' The then Earl of Derby, a bitter opponent, came down to rejoice over the expected failure, but was disappointed, and when the line was formally opened, the Duke of Wellington, as one of the spectators, and guarded by a posse of special constables (owing for the moment to his unpopularity), even refused to enter a railway carriage until thirteen years afterwards." It is interesting to note that the present Earl of Derby is the President of the Liverpool Centre of the Self-Propelled Traffic Association. "Some Notes on Railway Construction," is an interesting account of the difficulties of construction that occur in unfavourable localities. "Water-Tube Boilers," by Mr. G. L. Benton, is a distinctly useful paper, and one that may be used with advantage by those who think about employing such boilers for automobiles. It may be noted that there are no less than 25 recognised types of water-tube boilers to select from. There is a good paper on "Mechanical Refrigeration," by Mr. J. Wemyss Anderson, and one on a similar topic by Mr. Bannister, who, by the way, is a Member of the Council of the Liverpool Centre of the S.P.T.A. Another good paper is on "Sewage Sludge Removal," by Mr. J. Corbett. Space forbids us to deal at large with this interesting and instructive volume of engineering literature. It is well worth quiet study.

"The Essentials of Gearing." By GARDNER C. ANTHONY, A.M. (D. C. Heath and Co., Boston, U.S.A. 1897.)

THE modern technical student does not lack either books or instructors. As one of the latter, Professor Anthony occupies a deservedly high place, while as a writer of the former he is no less well known. The present work on gearing bears strong internal evidence that it has been written with a full knowledge both of the subject and of the student. Many otherwise excellent treatises fail of general acceptance because the writers lack a knowledge of student nature. One can spend much time—not altogether profitably—in studying the principles of wheel gearing: and as presented in the larger works one reads much that, from the practical point of view of the draughtsman, is of little use. Professor Anthony has contrived, in the course of some 80 pages of matter, accompanied by 15 separate plates, to say as much about gearing as will satisfy all but the very advanced mathematician. After some preliminary definitions of terms, assisted by sketches, the various curves are described, together with the method of tracing or drawing them. The theory of Cycloidal Action is, while fully, yet simply, treated of, and the same remark applies to the theory of Involute Action. The chapter on Annular Gearing contains about the best description of this species of toothed gearing we have seen; the limitations and practical considerations being clearly stated. Bevel gearing is thoroughly well described. A table, containing all the elements for shafts at 90° apart, should, we think, prove extremely useful. Although it is customary to tabulate such elements, we quite agree with the author that the most feasible method for the acquirement of a working knowledge of the theory of gear-teeth curves is by a graphic solution of problems relating thereto. But it requires much time on the part of an instructor, and is very difficult for the student, to devise suitable examples which, while fully illustrating the theory, shall involve the minimum amount of drawing. It has been the aim of the author to overcome these difficulties by the presentation of a series of progressive problems, designed to illustrate the principles set forth in the text. An interesting account of various odontographs is given. These means of describing teeth are not so much used here as in the United States. In addition to the purely theoretical aspect of gearing, many valuable hints are given on the practical questions relating to drawing teeth, &c. The work is very well got up, the printing and the plates leaving nothing to be desired.

"The Universal Electrical Directory" (Berly's). (Alabaster, Gatehouse, and Co., 4, Ludgate Hill, London, E.C.). Price 6s.

To all engaged in the electrical industry this work may be said to be indispensable. We notice that the proprietors and publishers do not confine their work to giving mere lists of names and addresses, but give many particulars of the industry in general such as must be very serviceable to the large number of people who are either shareholders in electric light companies or ratepayers interested in municipal lighting and traction schemes. Needless to say that, owing to the rapid growth of the industry, it has been necessary to enlarge the book, which now consists of 1,180 pages. It now contains the names of the members of the electrical and kindred industries throughout the world, and the British Alphabetical Section now comprises about 9,918 distinct names, the Continental 7,872, the American 4,080, and the Colonial 1,924, making a total of 23,794—approximately 1,136 names of individuals and firms more than were contained in the book for 1897. For simplicity and facility of reference it is divided into four groups—viz., British, Continental, American, and Colonial—which are again subdivided into alphabetical and classified sections. In the case of the British a geographical section is given, making in all nine subdivisions. The printing and get-up are also much better than have been the case with former issues.

"Willing's British and Irish Press Guide." (Mr. James Willing, 125, Strand, London.)

This work is now in the twenty-fifth year of its age, and there is indication of its utility and importance, and also of the growth of journalism. It is only by turning over the leaves of such a work as this that one realises the vastness of the enterprises associated with newspapers; while to think that the large number of newspapers shows no tendency to diminish, but, on the contrary, is steadily increasing, is evidence of the growing literary intelligence of the public. On examining the work before us we naturally sought for The Automotor. It was not under the heading of "Motors," nor "Horseless Vehicles," nor "Engineering," but it is placed in the list of papers relating to cycling. This is an error which only needs to be pointed out. The book is distinctly useful to all connected with the Press, and especially to advertisers.

The Yachting Monthly Magazine.—This is the first number of a new magazine emanating from the *Yachtsman* Office. There are a number of interesting "yarns" in it, and some good descriptive writing, but the tone throughout is extremely amateurish, and the professional nautical automobilist will find but little to interest him. The best article is by Mr. E. Horn, on the probable renewal of Schooner Racing. The letterpress is good, and the illustrations also. The magazine is susceptible of considerable improvement in its literary matter, but one must not be too hard on a first number.

CATALOGUES.

Mr. H. Ronnebeck, of Middlesbrough, has sent us his catalogue of steel and iron girders, bars, channels, &c. We observe that the lists are very copious.

Messrs. C. A. Parsons and Co., of Newcastle-on-Tyne, have issued a new descriptive and illustrated catalogue of their well-known Turbo Motor, which was recently described in our columns. This special motor is already very largely used for electric lighting. The catalogue also contains illustrations of the various other appliances connected with naval automobilism made by this firm.

One of the most attractive catalogues we have seen for some time is that of Messrs. Alley and Maclellan, of Glasgow, the makers for Great Britain of the "Sentinel" (Westinghouse) high-speed motors. This cataloge is a useful one to have, as it contains much information of a practical kind. We do not see why the remarkably compact engine made by this firm should not be used for motor-vehicles. A little alteration to some of the parts, and the addition of another eccentric, would render this quite possible.

We have received an excellently well-written catalogue from the Mirlees, Watson, and Yaryan Company, of Glasgow, describing their water-tube boiler. This boiler consists essentially of three upper horizontal steam and water drums, connected by three series of tubes to one lower horizontal drum, which latter serves also as a mud drum, where solids originally suspended in the feed water or thrown out by the evaporation may be deposited. A very high evaporative efficiency is obtained in this boiler owing to the heating surface being in the form of tubes. The transmission of heat across the metal is, therefore, rapid, and takes place with lower differences of temperature than are necessary where the surface is in the form of heavy plates. The hottest gases are applied at the lower and colder portions of the front section of tubes. A very rapid transference of heat to the water thus ensues, and, what is of equal importance, a vigorous circulation of the water is set up and maintained. The circulation is rapid, complete, and continuous, not being impeded by headers, although the tubes are sufficiently inclined to prevent "geyser"-like action. The back section of water tubes is an "economiser," in which the feed water, descending slowly, has time to absorb heat from gases which have already done their principal work in the generation of steam in the front sections.

We have also received *Industries and Iron*, the *Practical Engineer*, *Indian Engineer*, the *Journal of Acetylene Gas Lighting*, the *London Chamber of Commerce Journal*, the *Machinery Market Review*, *La Locomotion Automobile*, *La France Automobile*, *Les Sports*, *L'Automobile Illustré*, the *Engineering Magazine*, *L'Energie Electrique*, *Horseless Age*, *American Wheelman*, *Cyclist*, &c.

Motor-Car without a Light.—On March 8th, William Syers, of Coventry, was summoned for driving a motor-car without a light on the Coventry Road on the 27th ult. A police constable proved the case. Defendant did not appear. He was fined £2, including costs.

Sub Judice.—Mr. Justice Stirling, on February 18th, fined the editor of the *Stock Exchange Gazette* £20 for contempt of court in commenting in his journal on a pending action, involving issues of fraud, brought by a Mr. Greenwood against the Leathershod Wheel Company. The editor pleaded youth and inexperience and ignorance of the law. He apologised to the Court, and agreed to insert an apology in his paper. He also undertook to comment no further on pending litigation.

CALCIUM CARBIDE AND ACETYLENE.

So many of our readers have addressed inquiries to us regarding acetylene—the new illuminant—that the following information will no doubt be serviceable:—

Acetylene was discovered by the great chemist Davy in 1836, who found that in the reduction of potassium from potassium carbonate a compound of potassium and carbon was formed which, in the presence of water, decomposed, producing acetylene. This gas was by him called "klumene." Acetylene is also produced by the decomposition of sodium carbide, and also by the electric arc in an atmosphere of hydrogen. That it was a powerful illuminant was well-known, but the difficulties of its preparation rendered its production of little use save as a laboratory demonstration.

With the introduction of high temperatures, whether produced by the combustion of various gases or by the electric arc, chemistry has assumed an entirely new aspect. The most refractory substances can now be resolved, and other ones formed. Thus Wöhler, by heating at a high temperature an alloy of zinc and calcium with carbon, obtained calcium carbide, and from the latter, in the presence of water, acetylene. The chemical reaction being—

$$Ca + C_2 = CaC_2.$$
$$CaC_2 + H_2O = CaO + C_2H_2.$$

Notwithstanding the discovery of calcium carbide, acetylene did not possess any commercial value owing to the high price of calcium.

The electric furnace, however, enabled Moissan in 1889 to produce calcium carbide much more easily, but still at great cost. He found that calcium carbide was formed by the action of the calcium vapour from the quicklime lining of the furnace in which projected the two electrodes. He fully studied the properties of the carbide, and described them. Simultaneously Mr. Wilson, of Spray, U.S.A., independently discovered that calcium carbide could be produced in the electric furnace. His discovery was, however accidental. He was seeking to produce something else, and threw away into a stream what he thought a useless by-product. He observed that on its coming into contact with water a violent effervescence ensued with the evolution of gas, which, on ignition, burnt with an intensely white light. The gas was acetylene. So valuable is the latter as an illuminant that means were sought to produce calcium carbide on a sufficiently cheap scale to render the use of acetylene a commercial possibility.

Calcium carbide is a hard, shiny crystalline substance of a brownish-red colour; its specific gravity is 2·262. It is practically insoluble in most reagents, but in presence of water it decomposes, as seen by the foregoing equation, into acetylene (C_2H_2) and lime (CaO). Theoretically 1 lb. of carbide requires ·525 lb. of water for its decomposition, and this should yield 1·1563 lb. of lime and 0·4064 lb. of acetylene, measuring 5·5857 cubic feet at 0° C. In practice, however, owing to losses and impurities, 1 lb. of carbide yields 5 cubic feet of acetylene. Upon decomposition 1 lb. of carbide gives 900 British thermal units, and this heat has to be considered in designing generating plant, owing to the low temperature at which acetylene is decomposed.

Calcium carbide acts as a reducing agent to many oxides, and alloys of calcium with most metals can now be obtained. Calcium carbide is manufactured by heating lime (60 per cent.) and carbon (coke) (40 per cent.) in an electric furnace. On starting the current an arc is formed, and the intense heat of this meets the two substances producing the carbide and (see equation above) the carbonic monoxide which burns as a gas with a blue flame. Very heavy current is required for the reduction, as much as 1,700-2,000 ampères at 100 volts; 2·2 H.P. hours are required to produce 1 lb. of carbide. After allowing for various losses it is found that 7,500 electrical H.P. hours are required for the production of 1 ton of carbide. This means that carbide can only be produced when the power can be obtained for little or nothing, hence the factories, in all cases, derive their power from high waterfalls; the idea of producing carbide from electric furnaces in which the current is produced through a steam-engine and dynamo being utterly out of the question. At present the price of carbide is about £16 per ton for large quantities.

Acetylene is an invisible evil-smelling gas, very irritating when inhaled, especially if at all impure. It is soluble in acetone, alcohol, and paraffin, the two latter absorbing 6 and 2·6 times their volumes respectively. Its density is 0·91. Its theoretical calorific power is 336·5 calories. In practice the calorific power is but 397 calories, the difference being due to the fact that acetylene is an endothermic compound, that is, during its formation heat is absorbed and this heat is again set free. When it is decomposed the liberation of heat, especially in the case of liquid acetylene or compressed acetylene gas, invests the use of acetylene in either of these forms with a certain element of danger. According to Professor Lewes, R.N., of the Royal Naval College, at any pressure up to two atmospheres acetylene is perfectly safe from any explosive action, *per se.* At higher pressures, however, a red heat will induce explosion through the whole volume of the gas, this being due to the revolution of the acetylene into its constituent elements, carbon and hydrogen, with the liberation of the endothermic heat stored in it. When burnt with 50 per cent. of oxygen an intense heat, 4,000 C., is produced. The gas freezes at −81 C., it ignites at 500 C., and decomposes at 780 C.

As an illuminant acetylene surpasses all other gases in purity and whiteness; it gives 240 C.P. per 5 cubic feet per hour under the most favourable conditions. In practice 30-40 C.P. are obtained with burners consuming about 1 cubic foot of gas per hour. If the burners were more suitable much better results could be obtained. As regards cost, according to some recent researches acetylene is as cheap as coal gas at 2*s.* 6*d.* per 1,000 cubic feet if burnt in a flat flame. It is thus from its high illuminating power and from its ease of manufacture particularly suitable for isolated mansions, country houses, railway stations, &c.

We shall in a future issue more particularly deal with acetylene as a motive power.

THE ALLAN ACCUMULATOR.

An accumulator which is likely to attract a considerable amount of notice in the traction world is being placed on the market by Messrs. Allan and Adamson (Limited), of 88, Tabernacle Street, E.C. This is the Allan accumulator, whose chief features are;—(1) The proper and effective support of the active material in the plate without the use of a heavy lead supporting frame. (2) Provision for expansion of the plate, to avoid buckling or bending. (3) Effective surface contact over the whole plate between the active material and its supporting frame.

The Allan accumulator plate consists of a hollow frame or envelope, with its edges perforated, and its sides constructed of lattices extending from edge to edge, the edges of the lattices being bevelled. This frame is filled with the active material in the form of a paste, which fills up the centre and keys itself into the two sides of the frame by the bevelled edges, and as these are bevelled towards the inside the active material is effectually locked within the frame, forming a solid block or cake of material in contact all over its surface with the sides and bevelled lattices. The perforations at the edges of the plate allow for expansion of this solid block, and prevent buckling. The effect of this construction is such that the completed plate is a mechanically sound article, whilst the active material cannot fall out, and is in direct contact at all points with the frame. There are consequently no pellets or discs of active material to drop between plates, whilst the excellent contact between the frame and the active material is just where it is required, namely, on and a short depth below the two surfaces. The construction of both + and − plates is similar.

It has been found from careful and lengthy tests of these accumulator cells that they will discharge at any convenient rate and can even be short circuited without harm; and, moreover, they are very free from sulphating and entirely free from buckling. The chief advantages derived from the plate are:—High capacity and discharge; mechanical strength and durability; lightness; freedom from buckling and sulphating.

These important points render this accumulator very suitable for traction purposes, and we understand it has been found from independent tests that Allan cells of standard size will give the same capacity as other cells, but at half their weight and about two-thirds their size. If this claim is substantiated by practical tests, the cell will have a great value, as it will be an ideal one for motor-cars, cabs, &c.

An accumulator which will stand the rough work and handling on motor-car work is, of course, suitable for all other purposes. The makers of the Allan accumulator are prepared to prove the capabilities of their cells by actual tests and trials, and are especially desirous of opportunities for proving their value in actual work in vehicles of every description.

CORRESPONDENCE.

**** We do not hold ourselves responsible for opinions expressed by our Correspondents.*

**** The name and address of the writer (not necessarily for publication)* MUST *in all cases accompany letters intended for insertion or containing queries.*

AUTOMOBILE CLUB BELGE.

MONSIEUR LE RÉDACTEUR,—Nous vous prions de bien vouloir insérer dans votre estimable journal le communiqué suivant:—

L'Automobile Club de Belgique vient de prendre excellente mesure qu'accueilleront avec joie tous les chauffeurs Belges; il s'agit de l'organisation d'une série d'excursions de propagande décidée par sa commission du Tourisme, excursions qui auront lieu de quinzaine en quinzaine. Les dates choisies sont:—le 20 Février, Pont de Soignes; le 6 Mars, à Tervueren; le 20 Mars, à La Hulpe, par les quatre bras. À Dimanche prochain donc, rendez-vous Place Royale, pour la première sortie à 9 heures du matin. En cas de mauvais temps l'excursion est remise au Dimanche suivant.

Veuillez agréer, Monsieur le Rédacteur, l'expression de mes sentiments distingués.

Comte F. DE VILLEGAS DE SAINT PIERRE,
Le Secrétaire Général.

[We have pleasure in publishing the above.—ED.]

THE ENLIGHTENED PRESS.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

SIR,—Noticing the usual remarks of our general Press, should they see a motor-car standing, we are much surprised to have seen no mention of a strange sight that met our view the other day in the Kennington Road; within 200 yards we noticed a four-horse 'bus, a White's ginger-beer van, and a Parcel Post van, all broken down at the same time. Surely this is of as much interest as one motor-car standing whilst its owner does business, yet not a word of this can be found in our enlightened Press.—Yours faithfully,

THE LONDON MOTOR-CAR WORKS CO. (LTD.).

Hammersmith, *February 15th*, 1898.

THE MOTOR-CAR ATTACHMENT COMPANY.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

SIR,—I hope it is not asking too much to supply me with the name of the patent, but preferably the date and number of the patent, under which the Motor-Car Attachment Company are working? Please insert your reply amongst the answers to "Motor-Car," in your next publication of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL, and you will oblige,—Yours truly,

A. MITCHELL.

Longside, Aberdeenshire, *February 10th*, 1898.

[We do not know the Company under this name, nor do we know what patents they own. All our most recent information on such matters will be found in our AUTOMOTOR POCKET BOOK.—ED.]

BRITISH MOTOR SYNDICATE AND ITS CLAIMS AS REGARDS PATENTS.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

SIR,—It is known that this Syndicate claim all controlling patents, or master patents, for petroleum engines used for propelling road carriages. It is quite possible that the broadness of the claim and the somewhat threatening advertisement in a contemporary may have prevented some firms from going in for the manufacture of motor-cars. That the greater part of these claims are groundless may be proved by any one who has time to make a search at the Patent Office.

Dalton and Kenworthy's patent, 3,467 of 1879, relates to explosion engines for tramways, locomotives, *wheeled vehicles*, canal boats. A carburettor is shown for producing petroleum vapour.

Hardaker's patent, 2,290 of 1880, relates to a small carriage driven by a gas engine, the charge being fired by an electric spark. Of course these patents have now lapsed, so it is difficult to see how the British Motor Syndicate can have the audacity to continue their threatening advertisements.—Yours, &c.,

JOHN HENRY KNIGHT.

Barfield, Farnham, *February 23th*, 1898.

[The above instances are not the only ones, we believe, of a similar character in connection with the British Motor Syndicate Patents. The current price of this Syndicate's shares, issued at £3, is a fair criterion of the real value placed upon these patents by the public. The Syndicate, however, seems to have got hold of a rather more valuable asset recently by the appropriation of the much-respected title of our JOURNAL in connection with the "Automotor" vehicles advertised to be manufactured "under special license from the British Motor Company."—ED.]

MESSRS. SIMPSON AND BODMAN'S PAPER ON STEAM ROAD VEHICLES.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

SIR,—We have been much interested in the paper written by Messrs. Simpson and Bodman and read before the Self-Propelled Traffic Association, as we perceive that there are others going through a similar course of experiments, *mutatis mutandis*, steam for oil, to those we have already been though chiefly before the new Locomotives Act came into force. All our experiments were made with oil and not with steam, but as to the means and gear for transmitting the power, as to the construction and suspension of the framing and car, the methods of steering, and the brakes, we had to encounter and solve similar problems to those described by Messrs. Simpson and Bodman in this the brief history of their troubles.

As we were probably the only firm in this country building cars before the new Act came into force (we were building in the winter of 1895), and certainly the only firm building oil motor-cars, perhaps a few observations of ours upon the paper will not be out of place. We would observe "right here" that in the use of the word oil we mean petroleum oil, not mineral spirit. The application of the word oil to the mineral spirit motor was a company promoting dodge to mislead the public. It was feared that the public would not look at a mineral spirit motor.* They knew benzoline, and had never called the benzoline lamp an oil lamp.

Messrs. Simpson and Bodman complain of the joints in their boiler giving out, we have not had any difficulty whatever in this way; joints remain as sound in our oil-motor on the cars as in the fixed oil engines. We next come to a somewhat surprising statement. "It is not much trouble to push the car a little to get right for starting." We fear that Messrs. Simpson and Bodman have another extensive series of experiments before them if they are going to take this for granted. Imagine having to get down to push your car before you can start it. This will be bad enough on the level, but suppose you had to start on a hill. Further, imagine that you are starting in the midst of dense traffic in a city—or, say, in the city.

"We were determined, at all costs, to avoid jack-in-the-box gear, which is liable to get a twist and fire, is heavy, and is not by any means efficient in transmitting the power on (*sic*) corners." We rub our eyes, and read it again and yet again. We can only suppose we have been unusually fortunate. We had thought if anything had been sufficiently demonstrated it was the efficiency and usefulness of the properly-constructed balance-gear box. We have not seen any liability to "twist or fire," our gear is very light for each size, and is perfectly efficient in all ways. The balance-gear box has, however, one disadvantage, its expense, assuming the gear is cut, and for this reason chiefly, as also for the fact that it usually requires the use of a tube surrounding the shaft to which it is attached, a substitute should be sought. The whole of that commencing paragraph on the "construction of the car and framing" shows us conclusively that Messrs. Simpson and Bodman have yet a good deal of expensive experimenting before them, but our remarks on this point might run into a paper.

* We note that your esteemed contemporary, the *Autocar*, still uses the word oil when it means benzoline or mineral spirit.

On the question of oak *versus* steel framing for parts of the vehicle we must say we have a good deal of sympathy with what Messrs. Simpson and Bodman say, although this would not be endorsed we expect by any other engineers than those who have experimented with motor-vehicles. With regard to the advantages of liquid fuel for steam boilers, we had thought this had been demonstrated by one firm at least; in any case we have made burners for kerosine that would use one gallon per hour, which were perfectly reliable, and which made but a very slight noise. Messrs. Simpson and Bodman have selected, and stand by, steam as the propelling power for motor traffic; we are, on the other hand, the advocates of oil. There will no doubt be a rivalry between the two sources of power until the time when, as we believe, oil, used in an internal combustion engine, will be so conclusively demonstrated the superior for road locomotives that steam will have no chance in the competition between the two. Messrs. Simpson and Bodman offer us a little proof for our conviction in the following paragraph:—

"The commercial points of a self-propelled vehicle that an intending user should require are, in our opinion, and as the result of careful consideration: A prime cost about equal to three and a-half times the prime cost of a horse lorry capable of moving the same load, with all its horses and appointments; a depreciation account and repair bill not exceeding 33⅓ per cent. per annum of the prime cost to keep it always in the highest condition."

We think Messrs. Simpson and Bodman's figures fairly accurate as to price of the lorry mentioned, since we are in a position to supply oil-motor lorries to carry 1 ton of goods at £350; but with the next item we think we can show Messrs. Simpson and Bodman that at the very outset of their experiments they started with a wrong assumption. In their first paragraph they say, "In deciding to confine our researches to steam as a motive power." They apparently assumed, probably not knowing much of the internal combustion engine, that the steam-engine was the more suitable power. It is our conviction that for all vehicles carrying weights up to 2 tons the steam-engine cannot compete with the oil-engine, and we will employ some of Messrs. Simpson and Bodman's figures in support of our view.

"A depreciation account and repair bill *not exceeding* 33⅓ per cent. per annum of the prime cost." 33⅓ per cent.! If it really works out like this, we fear very much for the future of steam automobilism. We allow less than half this amount, 15 per cent., and then believe it allows a margin for some accidents. As far as we can arrive at it from the figures given, the cost per ton-mile for motive power with steam is three-farthings; the cost per ton-mile with our oil-motor is only one-third of a penny. These figures include fuel, lubricant, and water only in each case.

Then, whereas the steam boiler and motor would require more or less continuous attention, the oil-motor would not require a further thought after starting for the day's run. There would, no doubt, be a more rapid depreciation of the boiler than of the oil-motor, and there would be also a certain amount of danger with the steam-boiler (especially after a few years' use), while there would be none with the oil-motor. To recapitulate briefly, on the points of running, cost, attention, depreciation, danger, handiness, and, in all probability, first cost also, we think that the advantages of the oil-motor heavily outweigh those of the steam boiler and motor.—Yours faithfully,

Roots and Venables.

Westminster Bridge Road, London, S.E.

CYLINDERS AND SHAFTS OF MOTOR-VEHICLES.

To the Editor of The Automotor and Horseless Vehicle Journal.

Sir,—Can you, through your journal, enlighten me upon the following points, viz.:—Is it true that all the most successful oil-motors have vertical cylinders? If so, what is the reason? In the Automotor and Horseless Vehicle Pocket-Book you give a formula for finding the weight of the fly-wheel rim for an oil-motor. Now, by this formula I make the weight of rim for a 5 I.H.P. or 4 B.H.P. oil-motor, 2-cylinder, at 700 R.P.M., fly-wheel 12 inches mean diameter, come to 159 lbs. But the Panhard and Levassor 4 B.H.P., at 700 R.P.M., only weighs 166 lbs. complete, and Peugeot's same power motor weighs but 198 lbs. How is this? What would be the weight of fly-wheel rim for my motor? Is a 1¼-inch steel crank-shaft large enough for above motor? You do not give any formula for crank-shafts of oil-motors in the Pocket-Book. I propose cooling the circulating water by pumping same through thin copper tubing placed under car-body. How can I arrive at the number of square feet of cooling surface required for a 5 I.H.P. motor? If you could answer the foregoing I should be greatly obliged.—Yours truly,

B. A. Payne.

Netley, Old Christchurch Road, Bournemouth.

[No; the object in fitting vertical cylinders is to save fore and aft space; but, as a rule, vertical cylinders are preferable for wear and tear and the avoidance of unequal stresses. The rule for fly-wheels is one deduced from theory and practice: it gives the least weight of a wheel necessary to avoid fluctuation in the power transmitted. The discrepancies you mention (really the agreement is very close) are due to the fact that in French practice slightly different factors in formula are employed. You may rely upon that given in the Automotor Pocket-Book as embodying the latest and best practice in gas and oil engineering. As regards the diameter of shaft, the size is ample; such a shaft, if of good steel, could transmit at 700 revs. 14 H.P. We give an excellent rule for shafts on p. 94, and on p. 93 of the Pocket-Book we give formulæ for cranks and crank-shafts. For air cooling it is difficult to give the amount of surface, as so much depends upon the surrounding temperature and the general design. You will see a description of an air-condenser in the present issue.—Ed.]

THE DAIMLER MOTOR AND WHO SUPPLY IT.

To the Editor of The Automotor and Horseless Vehicle Journal.

Dear Sir,—On reading a letter on page 185 of this month's Automotor, relative to the price of Daimler Motors, we sent the enclosed letter, addressed to Edgar Wrightson, Esq., The Nine Elms, Hinckley, Birmingham, but it was returned from the Lost Letter Office marked "Not known at Hinckley." We should be very much obliged to you if you could forward the enclosed to the writer of the letter, or, if he cannot be found, if you would permit the enclosed to appear in your next issue.—We are, yours faithfully,

Per pro The Motor-Carriage Supply Co. (Ltd.),
E. E. Lefébure, Secretary.

Donington House, Norfolk Street, Strand, London, W.C.,
February 23rd, 1898.

[Enclosure.]

Dear Sir,—We notice your letter to the Editor of The Automotor and Horseless Vehicle Journal of January 5th, inquiring where you can obtain Daimler Motor-Carriages. We therefore beg to inform you that this Company is in a position to supply Daimler Motor-vehicles of the very best quality and workmanship, and ranging in H.P. from 4 to 20. These carriages are being manufactured by the most experienced men, under the personal supervision of Herr Daimler, the original inventor of the Daimler Motor, and the workmanship is of the most reliable kind. You will find there is no firm besides ourselves who can supply Daimler Motors of 4, 6, 8, and 10 H.P. If you will tell us what type of motor-vehicle you are seeking, we shall be pleased to send you full specification and quotation as to price. We may add that our carriages will contain many of the latest improvements which have not yet been adopted in the Daimler Motor-Carriages of this country, one of the most important improvements being an automatic form of electric ignition, which requires no accumulator and no recharging, and which is absolutely certain in action.—We are, yours faithfully,

Per pro The Motor-Carriage Supply Co. (Ltd.),
E. E. Lefébure, Secretary.

A DIFFICULT PROBLEM.

To the Editor of The Automotor and Horseless Vehicle Journal.

Sir,—Messrs. Simpson and Bodman seem to have set themselves a somewhat difficult problem. They have come to the conclusion that a *short* wheel-base is necessary for steering purposes, and yet their vehicle must be sufficiently *long* to accommodate the engine, boiler, fuel and water necessary for propulsion, and at the same time leave as much room for cargo as in an ordinary horse-drawn "lorry." If you can bring yourself to adopt so grotesque a method as using more than four wheels, there is no difficulty at all; but then, of course, that idea is inadmissible—a six-wheeled van, for instance, would *look* so ridiculous. No engineer of repute would think of such a thing; he would rather bury his head in the sand like the ostrich, and say that he has decided that there *is* no automobile

industry after all! And perhaps he is right, too—until, that is, we can plan something better than merely *horseless* vehicles.—I am, &c.,
March 3rd, 1898. A. J. A.

[We are not sure that a six-wheeled vehicle is at all ridiculous, and we certainly do not believe in short wheel bases.—Ed.]

THE PYGMEE MOTOR.

To the Editor of The Automotor and Horseless Vehicle Journal.

Dear Sir, — Have just now subscribed to your Journal, through your agents, Messrs. Phillips and Ormond, Melbourne. Found a special notice in my first copy (November), with a list of contents and number of illustrations contained in each volume. However, I could not see anything of the Pygmee Motor for road carriages. Wallace Taylor states in his book, p. 147:—"The 'Pygmee' is one which, in point of efficiency, equals, if not surpasses, the Daimler Motor." Gives a very meagre account, and no illustrations showing the disposition of its parts, especially the regulating device. Would it be asking too much to give us a full account, together with illustrations of the same, in the Automotor Journal at an early date?—Yours very respectfully,

H. Austin.

Melbourne, *January 10th*, 1898.

[This is a French motor, and French makers are not at all inclined to give particulars of their machinery. We have endeavoured to obtain drawings, &c., but so far have not been successful.—Ed.]

THREE v. FOUR WHEELED CARS.

To the Editor of The Automotor and Horseless Vehicle Journal.

Sir,—It would be interesting to have some discussion as to the relative advantages of three and four wheeled motor-cars, up to a weight of 10 to 16 cwt. I am strongly in favour of three wheels. I find, however, considerable prejudice against this design. So far as my experience goes, the only disadvantage of the single front-steering wheel is in its being out of the usual wheel tracks; on very bad country roads this might have some little weight. On the other hand, the single steerer has distinct advantages, which I may tabulate as below:—

1. Simpler and cheaper construction of car.
2. Reduction of weight of car.
3. More certain and greater range of steering.
4. Less wind resistance.
5. Less road resistance.

These are all most important points in motor vehicles. In my experimental three-wheeled car I am able to run round in a circle of 5 feet 6 inches radius, being the length of wheel-base of car—that is to say, with steering wheel parallel to hind axle. This would be quite impossible with a four-wheeled car. I should, however, like to see the matter discussed in your useful columns.—Yours truly,

F. Lister.

Keighley, *March 5th*, 1898.

[We shall be glad to receive communications on this subject.—Ed.]

That Battery.—Says the *Chicago Herald*:—"The American Electric Vehicle Company, of Chicago, confirms the report that it is about to establish a factory at Dayton, O. C. E. Corrigan, manager of the Company, is at Dayton looking over the ground. Officers of the Company say they have so many advance orders they will start with 350 hands. Their horseless vehicles are operated by electric storage batteries, which have the merit of weighing only 13 lbs. as against the 40 lbs. of other systems. This battery is the invention of a Chicago man, and the Company is controlled by Chicago men, but Dayton people will be permitted to take $50,000 worth of stock." America is the country of great inventions truly. On this side if we can get a battery for an electrical cab weighing some 1,500 lbs. we think we are doing fairly well; but then we poor benighted Britishers cannot expect to keep pace with the American inventor and motor-vehicle maker. We long to see that battery which, according to the *Chicago Herald*, weighs but 13 lbs., or even 40 lbs. of "other systems." Really, we have much to learn.

PROCEEDINGS OF TECHNICAL SOCIETIES.

Mechanical Features of Electric Traction.*

(*Concluded.*)

Single-Reduction Motors.—The maturing of the design of single-reduction motors marks a distinct epoch in the construction of tramway motors. The practical experience of many years' use has proved them reliable and efficient; and they have fairly fulfilled the following essential requirements of a motor for tramways:—

1. The motor must be as light in weight as possible, having due regard to strength and simplicity in its mechanical and electrical construction.

2. It must be completely closed in, and protected from dirt, moisture, &c.

3. Its capacity must be ample, and it should be able to run continuously for at least two hours at its rated capacity, without heating beyond 90° to 135° F. It should be capable of developing at least 50 per cent. more than its rated capacity, without injurious sparking or other damage; and the starting torque must be great.

4. All the external and internal parts of the motor must be thoroughly accessible, and easily taken apart.

That motor is the best which enables the line to be worked at the lowest cost for fixed charges as well as for running expenses. The relation between weight of motor and expense of working is forcibly shown by the maintenance of way on various tramways at present working. A motor entirely protected from dirt, moisture, &c., needs far less repairs, and so diminishes the cost of working. If a motor does not keep within a certain limit of heating and sparking, renewals of parts will obviously become numerous and costly. Difficulty of access to the wearing parts means higher charges for maintenance and labour.

Gearing.—More than one reduction in gearing between armature and axle means too high speed of the armature, and consequently too great wear in the teeth. Any decrease in number of parts and bearings diminishes the cost of maintenance. Large teeth must be used, and the gearing must run in grease. Experience has proved the greater economy of steel over cast-iron gearing for tramway motors. A recent careful investigation of 66 tramways in 49 cities, using over 7,000 motors, has demonstrated that the average life of cast-iron gearing is somewhat over 30,000 miles, while that of steel gearing is nearly twice as great. Apart from the advantages of longer life and higher efficiency, there is much less danger of breakage in steel than in cast-iron gearing, and of consequent springing or breaking of shafts and frames. The teeth are cut out of a solid rim by finely made cutters of the best known shape, as determined by exhaustive experiments. Motor pinions should be made from the best hammered steel forgings, and the teeth should be formed by accurate cutters and specially designed machinery with the same care as is used in the manufacture of the gearing; and they should all undergo the same rigid inspection and tests as the gearing.

Power.—The average horse-power exerted by a tramway motor at the car wheel probably does not exceed 20 per cent. of the maximum power it is expected to exert in starting the car under the various conditions encountered. In order to get the best efficiency out of such a motor, it is necessary that its point of highest possible efficiency should coincide with the development of the power at which the greatest amount of work is to be done.

Suspension of Motors.—There are three principal ways in which the motors can be suspended from the trucks; they are known as "nose," and "side-bar," and "centre" suspension. In the first method, one end of the motor rests on the axle through its bearings, while the other is hung from the truck by a cross-bar and springs. An advantage claimed for this method is that the gearing wears more evenly. In "side-bar" suspension the weight is nearly all taken off the axles. A side frame resting entirely on springs carries the motor by two lugs, one on either side, which are so placed that the motor is suspended from its centre of gravity. This plan has not proved as successful as was anticipated; and the first, or "nose" suspension, is still much in use.

Rating of Motors.—This is rather a difficult question, because there are so many variable factors. At present nearly every manufacturer has a different method of rating, and a motor which

* Paper read at the Institution of Mechanical Engineers by Mr. Philip Dawson.

would be called 15 H.P. by one is called 30 H.P. by another. A tramway motor works intermittently, and, therefore, can exert for brief periods a much larger power than it could continuously. Motors may be rated either by the torque which when making a given number of revs. per minute they exert upon a wheel of a given diameter, that is to say, by their tractive effort; or else by the horse-power which they can develop. In both cases, however, care must be taken to state the length of time during which the motors are to exert their rated power; and also the rise of temperature permitted in that time. The General Electric Company, which is the largest manufacturing establishment in the United States, rates its motors by the torque which they can exert for one hour at the circumference either of a 30-inch or of a 33-inch wheel, at the speed for which they have been constructed, with a limiting rise in temperature of 135° F. after a run of one hour. Such a rating fairly represents the maximum conditions of ordinary working, and leaves sufficient margin to meet emergencies without injury to the motor. Instead of expressing the power of the motor by the torque, the tractive effort which the motor can give out at the normal speed may be stated. Motors may also be rated by the horse-power which they can safely give out temporarily, while they are so designed that they can run continuously at half that rated power without their temperature rising by more than 90° to 135° F. Inasmuch as all the insulation used in the construction of tramway motors is practically fireproof, they can stand a far greater amount of heating than ordinary stationary motors. It is unnecessary to go into the electrical details of the devices used for controlling the speed with tramway motors; they can now be considered practically perfect, and they are so designed mechanically that it is impossible for an attendant to make a mistake in handling them.

Power Station.—The success or failure of an electric line depends to no small extent upon the situation and design of the power station. The conditions which govern its erection are in many ways entirely different from those which have to be considered in the construction of an electric-lighting station. The load is constantly varying, and the variations are large and unexpected. Breakdowns are more serious than in electric lighting; and such precautions must be taken as will render a suspension of service practically impossible under any circumstances. In many instances the station must be in continuous operation for several consecutive days. In large American power stations certain of the engines have frequently been running for eight and ten days continuously. In Table 9 are given the sizes of engines recommended for use in power stations.

TABLE 9.—*Sizes of Engines recommended for use in Power Stations.*

Maximum Power required. I.H.P.	Number of Engines.	Power of each Engine. I.H.P.
200	2	200
400	3	200
600	3	300
1,000	3	500
1,500	4	500
2,000	4	750
5,000	6	1,000
10,000	6	2,000

In early days the engines employed were far too small and weak. At the present time dynamos for tramway work are so constructed that accidents to them are quite as rare as to the driving engines themselves. Countershafts have been abandoned as wasteful in power and useless. Large reserves of power were also provided on the earlier electric lines; this practice has been abandoned, and Table 9 shows the reserve power which should be allowed; it will be seen that a sufficient number of engines are provided to furnish the maximum horse-power required for working the line, with a surplus of one engine in reserve. With this reserve the machinery can be kept in perfect adjustment and repair, one engine being at all times stationary. In case of a breakdown, this extra engine is ready to take the place of the one disabled.

Driving.—A great diversity of opinion used to exist as to whether the engines should drive the generators by belts or ropes, or be directly coupled. The great objection advanced against direct coupling was the want of elasticity, which in the event of sudden and heavy overloading might cause a breakdown of the engine itself. It is said that belts and ropes act as a spring, and prevent sudden shocks from damaging the engine. It seems, however, to be beyond doubt that, for large stations having direct-coupled engines of 500 H.P. and upwards, slow-speed compound condensing engines, horizontal or vertical, are preferable. Direct coupling is steadily gaining ground, and should always be used for units of 100 kilowatts and upwards.

Stations should always be built as compact as possible; but space, light, and, above all, ventilation, should never be grudged in the engine room. Whether vertical or horizontal engines are adopted seems to depend primarily upon the available space; and secondly, and to a large degree, upon the fancy of the designing engineer.

Power.—Tramway work being of such a character that even in the largest stations the average load rarely exceeds two-thirds of the maximum, it becomes necessary, in order to have an economical engine, for it to be so constructed that at its most economical cut-off it will give out two-thirds of its maximum power. Thus, supposing an engine at its most economical cut off of 28 per cent. will give 350 H.P., at its maximum cut-off of 80 per cent. it will give 520 H.P. When, therefore, an engine of 350 H.P. is ordered, it is expected to be able to run at 50 per cent. overload, the generators being constructed to stand the same strain. All bearings must be of such ample dimensions as to run perfectly cool when the engine is working at 50 per cent. above its rated power.

Engines.—In consequence of the difference of conditions between a lighting and a traction station, all engine builders who have had experience in tramway work now build an entirely different kind of engine for traction from that which they supply for lighting stations, as far as dimensions and weights are concerned, as indicated in Table 10. The conditions under which a tramway engine works are if anything more onerous than those of a rolling-mill engine. A slight variation either in number of revolutions per minute or in angular velocity per revolution is of the greatest importance in a traction station, whereas it is of small importance in a rolling mill. A traction station should always be so arranged that, if the normal load be suddenly thrown on or off an engine, the speed shall not vary more than 2 per cent. In some cases a maximum variation of 1¼ and 1½ per cent. is all that is allowed. Where polyphase currents are used, constant speed is of even greater importance; and a guarantee should be required that under no circumstances shall the angular velocity during one revolution vary more than three-quarters of 1 per cent., and in some cases not more than half of 1 per cent. With heavy fly-wheels, and governors properly designed for tramway work, especially when the governors are of the fly-wheel kind, it is quite practicable to fulfil the above conditions. A shaft governor is undoubtedly far more satisfactory in every way than any ball governor driven by belt or gearing from the engine shaft.

TABLE 10.—*Comparative Weights of Engines for Lighting and for Traction.*

Power of Engine.	Weight of Engine. For Lighting.	For Traction.	Difference.
I.H.P.	lbs. tons.	lbs. tons.	lbs. tons.
90	13,000 = 5·8	15,000 = 6·7	2,000 = 0·9
115	15,000 = 6·7	17,000 = 7·6	2,000 = 0·9
140	21,000 = 9·4	23,500 = 10·5	2,500 = 1·1
215	33,000 = 14·8	37,000 = 16·6	4,000 = 1·8
325	46,000 = 20·5	50,000 = 22·3	4,000 = 1·8
400	53,000 = 23·7	58,000 = 25·9	5,000 = 2·2
500	74,000 = 33·0	80,000 = 35·7	6,000 = 2·7

Governing.—During the last few years there have been several fly-wheel accidents in tramway stations in America. Respecting these accidents and fly-wheels in general, more is said later on. Most fly-wheel accidents have occurred with engines employing a releasing valve gear and a delicate ball governor. When the load is suddenly thrown off, and when they have to work with no load and a vacuum, ball governors are too uncertain. They generally act; but occasionally the valve gear, owing to wear or bad adjustment, prevents the engine from controlling itself. To obviate this, a second governor is put in engines of this class, which governs some 10 revolutions slower than the main governor, and which, when it exceeds the speed it is set for, causes a stop-valve to trip, whereby the steam is entirely shut off from the engine. This seems to be an admission that such engines are liable to run away. With powerful shaft governors connected directly to the cut-off valves hy means of positive mechanism it is impossible for engines to run away.

Tahle 11 gives the standard dimensions of bearings and fly-wheels and the weights of typical engines now successfully working large tramway stations. Tho first two examples are engines with fly-wheel governors; the smaller engines are fitted with single or double piston valves, and the larger with gridiron valves. In small engines tbe governor acts only on the high-pressure cylinder, hut in large engines it is so arranged as to act on both cylinders. Table 12 gives tbe dimensions of some standard Continental engines, most of which are driving rolling mills. On comparing the dimensions of the bearings in this tahle with those of the tramway engines, it will be seen that the ratio of the length of the bearing to its diameter in the tramway engines is generally somewhere near 2 to 1 (Tahle 11), whereas in the engines not designed for tramway work it is nearer 1¼ to 1 (Table 12). The main bearings are usually provided with cylindrical shells, which can be taken out by simply jacking up the shaft to take the weight off tbe bearings. The shells are made hollow for water circulation, which can be used in case the bearings should heat from dirt or other cause; by this means the engine can he enabled to complete its run.

TABLE 11.—*Weights of Engines and Fly-wheels for Electric Traction.*

Description of governor	Fly-wheel governor.				
Power of engine—					
At economical load ...	I.H.P.	583	1,070	500	800
Maximum	I.H.P.	911	1,650	1,000	1,600
Weight of engine	lbs.	106,000	177,000	166,000	325,000
	tons	47·4	79·0	83·1	145·0
Fly-wheel—					
Diameter	feet	11	15	15	20
Weight	lbs.	25,000	45,000	60,000	100,000
	tons	11·2	20·1	26·6	41·6
Bearings—					
Diameter	inches	13	15	18	20
Length	inches	25	30	31	36
Ratio of length to diameter of bearings ...		1·92	2·00	1·89	1·80

TABLE 12.—*Proportions of Bearings in Rolling-Mill and other Continental Engines.*

Cylinder—								
Diameter	ins.	17·7	23·3	23·6 35·4	23·6 39·3	25·6	27·5	49·2
Stroke...	ins.	27½	43	41	39	25½	39	49
Revolutions per minute	revs.	66	75	60	120	105	100	85
Bearings—								
Diameter	ins.	6·7	12·6	8·6	9·8	9·6	10·2	17·1
Length	ins.	10·3	24·4	14·2	14·5	15·7	16·3	23·6
Ratio of length to diameter of bearings...		1·61	1·93	1·65	1·48	1·63	1·32	1·48

Mean ratio of length to diameter of bearings, 1·63.

TABLE 13.—*Tests of Pratt Street Electric-Power Station, City and Suburban Railway, Baltimore.*

—	Date of Test, 1695.				
	August 14.	August 16.	August 17.	August 21.	Average.
Average I.H.P. for 20 hours ...	1,860	1,873	1,773	2,000	1,876·5
„ E.H.P. „ „ ...	1,395·5	1,405	1,330	1,499	1,407·4
Coal used, total ... ... lbs.	75,678	70,885	72,835	74,511	73,490
„ per I.H.P. per hour, engines only lb.	1·83	1·70	1·85	1·67	1·76
„ per I.H.P. per hour, other machinery lb.	0·20	0·19	0·21	0·19	0·20
„ per I.H.P. per hour, entire station lbs.	2·03	1·69	2·06	1·86	1·96
„ per E.H.P. per hour, entire station lbs.	2·71	2·52	2·74	2·48	2·61

COAL CONSUMPTION.—The above consumptions are based on the total amount of coal actually used in the station for the above electric output, no deductions being made for ash, clinker, or moisture.

LOAD.—The heaviest load was 781 I.H.P., the lightest 366, and the average during four hours 553 I.H.P.

GENERATORS.—Four 500 kilowatt by General Electric Company, of 670 E.H.P. each, making 2,680 E.H.P.; and one 200 kilowatt, of 268 E.H.P.; total, 2,948 E.H.P.

BOILERS.—Campbell and Zell water-tube, four sets of 700 H.P., making 2,800 H.P. total.

ENGINES.—Four compound by McIntosh and Seymour, cylinders 20 and 36 inches diameter by 36 inches stroke, of 750 economical I.H.P. each, making 3,000 I.H.P.; one compound by same makers, cylinders 15 and 23 inches diameter by 17 inches stroke, of 250 economical I.H.P.; stoker, hoisting and conveying engines of 50 I.H.P.; total, 3,300 I.H.P.

Two Blake vertical twin air-pumps and condensers, each 1,800 H.P. capacity, making 3,600 H.P.; one horizontal ditto, 250 H.P.; total, 3,850 H.P. capacity.

Two Blake duplex feed-pumps, 14 and 8½ inches diameter by 12 inches stroke, each 2,800 H.P. capacity, making 5,600 H.P.; two combined pumps and receivers, 6 and 4½ inches diameter by 7 inches stroke, each 4,500 H.P capacity, making 9,000 H.P.; total, 14,600 H.P.

Hunt's coal and ash conveying apparatus. Roney mechanical stokers.

Tests.—Table 13 gives the results of tests recently made in a largo American station. There are four tandem compound condensing engines—bigh-pressure cylinder, 20 inches diameter; low-pressure, 36 inches; stroke, 36 inches; initial pressure, 125 lbs. per square inch; economical cut off, $\frac{5}{18}$ of stroke in high-pressure cylinder; vacuum, 24 inches of mercury; revolutions, 103 per minute. These four engines each drive by belt a 500 kilowatt generator; and there is one direct-coupled engine, with cylinders 15 and 23 inches diameter, and 17 inches stroke, driving a 200 kilowatt generator. The results may he considered highly satisfactory. Practically the minimum coal consumption is 1·67 lbs. per I.H.P., and 2·48 lbs. per E.H.P. at the switchboard. It therefore appears safe in a well-designed and fairly large station to estimate the coal consumption per I.H.P. at 2 lbs., and per E.H.P. at not more than 2·66 lbs., so that the coal consumption per Board of Trade unit will not exceed 3·3 lbs.

Fly-wheels.—The use of fly-wbeels in electric traction stations is important. Owing to the need of keeping the angular velocity as constant as possible, especially in large stations where, owing to Board of Trade regulations, polyphase transmissions become a necessity, the fly-wheels have to be much heavier tban for ordinary lighting work. The strains they may be called upon to bear occasionally are enormous. The dynamos for tramway work are now constructed with such an amount of copper, and with such fire-proof insulation, that they can stand short-circuiting without serious damage. Circuit-breakers are, of course, supplied, and are generally prompt in action; hut it may happen, and has occasionally occurred, that something goes wrong witb the circuit-breaker, and it will not immediately break the line when a sbort circuit occurs. It may therefore happen that an engine may be practically stopped dead, and enormous strains may thus be put on the fly-wbeel. Moreover, the moment the fly-wheel has stopped, the circuit-breaker may happen to act, and the full power behind the piston may be applied to rotate the wheel, thereby again subjecting it to great strains. The utmost care has therefore to be taken in the design of fly-wheels. Accidents cause terrific havoc, and as far as the damage done is concerned are nearly as bad as boiler explosions, if not worse. In America the circumferential speeds allowed, even with cast-iron wheels, are much in excess of those to be met with in this country or on the Continent; over 90 feet per second is frequently allowed, as seen from some of the tables, whereas in English practice it is not considered safe to go beyond 80 feet. This may possibly be owing to the better quality of cast-iron in America.

Fly-wheels built up of rolled plates, and constructed more like a boiler or a bridge, have been adopted to some extent in electric tramway stations in America. These built-up wbeels generally have a cast-iron centre or hub, with brackets to which tbo armature is bolted, so as to take some of the strain off the two keys that hold the armature on the sbaft. To the centre of the hub are connected segmental web-plates, extending to the extreme outside diameter of tbe wheel. The plates are faced along their edges, so as to form a good joint. Outside of these segments are two circular plates, bolted through each segment and through both plate and hub. The segments are generally braced by truss pieces, held in the centre by cross bolts which act as struts. Outside tbe web plates surrounding the rim is a strip riveted through the rim; and outside of this is a second strip also riveted through. The rims of these wheels are usually turned down after the wheels have heen riveted up and fixed on the shaft.

Accidents to fly-wheels may generally be attributed to three chief causes:—Firstly, poor castings or internal strains; secondly, faulty design and construction; thirdly, excessive speed. In designing a fly-wheel it is easy to calculate its parts so that it shall be perfectly safe to bring it to a standstill within a given angle. Investigation of some of the best fly-wheels for tramway stations shows that their design permits of their being stopped in less than one revolution, with factors of safety varying from 17 to 18.

Generators.—The kind of generator to be used for electric traction is an important question. As in the case of the engines, tramway generators (Table 14) must stand heavy overloading without damage. Moreover, as one pole is earthed, the greatest care must be taken that the best insulation is used throughout. Since the loads to which they are subject are extremely variable, dynamos as usually constructed for lighting work would require the position of their brushes to be constantly altered. To obviate this, heavy magnetic inductions are allowed for in designing tramway generators, thus rendering it unnecessary to shift the brushes, and also avoiding sparking. It is the universal and best practice to use toothed armatures in tramway work.

TABLE 14.—*Electric Tramway Generators.*

Rated Power.	Total Weight of Generator.	Diameter of Shaft.	Armature. Diameter.	Armature. Weight.	Number of Poles.	Revolutions per Minute.	Commercial Efficiency. Full load.	Commercial Efficiency. Half load.	Commercial Efficiency. Quarter load.
Kilowatts.	lbs. tons.	inches.	inches.	lbs. tons.			per cent.	per cent.	per cent.
150	13,100 = 5·8	7 to 9	45	6,000 = 2·7	6	200	93½	92½	89
225	37,000 = 16·5	9 to 11½	59½	14,520 = 6·5	6	120	93¾	93	89½
	24,300 = 15·3	9 to 11½	59½	13,920 = 6·2	6	150			
	21,000 = 9·4	9 to 10½	45	7,000 = 3·1	6	200			
300	60,400 = 27·0	14 to 16	59½	20,720 = 9·3	6	100	94	93	89½
	43,000 = 19·6	14 to 16	59½	16,650 = 7·5	6	150			
	39,100 = 17·4	14 to 16	59½	15,500 = 6·9	6	200			
400	74,250 = 33·1	15 to 18	72	31,480 = 14·0	8	80	94	93	89½
	71,440 = 31·9	15 to 18	72	30,580 = 13·6	8	100			
	64,300 = 28·8	15 to 18	72	28,740 = 12·8	8	120			
	59,700 = 26·6	14 to 16	65½	24,900 = 11·1	6	150			
500	87,100 = 38·9	16 to 18	88½	35,800 = 16·0	10	75	94	93	89½
	76,000 = 34·0	16 to 18	88½	32,000 = 14·1	10	90			
	71,300 = 31·8	16 to 18	88½	30,500 = 13·6	10	100			
	64,300 = 28·8	16 to 18	88½	27,100 = 12·1	10	125			
800	110,000 = 49·1	19 to 22	94½	49,440 = 22·1	10	80	94½	93½	90
	100,900 = 45·0	19 to 22	94½	45,520 = 20·3	10	100			
	94,400 = 42·2	19 to 22	94½	41,170 = 18·4	10	120			
1,300	158,930 = 71·0	21 to 27	126	69,910 = 31·2	12	80	95	94	90½
1,500	163,200 = 72·5	24 to 27	126	73,100 = 32·6	12	75	95	94	90½
250	40,000 = 17·8	12 to 14	60	15,000 = 6·7		100			
400	60,000 = 26·8	16 to 19	75	25,000 = 11·2		90 to 100			
500	90,000 = 40·0	18 to 21	80	30,000 = 13·4		90			
800	125,000 = 55·8	21 to 23	90	40,000 = 17·8		80 to 90			
1,200	195,000 = 87·1	23 to 25	115	65,000 = 29·0		80			
1,500	240,000 = 107·0	24 to 27	130	70,000 = 31·3		75			

As to the kind of field winding which should be adopted, it would seem from tests made on a large scale with separately excited shunt-wound, and compound-wound machines, that the best suited to tramway work from every point of view is the over-compounded generator. The usual pressure of current employed on trolley lines is 500 volts; and for this tension dynamos are so designed that the pressure between their terminals is 500 volts at no load, and is increased to 550 volts when the full load comes on. The over-compounding can be regulated up to 10 per cent. by varying a German-silver shunt placed on the series coil.

Automobilism on Roads.*

(*Continued from p.* 196.)

Some evidence of this is given by an examination of a London granite macadam road when it is broken up for any purpose. Down to a depth of several inches it will be found that the once sharply angular stones have all been more or less rounded by the rubbing together of the adjacent pieces before they became fixed by the crumbled and pressed material from the corners of every other surrounding piece. This process commences with the steam-rolling of the large stuff tipped and levelled with the shovel. If the progress of a heavy roller be watched, a wave of the road material immediately in front of the rollers will be seen, a wave which gradually lessens as the rolling approaches completion, but which is there to the end, and is formed in both backward and forward travel. In this way not only does the road-metal get its corners rubbed off, but there is more or less regular recurrence of harder and softer places formed by the recurrent surmounting of the wave. The really good road surface cannot be made in this way, and an illustration of the reason may be given by a reference to what would happen if a similar process were adopted with a heap of loaf sugar. If a large box of broken loaf sugar were put under a heavy roller to make a level hard surface, an irregular hard and soft surface would be obtained, with a sub-surface of crushed lumps. If, however, every piece were carefully packed, a very little or no rolling would be necessary. Now, although packing by hand, like laying of small bricks, cannot perhaps be indulged in in macadam road-making, the packing should be done, and I believe can be done by apparatus not at all difficult to devise.

Of the third very desirable improvement in our roads it is impossible in this address to do more than call attention to the vast saving that might be made in work done and wasted, in time lost, and in avoidable accidents, by the profitable employment of capital in reducing the hill gradients, and in making up the roads across hollows.

As an example of this class of work reference may be made to the proposed new road through the Sty Head Pass from Borrowdale to Wasdale. Here a new road is to be made according to the plans of Mr. G. J. Bell, which will reduce the gradient of 5¼ to 1 of the pony road hitherto used to 1 in 20 one side of the summit, and 1 in 12 the most on the other; that is to say, the power of every pony or horse will be more than treble, as between Wast Water and the Sty Head, and more than doubled on the Borrowdale side. In this case a certain summit 1,578·6 feet above datum has to be reached from starting point at 264 feet, and the length of the road has to be increased from 4·3 to 7·88 miles, but the time taken with the doubled or trebled load will only be about the same. The road is to be 18 feet wide, and the whole cost will be only £10,000, or about £1,260 per mile. This is an extreme case, a rise of over 1,300 feet being made under five miles. In many cases, however, the road improvement will be made by taking the top off the hill, going through it or round it, not necessarily surmounting it, and while the gradient will not often be improved by so large a reduction, the length of the road will, on the other hand, not be increased.

The capital expenditure on the Sty Head road will only represent a yearly charge of, say, £350, and for this a good safe road is obtained, the transporting power of every horse is doubled, and safety is exchanged for many dangers. Either less than half the horses will be necessary, or more than double the passengers or baggage can be carried. Assume that four one-horse journeys each way are made per day for six months of the year, we have, for only six days per week, 1,296 journeys. To this addition to the horse's journeys or to his load must be added the numerous profits arising from the doubled power of transport, and when these are put together it will be obvious that the inhabitants will reap a handsome return for the money expended.

This is only a small example of the kind of work which could be carried out in many main and secondary roads all over the country. Many of the Kent hill roads, for example, might, with the greatest advantage to the ratepayers, be put into the hands of the engineers, as in days gone by the roads of the north were put into those of Telford. Small detours and small cuttings and banks, which in these days can be carried out by mechanical means at small cost, would in many cases cheat gravity of half of its natural aid to high rates for cartage. The hills of the 100,000 miles of road in this country not only cost us an enormous sum every year to surmount, but they put the most effective stop on the cheapening of road transit of goods between railway stations, villages, and agricultural districts.

The days are past when the natural highways were looked upon as only of importance to those who used them. Everything that can be done to make haulage on the roads easier and cheaper, cheapens commodities partly by the reduced number of horses necessary or by the use of mechanical road vehicles, and partly by saving of time, which is equally valuable. We have arrived now at a time when it is seen that the great railway system which has

* Excerpt from the inaugural address delivered by Mr. WORBY BEAUMONT, M.I.C.E., M.I.M.E., &c., before the Society of Engineers, London, on February 7th.

done so much for us has its limits with regard to distribution, and we see now the common high road must again receive the attention which for some years was given to it in the early part of this century under Telford and others. The extensive employment of engineers must again be resorted to for the planning of new and the improvement of existing roads, and the mechanical aid to road transport, which was spurned when railways were growing up everywhere and promising everything, must now be taken into service.

If we are to have the advantages of cheap and rapid transit between the hard and fast points of railway service we must have mechanical power on the roads. Already the importance of this is recognised, but it is necessary to point out that to secure the great possible advantages of this we must have not only the mechanically propelled vehicles and the roads suitable for their working, but that these very road improvements are as desirable for the horse-propelled vehicles.

Over many miles of suburban and country roads the construction of really well-made macadam roads, with wheel ways at the sides, will make a splendid national investment. The better the road the longer it lasts, the less the time lost by stoppages of traffic for heavy repairs, the greater the average speed of travelling of goods and passengers.

The haulage resistance on well-finished macadam roads is less than half that on a badly-made road of the same kind. This means more than the old fact that one horse would do the work now done by two, and do it quicker. With the improvement of the worst gradient, one horse could in many parts do the work now done by three, for it happens frequently that the full power of the two or three horses of a team is only required for a fraction of the whole road traversed. Further than this, it means that the mechanically-propelled vehicle could do with either less than half the steam-engine power now necessary, or could carry much greater loads, and the average speed would be greatly increased without making any addition to the full speed. In fact the maximum speed could be reduced, and a higher average speed attained.

With the improved roads the cost of fuel either as horse feed or as coal or oil, would be enormously reduced, especially in the case of horses, and the distance traversed by mechanical road vehicles with one supply of fuel and water would be proportionally increased. The reduction of cost in this respect is comparable with that of locomotives on the railways as against that by horses, but not equal to it in every respect.

When stage and mail coaches were employed the allowance of horses was a horse per mile of double coach road. Now see what this means on the London and Birmingham road. The distance is 113 miles, which would require 56 horses per coach for the single journey. These horses would consume about 28 lbs. of food per day each, so that for the journey from London to Birmingham 14 cwt. of food would be consumed in order to convey at most 14 passengers, or 1 cwt. per passenger. This food at the present day would cost not less than 5*s*., so that the cost for food fuel alone for, say, the 500 passengers (which a locomotive of to-day would take) would be £125, and it would weigh 25 tons. The locomotive takes the 500 passengers for about 1·8 tons of coal, or about 8 lbs. per passenger instead of 112 lbs. The coach carried a passenger for about 35*s*. of the then value, and the engine does it for 9*s*. 5*d*. present value.

To take the 500 passengers to-day it would have required 35 or 36 coaches and 2,000 horses, and they would do the journey in 11 hours, while a 700-horse engine does the distance in 2¼ hours. Thus the passenger does the journey in less than quarter the time and quarter the cost, and for a visit for a few hours he saves the cost of staying a night at an hotel, saves the cost of about nine hours' travelling refreshments, and saves the value of at least a day of his time. Thus one train carrying 500 passengers saves over a year and a half of working days.

For each 20 travellers a ton of food had to be carted for the horses, while at the present time each passenger could carry the necessary coal in his pocket to take him the journey. The time saved is one of the greatest of all, and, although we do not always remember this, it is one of the several ways in which the steam-engine has more than doubled the money-earning capacity of men who do much travelling, and has increased the earning power of all.

(*To be concluded.*)

NEW INVENTIONS.

Claiming particularly to apply directly or indirectly to Motor Vehicles, &c.

Compiled for "THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL" by HERBERT HADDAN and Co., Registered Patent Agents, of 18, Buckingham Street, Strand, W.C., London.

Patents Applied For.

Abbreviations: Impts., Improvements in; Relg., Relating to.

1898.

Feb. 1. 2,521. J. T. ELLIS. Impts. motor, &c., cycles.
,, 1. 2,538. W. WILKINSON and L. W. HOLMES. Electrical propulsion of road vehicles.
,, 2. 2,641. R. HILDICK. Impts. cycles and motor-cars.
,, 2. 2,687. W. C. NANGLE. Impts. propelling apparatus.
,, 2. 2,705. J. V. PUGH and H. I. PEDLEY. Impts. joints for tubes.
,, 4. 2,837. R. F. DALZIEL. Sprocket-wheel attachment and crank axle.
,, 4. 2,838. R. HYDE. Impts. motor-cars and power-driven vehicles.
,, 4. 2,910. H. HAMELLE. Impts. lubricators for motor-vehicles.
,, 4. 2,983. A. J. ASHMORE. Safety device for motor-cycles, &c.
,, 7. 3,072. F. W. MEDWAY. Impts. mudguards for motor-vehicles.
,, 8. 3,134. K. EDGE. Improved motor and apparatus therefor.
,, 9. 3,307. A. HERSCHBERG. Impts. motors.
,, 10. 3,383. C. H. HALL. Impts. mudguard bridges.
,, 12. 3,586. H. JUNGE. Impts. reltg. to motor-carriages.
,, 14. 3,627. E. MIGNOT. Impts. autocars.
,, 16. 3,922. N. P. THEAUDER. Impts. driving chains and chain-wheels.
,, 17. 3,991. A. J. BOULT. Impts. reltg. to carburetters for internal combustion engines.
,, 17. 4,013. W. HURLEY. Adjusting driving chains of cycles and motor-vehicles.
,, 18. 4,053. H. AUSTIN. Impts. gears for motor-cars, &c.
,, 18. 4,105. F. R. SIMMS. Impts. connected with motor tricycles and carriages.
,, 22. 4,458. H. W. DOVER and P. PHIPPS. Impts. in joints for frames.
,, 23. 4,473. J. E. WALLIS. Impts. condensers for motor-vehicles.
,, 23. 4,488. W. SIMPSON, W. L. BODMAN, and D. H. SIMPSON. Improved clutch arrangement.
,, 23. 4,498. C. M. JOHNSON. Motor-car.
,, 23. 4,517. G. E. MINTON. Impts. tubular frames.
,, 25. 4,677. E. TAYLOR. Impts. jointing frames.
,, 26. 4,813. A. F. SPOONER (C. LENO and J. HENRY). Impts. reltg. transmission gear.
,, 28. 4,842. J. S. LEGGE. A new motive power for motor-cars, &c.
,, 28. 4,853. W. C. PINSON. Impts. jointing frames.
,, 28. 5,100. A. B. de BOUVAUD. Impts. rotary motors.

Specifications Published.

THE following is a List of Specifications recently published, and obtainable at the Patent Office, 25, Southampton Buildings, London, W.C., at the uniform charge of 8*d*. per copy. Owing to the enormous pressure upon our columns it has been found impossible to deal in any other form with the accumulation of patents now being taken out in connection with automobilism. As far as possible, a selection for special mention is made by the Editor from the more prominent inventions:—

Applied for during 1896.

27,368. R. WADSWORTH, Sanitary Implement Works, Thomas Street, Halifax, Yorks. Motor road-sweeping, watering, &c., vans.

27,603. Major H. C. L. HOLDEN, Royal Arsenal, Woolwich. Construction of internal combustion engines in combination with cycles or carriages.

28,833. J. RIDGE, T. MUTTON, and H. E. HUPTON, 84½, Kings Road, Brighton. Gearing.

28,850. H. LANE, Corporation Street, Birmingham. Method of and apparatus for applying motive power to vehicles running on ordinary roads.

29,269. F. J. GIBBS and W. WRIGHT, 70, Lower Hurst Street, Birmingham. Pneumatic tyres.

28,585. MILLS. Hubs for wheels.

30,145. E. ARCHDEACON, 12, Rue du Ranelagh, Paris. Driving gear.

28,192. H. R. GILLING, Oaklands, Arkley, Barnet, Herts. Pneumatic spring arrangements.

28,400. THOMPSON (J. Dulait), Charleroi, Belgium. Electrically-propelled motor road-vehicles.

28,422. W. T. SHAW, L. W. BOOTHROYD, and A. SYDENHAM, 29, Clerkenwell Road, London. Driving gear.

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CONTENTS.

MOTOR DUST-CARTS FOR CHELSEA.

THE Chelsea Vestry lately instructed their surveyor, Mr. T. W. Higgins, Assoc. M.I.C.E., to report upon the advisability of utilising motor vehicles for the collection of house and street refuse. This gentleman has reported at considerable length upon the subject. After some elementary remarks upon automobilism and means of obtaining the motive power, he says:—

In order to obtain the necessary estimates I wrote to 11 firms asking if they were prepared to submit estimates to the Vestry for motor dust-vans. These vans I specified were each to contain 6 cubic yards of refuse which would not weigh more than 4 tons, they were to be worked in accordance with the Locomotives on Highways Act of 1896; and would be required to tip the refuse over a shoot.

From the replies I received it seems evident that a vehicle of the size I specified is rather beyond the capacity of the ordinary electric-motor or oil-engine.

There do not at present seem to be any firms making electrically-driven cars of the size we require. The makers of electric motor-cars seem to be directing their attention more to light passenger vehicles than to heavy vans for business purposes.

The Daimler Motor Company and the Great Horseless Carriage Company, of Coventry, both makers of oil-motors, write that at present they are unable to quote for so large and heavy a type of car as would be required for the purpose we have in view.

Messrs. Roots and Venables, of Westminster Bridge Road, will build a dust-van driven by an oil-motor of 6 H.P. geared to run at any speed not exceeding 6 miles an hour, and capable of carrying a load of 1½ tons, for £375. The engine would be driven by ordinary paraffin, and the cost of fuel would be less than 3*d*. per hour. This van is, I think, too light for the work required. If a van of larger capacity is used the time spent in travelling backwards and forwards to the wharf to tip will be reduced by one half.

Five firms have submitted estimates and specifications for steam motor-vans, viz.:—

(1) The Lancashire Steam Motor Company, of Leyland.
(2) Messrs. T. Coulthard and Co., of Preston.
(3) Messrs. Toward and Co., of Newcastle-on-Tyne.
(4) The Liquid Fuel Engineering Company, of East Cowes.
(5) The Steam Carriage and Wagon Company, of Chiswick.

The prices of their motor-vans and the description of machinery to be used are as follows:—

(1) The Lancashire Steam Motor Company, of Leyland, will build a steam motor dust-van for £320. The tip van to carry 6 cubic yards of dust, the weight of dust not to exceed 4 tons. The body of the van to be made of ash supported with ironwork. The underframe to be channel steel filled up with oak. The engine and boiler to be placed alongside the driver's seat within a covered shelter for the driver. The engine to be a compound steam-engine of about 14½ H.P., to give a speed of 4 miles an hour; and the boiler to be composed of patent copper conical tubes, and to work at 200 lbs. to the square inch.

The firing is done by a patent automatic oil-firing apparatus which keeps the working pressure steady; it is quite independent of the driver's attention after he has once lighted the burner. The consumption of oil does not exceed two gallons per hour when in full work. The commonest paraffin oil is used.

The Lancashire Steam Motor Company are the makers of steam road vehicles and lawn mowers.

(2) Messrs. T. Coulthard and Co., of Preston, will build a steam motor dust-van for £340; if the 12 vans are ordered at the same time there will be a reduction of 5 per cent. The tip van is to carry 6 cubic yards of dust, the weight of dust not to exceed 4 tons.

The effective H.P. of the engine is to be under ordinary conditions 9 H.P., but when high pressure steam is used in both cylinders

18 H.P. A patent distribution valve will be used which will admit of the steam being regulated between "no load" and "full load," the whole operation being performed with one lever. The engine is fully protected from dust and can easily be cleaned. The boiler is of the water-tube type, oil fired, all the tubes are straight and accessible.

The tip van is to be built by the Gloucester Carriage Company, and is to be provided with their patent tipping gear.

The engine and boiler will be placed alongside the driver's seat, and the driver will be protected by a covered shelter. The consumption of oil—ordinary lamp oil—will be less than 15 gallons during the day's work.

Messrs. Coulthard and Co. have a van in use at Preston which is used for carrying coal and heavy goods.

(3) Messrs. Toward and Co., of Newcastle-on-Tyne, will build one steam motor dust-van for £430. The engine and boiler would be placed under and alongside the driver's seat within a covered shelter. The engine would be a compound steam-engine, fired with coal or coke, having an intermediate shaft geared for 5 and 3 miles per hour. The road wheels would be of steel with iron tyres.

The tip van is to contain about 6 cubic yards, the weight of dust not to exceed 4 tons.

The approximate cost of working, according to the makers, would probably be:—

Driver	20s. to 25s.	per week.
Coke or coal	5s. to 6s.	,,
Waste stores	3s. to 4s.	,,
Total	28s. to 35s.	,,

Messrs. Toward and Co. have built a steam-driven parcels van, which is now in use in the North.

(4) The Liquid Fuel Engineering Company, East Cowes, Isle of Wight, will build a steam motor dust-van for £525, but if the order is given for three vans at the same time the price to be £475. The tip van is to carry 6 yards of dust or from 3 to 5 tons of rubbish. It is to be built of suitable seasoned wood, the frames to be of best channel iron. The engine and boiler to be placed in front of the van. The engine to be a compound steam-engine, and the vehicle is to have a speed of from 5 to 6 miles an hour, the boiler to be of the water-tube pattern, ordinary paraffin oil to be burnt, and the firing is automatically regulated by means of the steam pressure in the boiler. The van is fitted with a steam ejector, whereby dust-bins could be steamed out.

The Liquid Fuel Engineering Company are the makers of the steam motor road train which runs between Circencester and Fairford.

(5) The Steam Carriage and Wagon Company (Limited), of Chiswick, will build a steam motor dust-van for £668. The tip van is to contain 6 cubic yards of dust, and will carry a load of 3 tons up an incline of 1 in 20 on ordinary macadam roads.

The main framing is to be of steel, as also are the wheels. The engine and boiler will be placed alongside the driver's seat and will be protected by a covered shelter. The boiler will be of the Thornycroft water-tube type, with special arrangements for the control of steam and silent blowing safety-valve; the engine, a compound reversing one, being enclosed in a dust-proof and oil-tight casing.

The Steam Carriage and Wagon Company are the makers of the two motor dust-vans now in use at Chiswick, which collect an average of 20 cubic yards of refuse per day with a consumption of 2 cwt. of steam coal.

The prices of these vehicles vary considerably, and an inspection of the plans and specifications submitted does not show sufficient reason for such a difference, but the two lowest estimates are very close. A sum of £320 or £340 is not much to pay for a motor-van of this capacity, and if a thoroughly reliable motor can be obtained at that price I think the Vestry would be wise in purchasing one on the understanding that if it worked to their satisfaction for six months they would obtain more motor-vans from the same maker.

The Vestry's resolution suggested 12 for the home district and three for Kensal Town, but I consider that at present 10 for the Home District and two for Kensal Town would be all that would be required, as each motor-van would do the work of two ordinary dust-carts, probably more, but how much more could only be ascertained by actual trial of a motor-van.

The cost of a motor-van compared with two dust carts and horses would be:—

Motor Van.

	£	s.	d.
Capital expenditure	320	0	0
Annual expenditure—			
Driver's wages, 35s. per week	1	15	0
Two dustmen, 25s. ditto	2	10	0
Fuel, water, &c.	2	0	0
Per week	£6	5	0
£6 5s. for 52 weeks = per annum	325	0	0
10 per cent. for depreciation, &c., say ..	32	10	0
	£357	10	0

Two Dust-Vans and Horses.

	£	s.	d.
Capital expenditure—			
Two horses at £70	140	0	0
Two dust-vans at £50	100	0	0
	£240	0	0
Annual expenditure—			
Driver's wages, two at 28s. per week ..	2	16	0
Two dustmen at 25s. ditto	2	10	0
Fodder, &c., two horses at 16s. per week ..	1	12	0
Per week	£6	18	0
£6 18s. for 52 weeks = per annum	358	16	0
Depreciation at 5 per cent.	12	0	0
	£370	16	0

The above shows that though the capital expenditure would be about £80 more for a motor-van than two horse-driven ones, yet the annual expenditure on the former is sufficiently low to more than repay the interest on the extra money borrowed to pay capital expenditure on the motor-van.

The annual expenditure on the motor-van would probably be about £12 or £13 less than for the horse-driven dust-vans, and if 12 were obtained the saving would be about £150, that is if each motor only did the work of two dust-vans. I think, however, it would do more. Besides, there is always the risk of a valuable horse dying. In looking through the annual report of an adjoining parish I find that out of a stud of 112 horses, six died or were killed during the year. One worth £80 only worked one month, another worth £74 three months, the others worked 3, 4, 4½, and 6 years respectively. An engine can be repaired and its interior renewed; a horse, however, goes to the knackers or the zoological gardens to feed the lions when any portion of his vital machinery goes wrong.

In conclusion, I consider that the offer of the Lancashire Steam Motor Company for a motor dust-van to cost £320, and that of Messrs. Coulthard and Co. to cost £340, deserve the careful consideration of the Vestry, but I cannot go so far as to actually recommend either of the two firms until I have seen their vehicles at work so as to satisfy myself that their arrangements for burning liquid fuel are quite satisfactory.

[The above report is useful and instructive as far as it goes. Mr. Higgins does not, however, adequately demonstrate the superior economy of the motor-vehicle. By the aid of Kelvin's "Law of Economy,"* we can determine this very exactly on the assumption that one motor dust-cart can replace two horse-propelled carts, and that the figures given above are accurate. This law tells us that "*the most economical design in any case is that in which the annual interest on the cost of an increment of material is equal to the saving in annual expenses which results from that increment.*" We then have:—

Two horse-propelled carts, cost	£240
One motor-cart, cost	320
Increment of capital	£80
Interest on, at 5 per cent. per annum	£4

* *Vide* Automotor and Horseless Vehicle Journal, Vol. II, October, 1897.

Annual cost of working two horse-propelled carts	£371
Annual cost of working one motor	357·5
Saving in annual expenses by employing motor-cart	£13·5

Inasmuch then as £13·5 is greater than £4 the economy is also very great, but assuming again that the motor-cart has a larger capacity, *i.e.*, it can perform more work in a given time than two ordinary horse-propelled carts, the economical advantage is still greater.—Ed.]

THE OPPERMANN VICTORIA.

Electric traction for vehicles plying in city and suburban districts has at length emerged from the region of experiment, and is now a mere commercial matter. Just as any one who can obtain a police license can become a hackney cab proprietor, so any one with the necessary capital can become an electric cab proprietor, with just the same commercial risk. Nearly every town of importance possesses an electric lighting station, or other sources of electrical energy, and arrangements for charging can in most cases be made with the same facility as the purchase of hay and fodder. Or, preferably, the enterprising electric cab proprietor can put down his own plant, and so reduce the cost of charging his cells. Among others who have rendered this agreeable elimination of the horse possible, the public have to thank Mr. Carl Oppermann, of Clerkenwell, London. This gentleman took up the question of electric traction by secondary batteries some years ago, and, like his colleagues who worked at the same problem, he had many difficulties to overcome. From the theoretical point of view the system of traction is charmingly simple. All you have to do, says the man in the street, is to pour electricity into a battery, which doles it out to the motor, which turns the wheels, and there you are! As many of our readers know, the solution of the problem of propelling a cab by electricity derived from storage cells was only a little less difficult than that of designing a successful arc lamp, or that of conveying high tension currents. And this problem required much time, thought, labour, and money, to solve. Of the nature of the difficulties that have been overcome we need say but little more than that improvement in some details is yet wanted, but in the main the problem is, as we say, practically solved. Mr. Carl Oppermann, unlike some other constructors, has managed to satisfy the æsthetic sense, as will be seen from the accompanying illustration. His latest vehicle, a Victoria, is distinctly handsome, and strikes one as being natural and elegant in its design. There is nothing of the ambulance wagon about it. It is essentially a vehicle that a gentleman would instinctively select for social purposes.

The battery is contained in a box attached to the body of the vehicle, and 40 "Headland" cells arranged in four groups of 10 each. The whole can be arranged either in parallel or series, or two groups in parallel, each with two groups in series. No resistances are used, the various speeds being obtained by the grouping of the cells. The capacity of each cell is 150 ampère hours. At the normal rate of discharge, 25 ampères, the charge suffices for a run of about six hours, covering a distance of 40 miles, at a speed of about 8 miles per hour. The motor consists of a 3½ H.P. series wound; on each end of the armature spindle is a pinion which, by means of chains, transmits the motion to the rear wheels. The weight of the vehicle in working order is 3,120 lbs., of which the battery weighs 1,330 lbs., or about 440 lbs. per E.H.P. All the machinery is well cased in and protected from dust. The vehicles are under perfect control, a single lever at the driver's left hand being all that is necessary to stop and start the car, or reverse it, or to apply the electrical brake. The steering arrangements are simple and efficient, and enable the vehicle to be turned completely in a little more than its own length. There are two powerful band brakes applied by foot to the two rear road wheels, thus preventing any undue wear to the indiarubber tyres.

The Oppermann Victoria.

The cost of recharging the accumulators at 1½*d.* per unit is about 2*s.*, there being no difficulty in obtaining the necessary electric supply at this rate, as a number of these vehicles would form an excellent means of providing a "day load" for municipal and other electric lighting undertakings.

One of these carriages has been running in Paris for the past three months, during which time its hill-climbing properties have been amply tested, with most satisfactory results; on one notable occasion ascending to Belleville and returning with four passengers to the heights of Montmatre, commencing at Rue Lepic and following the cable tramway; also ascending from the bridge up to the entrance of the Trocadero, a gradient of 1 in 7, or 14 per cent.

One most important feature was the entire absence of "side slip," accounted for by the makers by the very sensitive steering arrangements; for during the end of February and early part of March there was a spell of very wet weather, and the carriage was out every day, doing an average of 30 miles per day. During a trial run, a distance of 45 miles was traversed in the streets of Paris with one charge of the cells. The whole of the mechanical part of the carriage, including the motor, controller, gearing, wheels, and axles, were specially designed by the inventor, and constructed at his works in Clerkenwell. The body of the carriage, which is finished in superb style, was made by Mr. Arthur Mulliner, of Northampton.

We may mention in conclusion that on Mr. Oppermann's arrival in Paris recently with his Victoria he was immediately approached by the representatives of certain French capitalists, with the result that a company has been formed to run these vehicles in Paris. Every one will congratulate Mr. Oppermann on his well deserved success.

CONDENSERS FOR STEAM-VEHICLES.

Messrs. Thornycroft and the Steam Carriage and Wagon Company, of Chiswick, have patented an ingenious system of air condensers for use in steam vehicles. The following description is taken from the patent specification :—

The object of the invention is the construction of surface condensers, in which steam can be readily condensed by the action of air coming

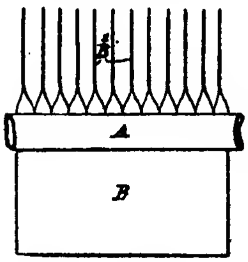


Fig. 1.—Side View.

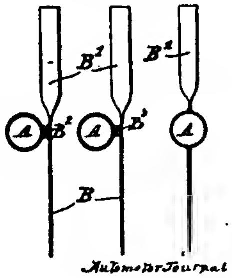


Fig. 2. Fig. 3. Fig. 4.

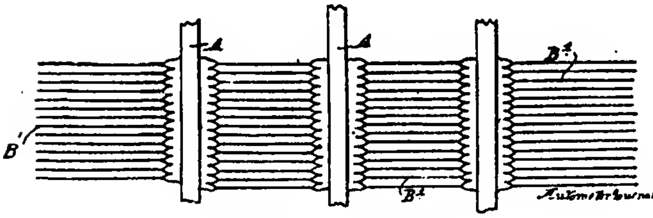


Fig. 5.—Side View of Condenser.

in contact with steam-containing portions of the apparatus. Such a condenser is made with thin tubes of metal that is a good conductor of heat; the tubes are constructed with a series of thin fins or gills that project outward laterally to a distance that is considerable in comparison with the diameter of tube, these lateral projections being so arranged that between them spaces are left for the passage of air, which, impinging upon the exposed surfaces, will take up heat from the steam that is in the tubes, and so cause condensation.

Referring to the accompanying drawings—Fig. 1 is a side view of a portion of an air-condenser tube, and Fig. 2 is a transverse section. The tube, A, is made with one or more extremely thin flanges, B, wide as compared with the diameter of the tube, and running its entire length, these flanges being cut transversely at short intervals into a number of narrow parts, B¹, each of which is at its inner end integral with the tube, and is twisted, as shown at the upper part of Fig. 1, so that there are formed a series of lateral projections, with spaces between them that will allow currents of air to pass, and will present efficient surfaces for the air to act against. The tube, A, is formed in one with its fins, B¹, from a thin sheet of copper bent to a tubular form, with a flange projecting tangentially on each side of the tube seam, which is soldered, as shown at B² in Fig. 2.

Fig. 3 illustrates a modified construction, in which the fins are made separate from the tube, and the two parts are joined by solder, as indicated at B³. Fig. 4 illustrates a further modification, in which the tube, A, and fins are made in one piece, the tube being made complete without soldering, and the fins being arranged to extend diametrically therefrom, and tapered towards their outer edges.

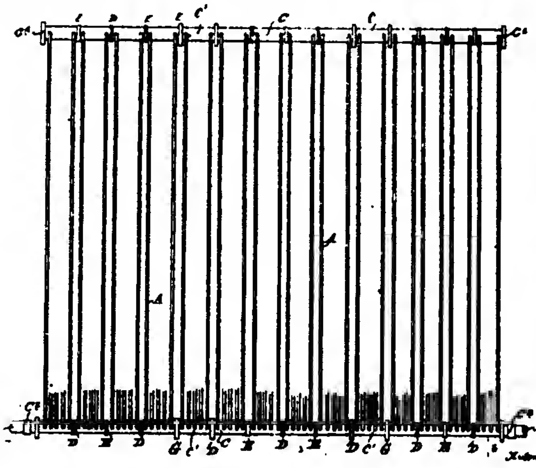
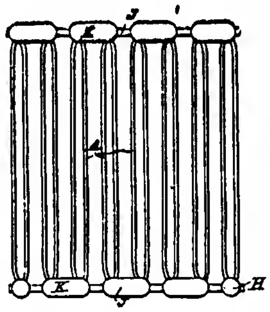


Fig. 6.—Plan of Condenser.

Fig. 7.—Section on line a—b.

The inventors have found that tubes with small fins or gills, such as described, give a much better result than an equal extent of surface not so subdivided. It will be understood that the surface of each lateral projection constitutes a small area which, by reason of the arrangement adopted, is traversed by air that has not just previously been flowing over another portion of surface belonging to the same tube.

Fig. 8.



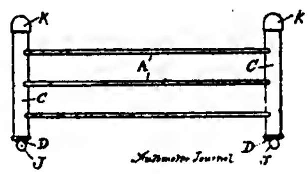


Fig. 9.

Fig. 5 is a side view of a portion of a set of condenser tubes so provided with fins; the tubes, A, are soldered to one side of a thin metal plate as shown, and the fins of the several tubes in the set are formed by making a series of short parallel slits in those parts of the plate that lie on each side of and between the tubes, A, and twisting or bending the strips of metal to the required angle. Condensers according to this invention can be constructed so that the flow of air may be that due to the passage through the air of vehicles carrying such condensers, or the flow of air may be caused by fans, blowers, or exhausters. Special provision is made for readily and automatically removing the water of condensation as the steam is condensed. A convenient arrangement of condenser comprises a number of transversely arranged tubes having fins or gills, these tubes being connected at their ends in series by longitudinal tubes provided with diaphragms to cause the steam to flow from one

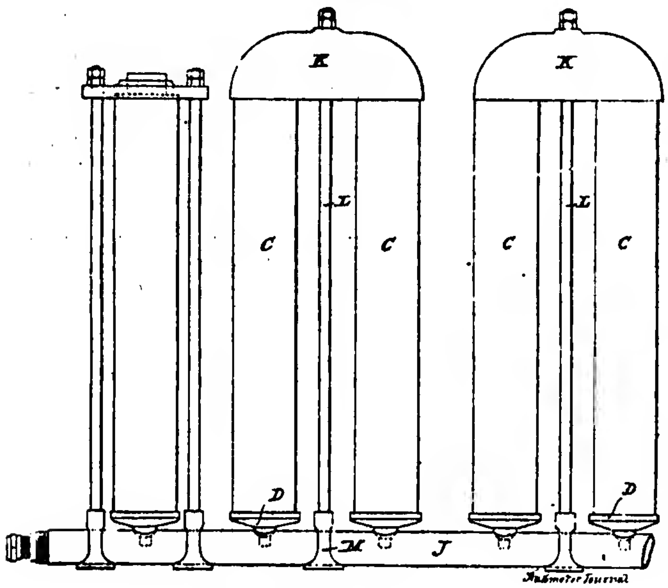


Fig. 10.

longitudinal tube through one series of transverse tubes to the other longitudinal tube, and thence back again by another series of transverse tubes and so on; small holes being formed through the diaphragms to enable the water of condensation to flow along the longitudinal tubes to suitable points whence it can be conveyed to the feed or water tank.

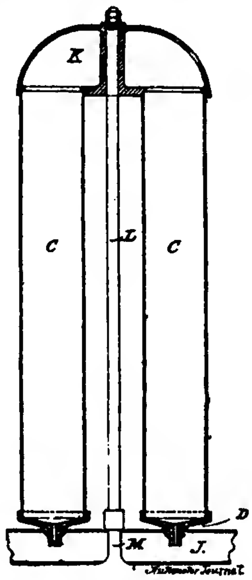


Fig. 11.

Fig. 6 is a plan of such an arrangement of condenser, and Fig. 7 is a section on the line, a—b, Fig. 6, and which are respectively a plan and a rear elevation of a modified construction of condenser in which the tubes, C, that connect in series the transversely arranged tubes, A, having fins or gills are vertical, the lower ends of each tube, C, being provided with a funnel-shaped diaphragm, D, the outlet portion of which is let into a pipe, J, adapted to lead off the water of condensation that passes through the diaphragms. The tubes, C, on each side of the condenser are connected in pairs at their upper ends by junction pieces, K, as illustrated in Figs. 10 and 11, which are detail views to an enlarged scale. The junction pieces are secured by rods, L, that screw at their lower ends into sleeves, M, embracing the pipes, J, and at their upper are fitted with tightening nuts as shown. It will be seen from Fig. 8 that the arrangement is such that steam admitted at H will be caused to flow in a zig-zag fashion through all the sets of transverse tubes, A, as in the previously described arrangement.

The following claim is made:—An apparatus for condensing steam made with thin tubes of metal that is a good conductor of heat, which tubes are constructed or provided with a series of thin fins or gills that project outward laterally to a distance that is considerable in comparison with the diameter of tube, these lateral projections being so arranged that between them spaces are left for the passage of air which, impinging upon the exposed surfaces, will take up heat from the steam that is in the tubes and so will cause rapid condensation.

The specification is numbered 25,489 of 1896.

AN EARLY ELECTRICAL CARRIAGE.

The accompanying illustration is reproduced from an old engraving of a carriage propelled by primary batteries, which was tried on the Edinburgh and Glasgow Railway in 1842. It cannot be said to have been a great success, as the maximum speed attained was only four miles an hour, but it is, nevertheless, of considerable interest as being the first electrical carriage, on a practical scale, ever constructed.

Model carriages had certainly been made before that date. Davenport, an American, in 1835, constructed one adapted to run on a circular railway; this was exhibited in this country in 1838. Botto, an Italian, Sturgeon, and Clarke had likewise constructed working models before 1842. Clarke's model was exhibited at work upon a circular railway in Leicester.

The particular machine we are now dealing with was the invention of a Mr. Davidson, of Aberdeen. It weighed, complete, 5 tons, and was 16 feet long by 6 feet wide. The drawing shows the construction and action pretty clearly. The armatures were composed of cylindrical blocks of wood, into which were inserted longitudinal bars of iron spaced at 120° apart.

The electro-magnets are not one solid piece of iron, as is generally the case, neither are they rounded behind. Each of the side parts, or arms, is constructed of four plates of soft iron, put together so as to form, as it were, a box, for the sake of lightness. The arms are 25 inches long, and joined together behind by plates of iron. Their rectangular poles measure 8 by 5 inches, and at their nearest points are only about 4 inches asunder. The coils with which they are surrounded do not consist of a single copper wire, but of bundles of

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wire wrapped round with cloth to ensure insulation. According to Mr. Davidson's first arrangement, these magnets were placed so that their poles were nearly in contact with the revolving masses of iron in their transit; but so prodigious was the mutual attraction, that the means taken to retain the magnets and iron in their assigned positions were insufficient. They required to be more firmly secured, and their distances had to be somewhat increased, by which considerable power was lost.

The electro-magnets of each pair were energised alternately in the manner shown in the upper figure.

Near each end of the axle which passes through the large cylinder are two smaller cylinders. Each of these cylinders has the half of its rim next to the larger cylinder entirely covered with metal, so that it is a conductor of electricity. The outer halves, O O′, are only partly covered with metal, the intervening portions being of ivory, well-baked wood, or some other non-conductor of electricity. We shall suppose the dark spaces on the belts, O′ O, to represent the conducting parts, and the white spaces the non-conducting parts. Now, suppose one end of the wire which is coiled round the iron, M, to be connected with Z, one pole of a battery, and the other end of that wire, *a*, to rest on *c*, the metallic rim of the right hand small cylinder, while the wire, K*b*, from the other pole of the same battery rests on a metallic part of the rim O; in this case the circuit is complete.

The batteries comprised 59 elements, each consisting of a plate of amalgamated zinc placed between a pair of iron plates. The dimensions of the plates were 15 inches by 12 inches. Means for elevating the plates out of the liquid were provided.

EXPLOSION OF A STEAM TRAMCAR BOILER.

The following account is taken from the official report of the explosion of a steam tramcar boiler at Birmingham, on December 21st, 1897. As will be seen from the accompanying illustration, the boiler is of the locomotive type, made of iron throughout, except the tubes, which are of brass, and the fire-box and fire-box stays, which are of copper. The barrel is 2 feet 9 inches external diameter, and 3 feet 3 inches long; the dimensions of the external fire-box are—length, 2 feet 7 inches; width, 2 feet 11 inches; and height, 3 feet 10 inches; and those of the internal fire-box are—length, 2 feet 2¼ inches; width, 2 feet 6¼ inches; and height, 2 feet 7 inches. The sides of the fire-box are supported by stays screwed into the plates and riveted at each end, and the top of the box by similar stays screwed into the plates and fitted with nuts at their lower ends. The plates are $\frac{7}{16}$ inch thick throughout, except the tube plates, which are ⅜-inch and ½-inch thick, respectively.

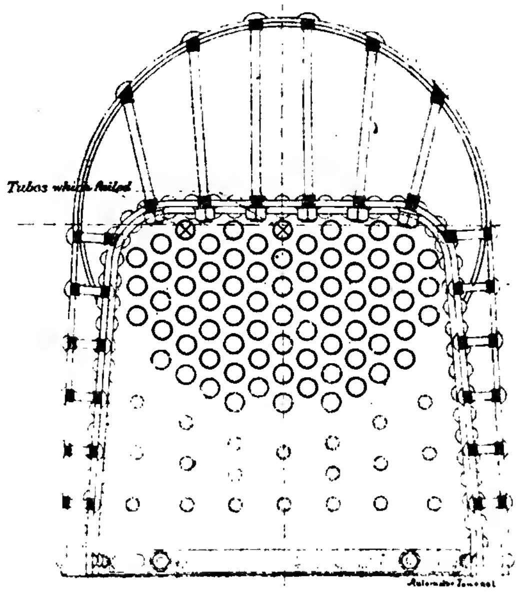
The longitudinal joint of the barrel is made with double butt straps, double riveted, and all the other seams are of the lap description, single riveted. There are 73 solid drawn tubes, 1⅜ inches external diameter, and about 3 feet 5 inches long between the tube plates, fitted with ferrules at the fire-box ends. These tubes were said to be made of a mixture of 70 parts of copper and 30 parts of zinc; their original thickness was 11 S.W.G. at the fire-box end, and 13 S.W.G. at the smoke-box end. The boiler was fitted with the usual mountings, including a pair of spring coiled safety valves, which were set to blow at 165 per square inch. The boiler was made by Messrs. Kitson and Co., of Leeds, in 1884, but has since been repaired by other firms. It was insured with the Scottish Boiler Insurance and Engine Inspection Company, of Manchester, and was examined by them every 12 months. In January, 1897, it was examined and tested by hydraulic pressure to 250 lbs. per square inch.

In addition to the above, the engines are brought into the tramway depôt once a week, when the boilers are washed out, the tubes swept, and any repairs that may be required are attended to. At the same time the Company's boiler-makers look them over, and it is the practice, from time to time, to test the condition of the tubes by means of a bent lever, which is inserted into the mouth of the tube for this purpose. The explosion consisted in the collapse and rupture of two of the tubes at the fire-box end, the positions of which are shown on the accompanying drawing, and through the openings thus made steam and hot water escaped, severely scalding the driver. The explosion was due to the tubes having become so thinned on the fire side near the fire-box tube plate that they gave way at the ordinary working pressure. Their wasting was probably due to the scouring action of particles of coke carried through them by the draught, and to the corrosive action of the sulphurous gases given off by the fuel.

At the time of the explosion the engine was standing at the Birmingham terminus of the tramway, in readiness to take up passengers and commence a new journey; nothing wrong had been noticed with respect to the boiler, when the tubes suddenly collapsed without any warning. The pressure of steam at the time is said to have been about 145 lbs. per square inch, and it is probable that one of the tubes failed first, and the consequent shock then caused the collapse of the other.

The life of brass tubes in this class of boiler varies considerably according to the nature and conditions of the work done, and in this instance the tubes have lasted longer than those in many similar cases have done, but, as in other boilers belonging to this Company, tubes have worked satisfactorily for still longer periods before renewal, the worn-out condition of those that have now failed was not suspected.

When weighed, the collapsed tubes were found to have lost about 30 per cent. of their original weight, but the chief wasting had been localised at the part near the fire-box tube plate, where the thickness was no greater than that of paper.



Section Showing Tube Plate.

In his observations, the Engineer-in-Chief of the Board of Trade, Mr. P. Samson, M.I.M.E., &c., says:—"It is well known that brass tubes in boilers of this type are subject to a wasting action by which they are frequently worn out in a comparatively short time. The deterioration in this instance seems to have been less rapid than usual, and those responsible for the safety of the boiler, though, no doubt, aware that the tubes must have been getting thin, appear to have relied on the tests which were made by the boiler-makers for the detection of any which were entirely worn out.

"Such tests, if applied systematically and to all the tubes at sufficiently frequent intervals, are no doubt of great value for the purpose intended, especially when supplemented by the drawing of samples from the box of which the loss of weight and actual thickness can be accurately determined.

"A water test of less than double the working pressure, unless applied at very short intervals, is of little use as a means of detecting the condition of thin brass tubes, inasmuch as the local wasting is often rapid, and the strength of the tubes when hot is considerably less than might be inferred from the fact of their satisfactorily withstanding a cold water test, such as that applied in this instance."

NAUTICAL AUTOMOBILISM.

Fire Floats.

The London County Council have adopted the report of the Fire Brigade Committee recommending the conditional acceptance of Messrs. Yarrow and Co.'s offer to supply for £8,000 a fire-float containing pumping and propelling machinery. The following are the particulars of the proposed craft:—The length of the vessel will be 100 feet, the beam 18 feet, and the draught about 1 foot 7 inches, and it is estimated the speed will be from 9 to 10 knots. The vessel will be propelled by twin-screw compound condensing engines, developing about 180 H.P., deriving steam from a pair of Yarrow's water-tube boilers. These boilers are also designed to supply the fire pumps, which will consist of four powerful Worthington duplex pumps, each capable of discharging 500 gallons per minute, any one or more of which pumps may be started as occasion requires and worked at full power. These pumps will deliver into a discharge pipe connected with a water tower or large air vessel in the forward part of the craft. and from which a series of branches will be carried with shut-off valves connected with any required number of fire-hoses in action. On the top of this large air vessel will be mounted a water-tower ladder, the two sides of which will be formed by water pipes delivering at its topmost end and through two 2-inch nozzles. The direction of these nozzles can be varied according to the instructions of the fireman at the top of the ladder by lifting, depressing, or swinging the water ladder from the deck. Branches will be taken underneath the deck from the pump delivery pipes to either side of the vessel forward or aft. The valves will be arranged in such a manner that the pumps may be made to discharge overboard at any of the four orifices provided, so that the vessel may be manœuvred to starboard, port, or broadside on. The vessel will be fitted with steam steering gear, steam winch, towing apparatus, and provided with two small boats, and the craft will be built of the same class of material at present used by Messrs. Yarrow and Co. for light vessels constructed for Her Majesty's Government. The propellers will be fitted in raised tunnels on either side of the vessel, so as to obtain the advantage of the lightest possible draught, and to ensure the capability of manœuvring near shore.

The Thames Automobiles.

The service of steamboats on the River Thames has at length commenced operations, and boats are now running between Chelsea and London Bridge and Greenwich. The service is now conducted under much more favourable auspices, the Company running the boats being very strong financially, and therefore able to effect those improvements in the boats which were so much wanted. The Company in question is really an offshoot of the Thames Ironworks and Shipbuilding Company, of which Mr. A. Hills, the well-known philanthropist, is chairman. This gentleman, as an ardent temperance and vegetarian advocate, has, as his first reform, abolished the "bars" which used to form such a feature, and a needless one at that, of the "penny steamer." All the boats have been overhauled and generally improved during the past winter, and the fleet now comprises 35 vessels, including three new ones, named the "Alexandra," "Boadicea," and "Cleopatra." As these vessels are intended for "above-bridge" boats, their dimensions, &c., have been adapted for that special service. They are each 125 feet long between perpendiculars, with a beam of 17 feet, a depth of 7 feet 9 inches, and a displacement of 100 tons, at which their water draught will be 2 feet 6 inches. They have flush decks from stem to stern, the height between the deck and the floor of the saloon being 7 feet.

Being paddle-wheel vessels, they are fitted with oscillating engines, having surface condensors; the engine cylinders are 23 inches diameter, with a piston stroke of 2 feet; steam of a working pressure of 30 lbs. per square inch is supplied by two cylindrical return-tube boilers, the object of these being in duplicate is to keep them entirely under the deck, which, conjointly with the engines, being as low in the vessel as possible, provides a spacious promenade—on deck—on each side right fore and aft. In previous boats of the class the boiler casings and engine-room skylights have been so wide that only a narrow gangway was left on each side, making the embarking and disembarking of passengers very inconvenient. This is now obviated by the improved boiler and engine arrangements, the skylights over these compartments being made no wider than just sufficient for light and ventilation.

It was at first proposed to fit these "above-bridge" boats with compound engines, but through the requirement of frequent starting and stopping at a number of piers, it was after careful consideration concluded that they would not be so convenient as the low-pressure type of engine, nor more economical in fuel through the shortness of run between stoppages. As the engines are surface condensing, each boat is fitted with a circulating pump driven by an independent motor, a large double-acting pump for wash deck and fire purposes, and a dynamo and engine for supplying the current for an electric installation throughout the vessel.

Below the deck each boat has two spacious saloons, the after one being 38 feet long, and the forward one 31 feet, both of the full width of the vessel; a commodious temperance refreshment bar, lavatory, &c, are provided in the after one.

As their engines will indicate about 150 H.P., the speed expected to be realised by these boats is 12 knots.

HORSE AND MOTOR-VEHICLE ACCIDENTS.

The Dangers of Driving Nervous Horses.—As Mr. Thomas Kank, of Leyland, was driving down Fishergate, Preston, in his dogcart, on March 29th, his horse was startled by a motor-vehicle, which passed it. The animal dashed down the street and collided with a lorry. The trap was wrecked, and Mr. Kank was pitched head first on to the pavement. The horse proceeded down Fishergate with the broken shafts trailing after it, but was stopped by a man, who, however, failed to retain his hold of the animal's bridle. Turning round, it dashed up Fishergate, and when passing the Town Hall fell and fractured one of its legs. By order of a veterinary surgeon it was poisoned. Mr. Kank was removed to the infirmary, where he remained in an unconscious condition. His injuries, it is feared, are of a serious nature.

A Similar Case.—On Thursday morning, the 31st ult., as a two-wheeled covered cart belonging to Messrs. Ford and Amor, contractors, was being driven through Basinghall Street, London, it collided with another van, causing the horse to bolt. The driver was thrown between the shaft and the horse, the wheel passing over his neck. He was killed instantaneously. Another man was thrown out of the back of the cart and was taken unconscious into an office close by.

A Bull in a China Shop.—While an ox was being driven through Islington on the 17th ult. it met a motor-cab, the driver of which tootled on his horn. This evidently terrified the bull, as with tail erect it rushed across the road, scattering the passers-by in all directions, some of them falling over one another in their eagerness to get out of the way. The bull then took a course down Chapel Street, and charged at a stall loaded with vegetables, overturning the lot, which were at once spoiled, as they, most of them, landed in a heap of street refuse which was piled at the side. The unfortunate woman who kept the stall was pinned to the ground by the stall. The bull then charged on, knocking over a man and a boy who had pluckily rushed to the assistance of the woman. They sustained a severe shaking. The bull next turned its attention to some piles of crockery ware, which had been stacked up on some sacking in the gutter for the day's market. In a very few minutes the greater portion of the crockery had been reduced to atoms, whilst the luckless owner was standing on the top of a van close by swearing as loudly as he could, and calling on the some half-dozen men who had been plucky enough to follow the bull, to shoot or strangle it in some way, or he would have the law on them. The man was in such a state of abject terror that, notwithstanding the seriousness of the situation, the men roared with laughter at him. A few moments after this the two drovers appeared on the scene, and also three or four constables. The bull stood at bay amongst the crowd, but by dint of a little manœuvring a constable succeeded in lassoing it, but not before the bull had managed to pull several people to the ground. The drovers then took him in hand, and in a very few minutes managed to lead him away amidst great excitement.

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THE EFFICIENCY OF BICYCLES.

PROFESSOR R. C. CARPENTER has recently pnhlished the results of an extended series of experiments on bicycle efficiency, which he has conducted at the Sibley College of Cornell University. Starting with the bearings, he found the loss here to be very small, being hut $\frac{1}{5}$ to $\frac{1}{10}$ per cent. of the work transmitted when light machine oils were used, and from $\frac{6}{10}$ to $\frac{7}{10}$ per cent. when the lubricant was a mixture of graphite and lard. This frictional loss appeared to he entirely independent of the speed. The chain efficiency at ordinary loads and at high speeds was found to range between 93 to 97 per cent., with chains in good oondition. A dirty chain, however, usually wasted 10 to 15 per cent. more in friction than the above; though much seemed to depend on the make, as one of the specimens tested worked practically as well when old and dirty as when new. Until the recent improvements in gear-cutting machines, no bevel gears were as efficient as a good chain; even now, in none of his experiments has Professor Carpenter found a bevel gear with a higher efficiency than a good chain, whilst medium quality chains are much superior to medium quality bevel gears. In one test of a high quality chainless machine, tested at 15 miles per hour, and receiving from 20 to 280 foot-pounds per minute, the work lost in friction ranged from 10 to 18 foot-pounds per revolution, whilst with a similar quality chain wheel the loss was hut 7 to 5 foot-pounds per revolution. The highest efficiency noted for a chain gear was 97 per cent., and for two pairs of bevel wheels 94 per cent. Independent experiments by Professor Denton, made under conditions particularly favourable to the bevel gears, showed very similar results, as, though these latter proved slightly superior at very high loads, the chain had the advantage when tested at the usual riding loads. The greatest difference in the efficiency of different machines is to be found in the tyres. Thus, one wheel running at 14 miles per hour, and taking $\frac{1}{4}$ H.P., showed a total efficiency of 42 per cent. On changing the tyres this was increased to 54 per cent., and a second change brought the figure up to 60 per cent. In another case a change of tyres hrought up the total efficiency of a bicycle from 42 per cent. to 75 per cent., which is the highest total efficiency noted in the experiments. As to the power required to move the hicycle, Professor Carpenter estimates that at 5 miles per hour, on a good level road, a rider does work at the rate of about 840 foot-pounds per minute; and at 10 miles an hour the work done, even with an allowance for wind, will not be more than 1,336 foot-pounds per minute. Hard continuous riding needs 4,500 foot-pounds per minute, whilst for a short period a good rider can do work at the rate of 11,000 foot-pounds per minute.—*Engineering.*

Motor-Tricycles *v.* Trains.—Mr. James Tuke, of Bradford, a well-known automobilist, writes:—"I left Bradford at 9.30 on Wednesday, 17th ult., for York on a 1898 pattern 'New Beeston' motor-tricycle. Arrived in York at 11.30, did husiness in York and got lunch; left York 1 p.m., arrived in Bradford 3 p.m., 35 miles each way: total, 70 miles, four hours' running. Had I gone by train I could not have been back till 4·17. Owing to change at Leeds the trains take two hours each way. How is this for a record?—17½ miles per hour kept up four hours."

The Local Authority Again.—At a recent meeting of that august legislative body, the Bedford City Council, a Mr. Potter called attention to the dangerous riding of bicycles in the town, and hoped some bye-laws would be passed to prevent it. A Mr. Burridge thought some attention should also be given to the motor-cars. The Town Clerk said there were already bye-laws dealing with these matters. It is really very curious to observe that directly a local tradesman obtains a seat in the city council he seems to be consumed with an overpowering desire to make bye-laws regulating either his neighbour's dog, mangle, housemaid, or something else which is *not* his.

SARGEANT'S WATER-TUBE BOILER.

MR. W. S. SARGEANT, of Chiswick, is a well-known builder of steam launches and of river craft generally, and as such has acquired a deservedly high reputation. Some years ago, when the secondary battery became a commercial and practical fact, he built and ran a small fleet of electric launches on the Thames, charging the batteries at a small station situated within his premises. When the era of water-tube boilers and high pressure of steam commenced, Mr. Sargeant went into the matter and experimented largely, his object, as was that of other constructors, being to design a boiler which would be lighter and more powerful than the ordinary multi-tubular boiler. With the passing of the Locomotives on Highways Act, Mr. Sargeant saw that the field for the use of small light cheap high-powered boilers was enormously enlarged, and at length he has succeeded in constructing a boiler which we have no hesitation

FIG. 1.—SARGEANT'S BOILER.

in saying, as the result of practical demonstrations carried out in our presence, meets the requirements of builders of motor-vehicles intended for heavy traffic in a most satisfactory manner.

As will be seen from Fig. 1, the boiler consists of an upper drum and two side chambers connected together by tubes resembling, so far as external appearances, a Yarrow water-tube boiler. There are, however, some novel features which differentiate it from this and other similar types. Within the upper drum is a kind of basin which serves as a separator and prevents water from passing into the main steam pipe. As the water within the tubes is heated steam is formed, and in rising carries with it globules of water into the upper drum. The steam and water, however, impinge upon the outer surface of the basin and the water falls, the steam rising and collecting in the steam space. The lower part of the upper drum is connected with the side chambers by a bifurcated downcomer, which, being away from the source of heat, acts as a means for circulating the water. The upper drum and side chambers are of Siemens-Martin steel, the latter being dished to shape. The drum is 3 feet 3 inches long by 10 inches diameter. As will be seen, the ends are flanged and closed by covers, and additional support is afforded by a longitudinal screwed and nutted stay. There are 330 steel tubes $\frac{3}{4}$ inch diameter, and of No. 16 gauge. The total length of tubing is over 800 feet. The total heating surface is 135 square feet. The normal working pressure is 250 lbs. per square inch, and steam of 100 lbs. can be raised from all cold in ten minutes. Such a boiler can be fitted with a fire-grate if required to burn solid fuel, but Mr. Sargeant recognises the advantages of liquid fuel in that its evaporative power as compared with coke or coal is, roughly, twice as great, while it can be more conveniently carried both in launches and in motor-vehicles. It also enables the heavy iron fire-bars to be dispensed with. Mr. Sargeant's patent burner acts on the regenerative principle and is automatic in its action, while from its construction it does not readily get choked by the deposition of carbon; should this occur the deposit can easily be removed even while the burner is hot. The oil is supplied to the burner from the tank by an air-pressure of 7–10 lbs. per square inch obtained by working a small air-pump. The consumption of ordinary burning oil, *i.e.*, refined petroleum having a flash point of 73-80° F., is 8 pints per hour.

FIG. 2.—SARGEANT'S STEAM MOTOR.

The following are the weights of this boiler:—

	lbs.
Weight of boiler, burners, and mountings, empty	907
Weight of contained water	110
Total weight	1,017

Several boilers of this type have been very successfully applied to motor-vehicles with most satisfactory results, and further orders are on hand. We hope to say more about their performances for this purpose on a future occasion.

Mr. Sargeant also makes an exceedingly light and compact steam motor suitable either for launches or motor-vehicles. We illustrate this in Fig. 2. As will be seen it consists of a pair of open-fronted compound engines, the cylinder being 3¾" + 7½" × 5½" stroke. A piston valve is fitted to the H.P. cylinder, and an ordinary D slide to the L.P. cylinder. The cylinders are jacketted, and the tops and bolts are covered with aluminium covers which gives a very neat appearance. The cranks are balanced and are of steel, as are the connecting rods, which are hollow. The link motion is of a plain and substantial kind of the Stevenson type, the links being solid slotted. The feed is worked through reducing gear off a crank at one end of the shaft, and is a gunmetal construction. With a boiler pressure of steam of 250 lbs. per square inch the engines run at 500 revs. per minute, and give off about 35 I.H.P. The weight of the engine as shown in the condition in the drawing is 600 lbs. with pumps.

The above-described engine and boiler have been fitted in a remarkably well-built launch, designed and built by Mr. Sargeant, and named the "Daring." This vessel has been built to the order of Mr. F. May, of Messrs. Grant and May, of Billingsgate Market. She is built of teak throughout, and is designed on the lines of an Admiralty pinnace. She is 36 feet long, 7 feet beam, with a draught of 2 feet 9 inches. The machinery and boiler are placed amidship with feed water tanks in the sides. The fuel tank is placed in the bows and is cased in. The space before and abaft the machinery will accommodate a large party, and when awninged over the vessel will make a delightful river cruiser. The propeller is an ordinary three-bladed bronze one while the rudder is a single steel plate. Speed 13½ knots.

In concluding this notice of Mr. Sargeant's machinery we have devoted so much space to it as it will be observed that he has produced an engine and boiler of great power on a weight of considerably less than one ton.

Testing Tyres.—Of the inventions relating to tyres there is no end, and much puncturing is a weariness to the flesh. At last we have, so the daily Press informs us, an absolutely unpuncturable tyre manufactured by the A.B. Company, of Coventry. The properties of this remarkable tyre were demonstrated recently before a large company of journalists, who were so much overcome with what they had witnessed that—so says the *Scottish Wheel*—several of the leading journalists rushed forward to the managing director and to the courteous manager of the factory and demonstratively congratulated them on the great triumph which the Company had achieved and their luck in being the possessors of such a marvellous invention. A good tyre of the pneumatic type is much wanted for light motor-vehicles, but whether the "A.B." tyre would answer the purpose we do not know. Judging from the account of the "tests," these seem to have been anything but scientific or practical in their character, and to us they demonstrate nothing of value. It is a rather curious thing about these and similar public "tests," "trials," and so forth, that representatives of the technical Press are never invited to witness them.

Mr. Sturmey's Trip.—In one of the interesting articles published in the *Autocar*, describing his recent trip through the length and breadth of the land, Mr. Sturmey gives the following useful information:—Total distance traversed, 929 miles; average speed, 10 miles per hour nearly; consumpt of petrol, 67·5 gallons, or 1·72 pints per mile. The motor was of 4 H.P.

Motor-Car and Cycle Company.—It seems to be a growing fashion for many firms who deal as agents in cycles to place this legend over their shop door, but rarely are any motor-vehicles to be seen inside. At best these agents can only quote for motor-cycles, and why they should persist in calling these by that hybrid name motor-car it is difficult to imagine.

Newspaper Motor-Vehicles.—Messrs. W. H. Smith and Son, the well-known newspaper and periodical distributors, of the Strand, London, employ in various parts of the country many hundreds of carts and vans, and the cost of the maintenance of so many horses is necessarily very great. They have decided to give motor-vehicles a trial, and have just placed an order with Messrs. Julius Harvey and Co., of 11, Queen Victoria Street, who have been so successful with the Post Office in carrying the mails in their famous "Lifu" van.

NOTES OF THE MONTH.

The Midland Cycle and Motor-Car Exhibition Company are paying a dividend of 80 per cent. on the share capital.

Among the smaller craft sent out by Germany for service in Chinese waters are a couple of naphtha launches.

According to a statement in the *Autocar*, it is very unlikely that the Daimler Motor Company will pay any dividend at all this year.

Says a Manchester exchange:—"The motor-car is making headway. There have been several in the Manchester streets lately, chiefly for advertising purposes. Now big concerns like John Heywood's and Sutton's are using them instead of the usual horse and wagon for the delivery of goods. No doubt we shall hear shortly of other firms following this example, and perhaps before long we may have motor-cabs such as are already in use in Paris and London."

As there may be many opportunities for the use of aluminium in engineering work where a bright surface is not required, it may be of interest to many engineers to know how this metal may be easily blackened. The process is as follows:—The metal having been carefully cleaned with glass paper, a coat of olive oil is applied to it, and it is then heated till the oil boils. When a yellow colour has been thus obtained, a second coat of oil is applied, and the metal is strongly heated till it turns black. The oil is then wiped off.

From a Melbourne paper we learn that a motor-vehicle has at length made its appearance in that city. In it were Mr. J. Pender, of Brunswick, and Mr. Edwin Phillips, the patent agent. Mr. Pender, who was in charge, appeared to have thorough control of the vehicle, and steered round the corners and through the many vehicles at the intersection of Swanston and Collins Streets with great skill. The conveyance, which seats two, is of American manufacture, and has four pneumatically-tyred wheels, the rear pair of which are operated by a two-cylinder horizontal explosion engine, consuming stove oil. It is the first of its kind in the colony.

In view of the visit of the Messrs. Barnum and Bailey's Show to Manchester, a light railway of standard 4 feet 8½ inch gauge has been laid through Trafford Park, wherein the performances are to be given, from the main entrance, near the Chester Road, to Barton. The railway, four miles in length, thus establishes communication with the tramway systems on the two sides of the Ship Canal, and provides convenient facilities of approach from many large centres of population. Vignole rails have been laid by the Trafford Park Estate Company, and the British Gas-Traction Company will work the railway with cars driven by compressed gas.

It would seem that in France a new malady has developed itself, which may be termed Petrol Motor Mania. Signs that it has crossed the Channel and is likely to be epidemic with us are also not wanting. From our French exchanges we learn that scores of patents are being taken out, and thousands of pounds being spent in experiments to perfect or improve upon the petrol motor. Indeed, most of our French contemporaries rarely describe a steam motor, but the number of petrol motors they describe and illustrate is legion. Yet we confess we rarely see any really novel or useful departure made, and as they all work on the Beau de Rochas cycle much improvement is not possible.

As the result of negotiations which have been going on for some time, the Dundee and District Tramway Company have placed an order for a motor-vehicle with a Scottish firm, and it is expected that it will be available for service in the course of a few days. According to the arrangement entered into some time ago, the tramways will fall into the hands of the Corporation 15 months hence, and, having regard to the changed situation, the directors have been giving consideration to the question of finding an outlet for the shareholders' money. It has been decided to experiment with an oil motor-vehicle, and one of the type built by Mr. Stirling, Hamilton, has been ordered. The vehicle will be something after the style of a wagonette, and will be capable of accommodating eight persons.

Tests are now being made abroad with mats of felt, which are designed for laying under the rails of street railway lines for purposes of protection and sound deadening. The new mat, which is a German invention, is described as being made of strong wool, which is thoroughly impregnated with oils, then superficially coated with glue which has been rendered insoluble by the addition of sodium bichromate and formaldehyde, and then very highly compressed to form plates from ½ inch to several inches in thickness, and of various sizes. They are especially recommended for crossings and bridges, and it is claimed that they tend to prolong the life of the rail by lessening the wear on it. The surface of the mat is said to be so hard that a rail may be placed upon such a piece of matting without cutting into it. The material is known by the name of iron felt.

In the eyes of the uninstructed scribe, every vehicle which is not drawn by horses is a motor-car, and hence cable cars and electric tramcars come under this description; and so it is not surprising that the *Morning Advertiser* should say, in its issue of the 19th ult.:—

"*Killed by a Motor-Car.*—At Douglas, yesterday, an engineer named Cæsar Brew, employed by the Isle of Man Electric Tramway Company, was attempting to jump on an electric motor-car, when he slipped and fell on the line. The car went over his head, almost severing it from his body. Death was instantaneous. The car was being shunted at the time. Brew was a middle-aged man, and leaves a wife and family."

It may be as well to point out that the electric car runs on rails, and weighs about 4 tons; the motor-car, as generally understood, weighs perhaps less than 1 ton, and is not confined to one part of the road, and hence can avoid such accidents.

PRICES OF MOTOR-VEHICLES.

The *Engineer* in a recent issue gives the following prices of the most modern French-made motor-vehicles:—

Description.	No. of seats.	H.P.	Price. £	s.	d.
Carriage..	2	3	187	4	0
Carriage, with hood ..	2	—	199	13	6
Dog-cart	4	—	208	0	0
Wagonette	4	5	228	16	0
Vis-à-vis..	4	—	249	12	0
Omnibus	4	—	249	12	0
Wagonette	6	—	249	12	0
Delivery van	—	—	249	12	0

An additional sum of £8 6*s.* 6*d.* to £25 is charged, according to the number of seats, when fitted with indiarubber tyres. The carriages have generally three grades of speed—slow, moderate, and quick. The petroleum used is called the essence of petroleum, with a specific gravity of ·70, and costs 4½*d.* per quart. Some employ naphtha, costing ½*d.* more per quart, and the cost of running is about ½*d.* per mile.

DOINGS OF PUBLIC COMPANIES.

The "Taxameter" system is likely to be shortly introduced to London, as a private syndicate has recently been formed with a capital of £20,000 to exploit this "much-needed want." The directors are Messrs. Frederick R. Sims, H. H. Stanley Evans, H. Sherwin Holt, and C. Harrington Moore, the registered offices being at Donington House, Norfolk Street, Strand. As it is stated these taxameters are to be fixed in a large number of cabs, including the new electrical vehicles, the advantages put forward by the Company will be fully appreciated by regular users of cabs, and we are inclined to agree with the management when they say that the cabman who has this novel and useful instrument fixed in his vehicle is likely to secure the largest number of fares. It renders overcharge impossible, the instrument always clearly showing the exact fare payable; it records the number of journeys and distances traversed; the day's total earnings; and as it can be set when hired to record either by distance or time, we hope very shortly that the disputes and scenes which are so continually taking place in regard to the proper amount payable to the cabman will become a remembrance merely of bygone days.

Midland Cycle and Motor-Car Exhibition.—The second annual meeting of the Midland Cycle and Motor-Car Exhibition Company (Limited), was held on March 30th at the Grand Hotel, Birmingham. Mr. J. B. Burman presided, and the other directors —Messrs. W. Calcott, R. F. Hall, F. H. Parkyn, J. H. Price, F. Westwood, J. Urry, and C. Wheelwright—were also present. The directors reported that the last exhibition was in every way a success, and they again recommended the payment of a dividend of 80 per cent.

The Salocin Patent Carriage-Wheel Company.—Under a winding-up order made against this Company, the statutory meetings of creditors and shareholders were held last month at the Board of Trade Offices, Lincoln's Inn. It appeared that the Company was registered in July, 1896, with a nominal capital of £50,000, and was formed to acquire from Mr. F. Klingelhöfer certain patents relating to the Salocin wheels for carriages, motor-cars, &c. It was promoted by Mr. P. H. V. Nicholas and the Salocin Syndicate. The purchase price was fixed at £40,000, and this consideration was to be divided as follows:—Mr. Nicholas, £20,000 in cash or shares; the Salocin Syndicate, £10,000; and the vendor £10,000. Only 4,300 shares were applied for, and upon that the Company went to allotment. The cash consideration could not be paid, and the purchase price was ultimately discharged as follows: To the vendor, £500 in cash, £9,500 in shares, and £1,500 in debentures; Mr. Nicholas received £19,100 in shares, and the Salocin Synndicate £9,400 in shares. The liabilities were returned at £1,118, and the assets at £697, but the latter were subject to a debenture for £516. As regarded shareholders, there was stated to be a total deficiency of £41,801. Mr. F. H. Pollexfen, accountant, was appointed liquidator under the proceedings.

Electrical Street Car Manufacturing Syndicate (Limited).—The statutory meeting of this Company was held on the 8th inst., at the works, Wodnesfield Road, Wolverhampton. The Chairman, Major Flood Page, thought that the speed and success with which the new works and offices had been erected and equipped indicated great energy and skill on the part of those of his colleagues who had directed the work. They had got excellent premises. The amount of money subscribed in cash was a little over £7,000. They were probably witnessing the commencement of a very great advance in electrical matters, and he was sure that electric traction in the streets would in a few years cause a great diminution in the number of horses so engaged. They only required a good accumulator and good business management. The fact that Mr. Parker was engaged in the undertaking gave it an element of certainty. He thought that their prospects were excellent. In four or five years' time there would hardly be a horse-drawn omnibus in the country. The London omnibus companies had incomes amounting to over a million, and they represented the business which the Syndicate was waiting for. He thought that the younger shareholders present would live to see the day when that business would attain vast proportions, comparable even to that of the London and North-Western Railway Company.

British Electric Traction Company (Limited).—The second ordinary general meeting of this Company was held on April 7th at the offices, Donington House, Norfolk Street, Strand, Sir Charles Rivers Wilson, G.C.M.G., C.B., presiding. The Chairman, in moving the adoption of the report and accounts, said he was glad to be able to state that at the end of their first year they had already succeeded in establishing a business of considerable magnitude, and one which they had every reason to believe would become very profitable to the shareholders. The gross profits amounted to £14,422, and after deducting such of the general expenses as were chargeable to revenue, and also the expenses incurred in connection with schemes and undertakings which had been initiated but eventually dropped, there remained a profit of over £9,800. In proceeding to give particulars of some of the important schemes the Company was developing, the chairman said that foremost among them were the enterprises in Staffordshire. In the Potteries district they had made arrangements with the North Staffordshire Tramways Company for the electrical equipment of its lines, and had obtained a provisional order, which had been confirmed by Parliament, and a light railway order for considerable extensions; so that their scheme in the Potteries now embraced all the principal towns, and covered a total route of upwards of 36 miles of tramways and light railways. With regard to the South Staffordshire scheme, they made an arrangement with the South Staffordshire Tramways Company by which the working of the portion of that Company's lines which was already electrically equipped was transferred to this Company. With regard to the Dudley and Stourbridge Tramways Company, they had purchased practically all the shares in that Company, and were virtual owners of it. The lines were being worked at present by steam as heretofore, but the necessary arrangements had already been made with all the local authorities, except Dudley Corporation, for the adoption of electric traction on those portions of the lines within their respective jurisdictions, and steps were being taken to equip and work electrically the line from Brierley Hill to Stourbridge. The whole of this South Staffordshire scheme when carried out would embrace the total mileage of upwards of 50 miles of line. After referring to the arrangements which had been made in connection with the Company for the adoption of electric traction in several other parts of the country, including Oldham, Ashton, and Hyde, in the neighbourhood of Manchester, Kidderminster, and Stourport, Hartlepool, North Shields, Gateshead, Paisley, Cork, and Crewe, the chairman said it would serve to give the shareholders some idea of the magnitude of the business they were engaged in carrying out when he told them that they had upwards of 50 different schemes under consideration, and that the agreements and contracts they had entered into, and the concessions they had either obtained or applied for, covered a total mileage of electrical tramways and light railways in the United Kingdom of upwards of 200 miles, and it was not looking very far into the future to say that a total capital expenditure of between £2,000,000 and £3,000,000 would have to be provided. In conclusion, the chairman pointed out the disadvantages attending the municipalisation of tramways, observing that undertakings of this kind, which often necessarily extended into several districts, could be much more satisfactorily worked by private enterprise.

New Companies Registered.

[Under this heading we give a full list of new Companies registered which take power to make, deal, or become interested in any manner in automotor vehicles.]

Automatic Conveyance Company (Limited).—Registered by H. J. Comyns, 9, Gracechurch Street, E.C.; capital £6,000, in £1 shares. Object, to enter into an agreement with F. H. Briggs, and to manufacture and otherwise deal in oil-engines, oil-motors, &c.

Taxameter Syndicate (Limited).—Registered by Castle and Co., 15, Duke Street, St. James's; capital £20,000, in £1 shares. Object, to carry on business as manufacturers of and dealers in taxameters and other fare and distance indicators for cabs, cycles, and other vehicles.

Surrey Machinists Company (Limited).—Registered by H. B. Vaughan, 132, St. John Street, E.C.; capital £1,000, in £1 shares. Object, to acquire the business carried on as the Surrey Machinists Company, and to carry on the business of cycle manufacturers and dealers, motor and carriage builders, &c. Registered office, 71, Mansion House Chambers, Bucklersbury, E.C.

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Paris Automobile Cab Company (Limited).—Registered by Mills and Co., 11, Queen Victoria Street, E.C.; capital £10,000, in £1 shares. Object, to enter into an agreement with J. P. Juvenet, and to manufacture, sell, and deal in motor-carriages, motors, cycles, and carriages of all kinds. J. P. Juvenet is the managing director.

The New Rossleigh Cycle and Motor Company (Limited) (Scotch Company).—Capital £50,000, in £1 shares (10,000 six per cent. preference shares). Object, to take over the assets and undertaking of the Rossleigh Cycle Company (Limited), and to carry on the business of manufacturers of and dealers in cycles, motor-cycles, motor-vehicles, &c.

Devon Traction and Motor Company (Limited).—Registered by G. P. Cooper, 1, Budge Row, E.C.; capital £25,000, in £1 shares. Object, to enter into an agreement with R. C. Fenton, J. E. Parnell, and W. J. Dart, and to carry on the business of hauliers, traction-engine, and motor proprietors. The first directors are R. C. Fenton, J. E. Parnell, and W. J. Dart.

British Automotive Proprietary Syndicate (Limited).—Registered by Marshall and Marshall, 3, Lincoln's Inn Fields, W.C.; capital £55,000, in £1 shares. Object, to adopt an agreement between the Automotive Syndicate (Limited) of the one part and this Company of the other part, and to carry on in all or any of their respective branches the businesses of builders of electric, steam, gas, oil, and other motors.

Dare Manufacturing Company (Limited).—Registered by R. E. Watt, 61, Chancery Lane; capital £2,000, in £1 shares (1,000 preference). Object, to acquire the business carried on by H. B. Hoch, at 14, Borough High Street, S.E., as the Dare Manufacturing Company, and to carry on the business of cycle manufacturers, motor and carriage builders, &c. Registered office, 14, Borough High Street, Southwark, S.E.

Hopkins, Taylor, and Co. (Limited).—Registered by T. T. Hull, 22, Chancery Lane, W.C.; capital £2,000, in £1 shares. Object, to acquire the business carried on by R. F. Taylor, R. C. Hopkins, C. H. Wiley, and P. Everitt as Hopkins, Taylor, and Co., and to carry on the business of motor manufacturers, motor manufacturers, &c. The first directors are R. C. Hopkins (managing director), R. F. Taylor (chairman), C. H. Wiley, and P. Everitt.

Jesse Ellis and Co. (Limited).—Registered by Powell and Co., 28 and 29, St Swithin's Lane; capital £60,000, in £1 shares. Object, to carry on in all or any of their respective branches the businesses of carriage builders, rubber merchants, manufacturers of and dealers in cycles and other vehicles or the component parts thereof. The first directors are F. J. Beadle, R. J. Fremlin, J. Ellis, and T. Scott. Registered office, Invicta Works, Maidstone, Kent.

Ribblesdale Cycle Company (Limited).—Registered by Jordan and Sons (Limited), 120, Chancery Lane, W.C.; capital £25,000, in £1 shares. Object, to acquire the business carried on by T. Shutt and R. Ryden, at Whalley Banks, Blackburn, Lancashire, as the Ribblesdale Cycle Company, and to carry on the business of cycle manufacturers and dealers, motor and carriage builders, &c. Registered office, Whalley Banks, Blackburn, Lancashire.

Motor Omnibus Syndicate (Limited).—Registered by Gibson and Co., 27, Chancery Lane, W.C.; capital £6,000, in £1 shares. Objects, to acquire, own, and work Edwerd H. J. C. Gillett's interest in Patent No. 21,302 of 1896, for "improvements in water tubes or sectional steam boilers," to construct, purchase, equip, maintain, and work omnibuses, vans, &c. The first directors are:—A. V. England, C. Hayles, and W. R. Manning. Registered office, 27, Chancery Lane, W.C.

Yachtsmen and Automobilism.—Writing on the recent yacht races at Cannes, a correspondent of the *Yachting World* says:—"On Thursday (the 18th ult.) we were invited by the Mayor and Corporation of Cannes to witness the ceremony of laying the foundation stone of the new Jetée by H.R.H. the Prince of Wales, our Vice-Commodore, making the journey from Nice to Cannes in a motor-car. I notice that yachtsmen in France are fond of this kind of locomotion, and are encouraging an epidemic of nervous complaints by scouring the country at the rate of 23 miles an hour. Our Vice-Commodore says he does not wonder that yachtsmen take to motor-cars, they are so like a sailing boat; when they are in full swing you cover a lot of ground, but it is a good deal like going to sea in a 2½-rater: when you will reach your destination or under what conditions you will eat and sleep depend upon an unfathomable number of contingencies."

CONTINENTAL NOTES.

The Panhard vehicles entered for the Paris-Amsterdam contest will be of 8 H.P., and weigh each 1,650 lbs.

The Municipal Council of Saint Gilles has authorised the employment of five motor-vehicles at the Midi Railway Station.

The Societé des Ateliers Germain have constructed a tractor of great power for towing lighters on the rivers and canals.

The Cie. Scotte has had to remove its workshops to larger and more commodious premises at La Rue d'Hautpoul, Javel à la Villette.

The Kriéger Company is actively engaged in building electrically-propelled cabs for Paris. They have no less than 22 vehicles in course of construction.

A Motor-Car Exhibition is being organised by the French Automobile Club, and is to be held in Paris next June. Over 30 firms have already applied for space.

The Société des Automobiles et Moteurs Henriod, with a capital of £20,000, and the Société des Voiturettes Automobiles Schmidt, with a capital of £12,000, have lately been formed.

The firm of MM. Chasson et Cie. (L'Agence Générale des Automobiles) have despatched to the Caucasus a motor diligence of 12 H.P. It is intended for the public service. Three other vehicles are to follow.

The Committee of the Automobile Club has adopted, on the motion of M. Paul Meyan, the proposal to hold a Concours des Petits Poids in May, 1898. No vehicle can be entered that weighs more than 440 lbs. empty.

In Belgium steps are being taken to establish lines of motor-omnibuses in various districts, and the authorities are favourably regarding the scheme. These omnibuses will each carry 20 passengers and their luggage. The roads are to be specially remade for these vehicles.

The latest thing in automobilism is the project of a wealthy Californian to reach the North Pole in an automotor vehicle. We are expecting to hear of another enterprising American who will explore the Sahara or the great Australian desert in a similar conveyance.

The Automobile Club of France is taking up the subject of speed indicators, and has invited makers to submit instruments specially suitable for motor-vehicles, for trial at the hands of a technical committee. A strong, accurate, and not too expensive speed indicator is much wanted.

A sign of the Times.—Outside the Velodrome at Courbevoie one read till lately, "Au rendezvous des cyclistes." This has been replaced with "Au rendezvous des automobiles." This may be rendered, Good accommodation for man and motors. Where is the British hotel-keeper sufficiently enterprising to write such a legend over his door?

The following firms have applied for space at the Exposition of Automobiles to be held on May 25th next:—Panhard et Levassor, De Dion-Bouton, De Dietrich, Georges Richard, Clément, Houry, Kriéger, Léon Bollée, Automobiles Peugeot, Mors, Leblond, de la Forêt, Société l'Automobile, Mouter, Decauville, Jeanteaud, O'Kelly, Popp, Cambier, Englebert, Léon Lefebvre, Brouhot, Chceslier, Société Industrielle; the total space required for motor-vehicles being 24,750 square feet.

The Automobile Club, Bordelais, has organised a meeting for May 29th and 30th next at Agen, which promises to be a big affair. The civic authorities of Bordeaux will offer gilt medals for competition, and there will be fêtes in connection with the more serious business of automobilism.

In consequence of the difficulty experienced by the French railway companies in classifying motor-vehicles for carriage, the following definition has been adopted:—A motor-cycle is a vehicle mechanically propelled, of a weight less than 440 lbs. empty. Above this the vehicle is classed as a voiture.

L'Energie Électrique, in its issue of March 16th, gave an excellent monograph on the life and work of M. Gramme, the distinguished French electrician, and the father of practical electricity. We remember having worked some of the earlier Gramme dynamos, which at that time were the best in the market.

As showing the remarkable increase in the use of cycles in France, we may say that in 1893 there were 130,480 machines, and the tax on these amounted to 941,362 francs. In 1897 the number of machines had risen to 303,562, the tax being 4,060,000 francs. In 1898 it is estimated that there were 400,000 cycles in use.

A writer in *La France Automobile* says:—To obtain the maximum effect in the new tricycles of De Dion et Bouton having about ¾ H.P., it is better to give as little admission of gas vapour to the cylinder as possible, as too much gas means a large increase of heat and a loss of power. Inexperienced *chauffeurs* frequently make the mistake of giving a too large admission.

We have received a copy of a new French paper entitled *La Vie au Grand Air*—an illustrated review of all the sports. It is excellently printed, and approaches in many respects our English standard of such journals. It, of course, deals with automobilism, but in a popular way. Yachting is another sport that is well described. In the number of its sporting papers France is emulating Great Britain. In both countries serious journalism is apparently declining, the public preferring matter which makes no demand upon the reflective faculties.

The Northern Railway Company of France has built a small electric railway tractor for shunting purposes in the large railway stations. It consists of a truck mounted upon four coupled wheels. The battery is composed of 64 cells of five plates each, each cell being of ebonite. A special commutator enables the cells to be arranged in various groups by which four different speeds can be attained. The motor is placed in a cabin with its spindle vertically, and drives the main axle through bevel gearing. On the level the tractor will easily maintain a speed of 12 miles per hour for six hours. It will haul from one to 12 wagons or carriages with ease.

With the growing use of motor-vehicles in France there has arisen among the more enthusiastic automobilists a dislike to the use of the term "horse-power," as reminding them too forcibly of that animal which all true automobilists regard as distinctly unsuited for traction purposes in towns. It is proposed to employ the poncelet as the unit of power. The poncelet is, we may remark, ·763 of a horse-power. Owing, however, to the inherent conservatism of makers and users, the new word is not likely to become general for many years. Our contemporary *L'Energie Électrique* has announced its determination to employ the poncelet in conjunction with the horse-power.

An attempt has been made to remove the name of M. Zola, the distinguished *littérateur*, from the membership of the Touring Club, but we are glad to see it has failed. *La France Automobile*, among other papers, protested vigorously against what we have no hesitation in describing as a mean and ignoble action. Besides, it would have, if successful, made a bad precedent. If there be one means more useful than another in softening political and religious asperity, it is in bringing men of diverse views together, who are, however, interested in some common object. If automobile, cycling, and touring clubs do nothing else, they at least in this way exercise an invaluable humanising and civilising influence.

In civilised France the influence of the Press in promoting automobilism is justly recognised, and we observe with pleasure that M. Paul Meyan, the distinguished editor-in-chief of *La France Automobile*, has been presented with a medal for his services in connection with the Marseilles-Nice Races, and MM. Villemot, Aubry (*Les Sports*), and Aimé, well-known writers on automobilism, have also been decorated by the Automobile Club. M. Aubry especially deserves this honour, as, apart from merely chronicling the doings of automobilists, he has contributed a great deal to the literature of the subject of automobilism in general. We congratulate him and his colleagues on a well-deserved recognition.

During the Marseilles-Nice Concours the mayors and magistracy of the various towns and districts through which the vehicles passed courteously, and very wisely, suspended any local regulations as regards speed. It was a special occasion, and hence the law could very properly be temporarily suspended. The magistrates, however, reserved themselves full liberty of action. The result was that no one was killed, the competitors were delighted, and the public, whose servants the magistrates are, were satisfied. In Great Britain such a course of action is impossible. A special Act of Parliament would be required; our unctuous magistrates would be shocked at the idea. The only occasions on which the local laws can be suspended in this country are during riots, and when, owing to an election, a horse race, or some other equally valid reason, an extension of time is permitted to the local publicans.

THE LANCASHIRE STEAM MOTOR COMPANY'S ROAD WAGON.

(BY OUR OWN CORRESPONDENT.)

In response to the joint desires of your Editor and the Lancashire Steam Motor Company, I journeyed recently to Leyland (Lancs.), where the works of the Company are situate, to witness the trial of a new road wagon made by the Company for heavy traffic. There was a representative gathering in some ways, though in point of numbers it was limited. Just before my arrival two gentlemen had witnessed a trial of the wagon on behalf of the Dundee Steam Tram Company, and had expressed themselves as pleased in every way. Mr. Spurrier, the courteous and enthusiastic manager of the Company, then gave me every opportunity to seek information, and arranged with Mr. Sumner, who was in charge of the wagon, for a trial run on behalf of The Automotor, of which he evidently has a good opinion both as an engineer and an ardent automobilist.

Shortly after, several other gentlemen joined us, including Mr. Deakin (Bo'ness), an enthusiastic amateur automobilist, and the Hon. Sec. of the S.P.T.A. (Mr. Shrapnell Smith, Liverpool). Numerous runs were then made, and the loaded wagon put to the test on some steep gradients. The roads were very heavy, so that I consider the tests *were* tests. In looking through a report made to the Chelsea Vestry on motor dust vans, which Mr. Spurrier passed to me for inspection, I was pleased to see that the Leyland van is one of the two commended to the notice of the Vestry. This is not altogether surprising, as I noted that in the matter of price the Leyland firm was well away from all competitors. For instance, one dust van was tendered at something over £600, to mount a gradient of 1 in 20, whereas the Lancashire Steam Motor Company's offer was to climb 1 in 7, in a van costing £320. *Verb. sap.* To come to the road wagon under consideration, however, the illustrations give a very good idea of the wagon as a whole, but the following items of general interest will be found useful. The tare is just under 3 tons, which is the limit fixed by the Locomotives on Highways Act. It will carry a load of 4 tons, under which it is capable of making 6 miles per hour on the level and of climbing a gradient of 1 in 7. The average speed comes to about 4½ miles per hour. As the Parliamentary speed limit for wagons of this capacity is 5 miles per hour it will be evident that there is an ample margin on the right side.

The inspection of this wagon was rendered all the more interesting by the fact that it was not merely made for demonstration purposes, but was made for Messrs. Fox Bros. and Co. (Limited), of Wellington, Somerset, to whom it was delivered a few days after the trials which I witnessed were made. It is fitted with double brakes, the reserve brake being operated by a hand-wheel on the steering shaft; the latter is thus quite independent of the automatic brake, which is applied by the same lever that cuts off steam. Either of them will stop the wagon in half its length, or hold it on an incline of 1 in 7.

The wagon is 18 feet long and 6 feet 2 inches wide, the loading space being 13 feet by 6 feet 2 inches. The total height is 10 feet 6 inches, and from the floor to the top of the cab 4 feet. The wheels, which are steel tyred, are 3 feet 4 inches in diameter, with a 5 inch tread. It is built on a steel frame, giving a platform area of 78 square feet. The loading platform is fitted with side and tail boards, which are hung on hinges, and can be let down at once for loading or unloading. Moreover, they are so hinged that they can be removed in a minute, and the vehicle used as an ordinary lorry.

Passing next to the equipment which supplies the motive power; the principles involved are similar to those embodied in the steam van which the Company entered in the Royal Agricultural Society's trials last year, gaining the Society's Silver Medal (the only award), and which was reported in The Automotor.* The boiler is of the Company's patent vertical fire-tube type, and has 110 square feet of heating surface, *the weight per square foot of surface being 6 lbs.*

The working pressure is 200 lbs. per square inch, the boiler being tested by hydraulic pressure up to 450 lbs.

The Lancashire Steam Motor Lorry.

With the feed tank it carries about 40 gallons of water, and owing to the highly efficient "Row" tube condenser on the top of the cab, only wants replenishing once a day. The inside can be removed for cleaning without touching the steam fittings.

Common petroleum is used as fuel. The burner employed is fairly silent, as such burners go. It is very economical, the combustion of the oil being perfect, and unaccompanied by the constant drop-drop-drop of unburnt oil, which proves so wasteful with some petroleum burners. As regards being noiseless, it is a distinct advance upon the burner used at the trials last June.

In this way steam can be raised in 18 minutes, from water at the ordinary temperature, to the necessary pressure of 200 lbs. The water is fed in by a small brass pump which gives a constant feed, while the flow of oil to the burner is controlled automatically by a diaphragm-valve, which is operated directly by the pressure in the boiler. This arrangement is simplicity itself, the working pressure being kept absolutely constant, without the slightest attention on the part of the attendant, be he skilled or unskilled, thus reducing to vanishing point any risk that might otherwise be attached to the use of a boiler of the "flash" type. The consumption of oil ranges from $1\frac{1}{4}$ to $1\frac{3}{4}$ gallons per hour. It never exceeds the higher limit. The oil used is the ordinary refined petroleum, such as "Royal Daylight," "Anchor," or "Tea Rose," which can be obtained in the most out-of-the-way places, in an emergency, and bought in bulk at $3\frac{1}{2}d.$ per gallon. The oil reservoir holds 15 gallons—more than enough for a full working day.

The engines are of the compound vertical enclosed type, giving 18 I.H.P. (14 B.H.P.) at 400 revolutions per minute. They are lubricated by an ingenious automatic device. The bearings are specially constructed, and a small pump driven from the main shaft forces the lubricating oil through special channels to the driving-shaft journals, and other parts of the engines. At full speed the pump supplies the oil at a pressure of 5 lbs. to the square inch, gradually diminishing as the speed varies. All running parts practically work in a bath of oil, and there is only a trifling loss, which is compensated by re-charging the lubricating oil-holder every two or three days.

The gearing gives three speeds—$1\frac{1}{4}$, 3, and 5 miles per hour.

The wagon is practically noiseless and very free from vibration, even when standing still. It runs evenly and without any emission of waste steam or smoke. The steering arrangements prove that the wagon is absolutely under control, its behaviour at the sharpest of corners and on broken ground was in every way reassuring, and showed a great advance on the steering at the R.A.S.E. trials. The runs made in the neighbourhood of the works gave every satisfaction to those who watched them, and drew commendatory remarks from the Hon. Sec. of the S.P.T.A. and others who were present. The wagon is a distinct advance in the heavy branch of automobilism, and the makers, I understand, are ready with several improvements for the next wagon, with a view to increasing efficiency by a free use of aluminium alloys, of which the engine bed is constructed in the present case. There is only one suggestion, if I might be allowed to make one, and that is to put two circular sight glasses in the back of the cab. They would greatly simplify running backwards, the backing of the wagon up to loading platforms, and the like. They would be available with the majority of loads, as only very bulky ones would come high enough to obscure the back view, and would always be useful when returning light.

* *See* Vol. I, p. 473.

A Sportsman's Exhibition.—Under the auspices of the London Exhibitions (Limited), what was ironically termed a Sportsman's Exhibition was held for a few days recently at Earl's Court. Of course, motor-cars were advertised as an attraction, but the whole thing was, as an exhibition, most disappointing. If the exposure of a few goods used by horsemen and others, with the inevitable automatic machines, the side shows in which cheap jewellery and sweets are retailed by pert young women, the whole being contained in a corrugated structure resembling a mission hall, constitutes an exhibition, then this was undoubtedly one. The show was bare and tawdry in the extreme. Barring a few river boats, such as scullers and punts, there was nothing worth looking at. The Daimler Company had six motor-vehicles of various types arranged in a side passage; and in spite of their fine appearance, due to the lavish expenditure of paint and varnish, they looked for all the world like a row of carriages at Aldridge's waiting to be disposed of by auction. What legitimate purpose is served by such so-called exhibitions it would be hard to say.

SOME RECENT IMPROVEMENTS IN ACCUMULATORS AND THEIR APPLICATION TO TRACTION ON COMMON ROADS.*

Means of vehicular locomotion by the aid of some power other than that of horses is a subject that is now receiving a vast amount of attention. Not only is it of interest to electrical and mechanical engineers and carriage builders, but it has been taken into serious consideration by all those responsible for the regulation of traffic in our large towns. The subject is of such huge importance that it not only affects those whose business or pleasure calls for some rapid and safe means of transport from place to place, but it affects the safety and comfort of the ordinary pedestrian as well. Our present system of horse traffic is open to many objections not only from a humanitarian point of view, but from its sanitarian and economic aspect as well. The streets in our large towns would present a vastly different aspect if, instead of horses, some other means of drawing our vehicles were used.

Much attention has been given to the application of steam, petroleum, and spirits to produce the necessary motive power, but there is but little doubt that electricity will eventually supersede them all, not only on the score of economy, but owing to its freedom from heat, steam, disagreeable odour, and to the ease with which it can be manipulated.

Electro-chemical generators may be divided into two distinct types, viz., primary and secondary. In a primary cell the electrical energy is developed by the direct chemical decomposition of the excitant or electrolyte and one or both of the elements, the magnitude and rate of such electrical development being chiefly dependent upon the chemical activity of the materials employed.

The secondary, storage, or accumulator cell, as it is variously called, is the name given to that class of apparatus which is quite inert in itself, but on passing an electrical current through it certain chemical changes are induced which render it capable of receiving, retaining, and the redeveloping a certain amount of electrical energy. The ratio between that amount of energy put in and returned is dependent upon the chemical activity and nature of the materials employed, and also the mechanical construction of the cell.

Secondary batteries may be divided into two classes, viz., those in which the active material is formed from the substance of the element itself, either by direct chemical or electro-chemical action, and those in which the chemical formation is accelerated by the application of some easily reducible salt of lead. Elements of the former type are usually termed "Planté," and those of the latter "Faure" or pasted, Messrs. Planté and Faure being the respective inventors.

The active materials in all the best known types of secondary cells, whether of the Planté or Faure pattern, is peroxide of lead in the positive element, and spongy lead in the negative. The medium through which the necessary chemical changes occur during either a charge or discharge is a solution of sulphuric acid and water. There is still much doubt as to the precise nature of the chemical changes involved in a lead sulphuric acid cell, due to the action of an electric current, and therefore this matter will not be discussed here. Enough, however, is known to enable those concerned in their commercial manufacture to construct cells of almost any electrical capacity, and capable of taking up and giving out any rate of charge or discharge. It is now usual to speak of any given type of secondary cell as being of so many ampère hours capacity per pound of plate, or per pound of complete cell. In the latter case the precise nature of the containing vessel, whether it be of glass, earthenware, metal, or vulcanite, must, of course, be specified.

Planté Cells.

The Planté original secondary cell was of an extremely simple nature, consisting merely of two long strips of thin sheet lead placed one upon the other. To prevent contact between these lead strips a piece of coarse felt was placed between them. This plate was rolled up into the form of a cylinder, and was immersed in a solution of one part of pure sulphuric acid to 10 parts of water. The "forming" process was managed in the following way :—The current was caused to pass through the cell until gas was freely given off from the lead plates. On examining the elements, that plate which had been joined to the positive pole of the charging source was found to be coated with a thin film of peroxide of lead. The plate which had been joined to the negative pole was scarcely altered in appearance, neither did it have any electrical capacity. At each successive charging the peroxide on the positive plate was found to sink deeper into the metal. This "eating in" operation was allowed to go on until a sufficient amount of peroxide was formed, or, in other words, until the requisite capacity had been obtained.

In all cells of the Planté type little or no difficulty is experienced in "forming" the positive element. With a negative element, however, the case is very different. Here the active material is chemically spongy lead, and it is only by repeated oxidising and deoxidising the metal surface that the necessary depth of this finely-divided lead can be obtained. This is the difficulty experienced in all forms of Planté cells.

The original method employed to produce the desired quantity of active spongy lead was a system of charging, allowing to rest, and then reversing the current through the cell. By each reversal of current the peroxide is reduced by the nascent hydrogen liberated on its surface during the decomposition of the solution, first into the lower oxide, and then into metallic lead in a very finely-divided state. At each successive reversal this oxidising and reducing action sinks more deeply into the substance of the lead, and by careful treatment any desired depth of active material may be obtained. To form plates by the above process is an exceedingly long, tedious, and therefore expensive operation, and many workers have exercised much ingenuity in devising methods to accelerate the forming operation. To this end Planté himself tried a large number of experiments, the most successful being a preliminary treatment of the lead with dilute nitric acid to thoroughly scour and roughen its surface, and the application of heat to the cell during its formation to open the pores of the metal and allow the electrolyte to penetrate more deeply into it. This, then, is the original secondary cell from which our present-day accumulators have been evolved.

One of the earliest to introduce into this country a commercial cell of the Planté type was Mr. Epstein, and a cell bearing his name has been long on the market. Mr. Epstein has given much attention to the production of accumulators of this type, and in a recent communication to the Institution of Electrical Engineers he promised to shortly introduce an improved form of his plate, which he stated was particularly suitable for traction purposes. Such a promise, coming from one so well versed in the subject, leads us to expect a real improvement. The original Epstein plate was made by deeply grooving both sides of a lead plate. The plate, when grooved in this way, was boiled in a solution of nitric acid and water, or some similar solution. This process is said to so corrode the metal that it is easily acted upon electrolytically. Owing to the serrated nature of the plate, the active material appears to wedge itself in the narrow grooves, and does not fall out under ordinary working conditions.

The Crompton-Howell cell, which we do not hear much of now, was constructed of plates sawn from a cast mass of porous lead. We believe this material was prepared by a system of aerating the metal while in its molten condition. The resulting plate was of a highly porous and crystalline nature, and, owing to its porosity, the electrolyte easily permeated it, thus rendering the formation quite an easy matter.

A form of cell now on the market, known as the "D. P." accumulator, manufactured by the D. P. Battery Company, is also of the Planté type. The elements in this case consist of a large number of narrow strips of lead built up one above the other. By this method a large active area, enabling the cells to be charged and discharged at high rates, is obtained, while disintegration of the active material or buckling is said not to occur. As in the case of the Epstein cell, the plates are chemically treated to accelerate the formation.

The traction cell made by this Company is not designed with a view to extreme lightness, but rather with the idea of combining durability with as little weight as possible. The containing case of this particular form of cell is of ebonite, and it contains three plates —one positive and two negative. The weight of the complete cell is about 33 lbs., and three cells are put in a crate for convenience of handling, the weight of the three thus fitted being about 100 lbs.

The capacity of each cell is 100 ampère hours, at a normal discharge rate of 15 ampères; they can, however, the makers state, be discharged at any rate within reason that may be desired without damage to them, the only consequence being a loss in capacity as the discharged rate is increased. The makers assert that with this form

* Excerpt of a paper by Mr. J. T. Niblett, M. Inst. E.E., and read before the Liverpool Centre of the Self-Propelled Traffic Association by the Hon. Sec., Mr. E. Shrapnell Smith, on March 20th, 1898.

of cell a current capacity of four ampère hours per pound of plate, and three ampère hours per pound of complete cell, is obtained.

The "Lamina" accumulator elements, as manufactured by the Lamina Accumulator Company, are made up of a series of perforated and corrugated lead strips. The method of making these plates is somewhat as follows:—Lead is received in the form of rolls of 8 to 10 inches wide, and of varying thickness of from 1-64th to 1-32nd of an inch. The lead is first perforated, and is afterwards corrugated by a suitable machine. After being treated in this way the lead is cut up into strips of the desired size. These strips when built up are encased by a sheet of perforated lead, held in position by leaden rivets, and lead-burnt at the top and bottom.

The forming process is said to take only 36 hours. As the mechanical construction of the plates is simple and strong, they are said to withstand quite well the severe work imposed upon them when used for traction purposes. The makers state that a cell of this form of construction can safely be charged or discharged in one hour. The following data of the Company's "A s" traction cell may be of interest. The containing case is of ebonite, and is of the following dimensions:—10½ inches long, 4¼ inches wide, and 12 inches deep. The complete weight of the cell, with elements, and electrolyte is given as 40 lbs. The dimensions of the positive plates are as follows:—8½ inches long, 7¾ inches wide, and ⅜ of an inch thick. The size of the negative plates are:—8½ inches long, 8¼ inches wide, and ⅜ of an inch thick. The discharging rate of this form of cell is 20 ampères; but it may be run up to 100 ampères. The normal charging rate is 25 ampères, but this can also be run up to 100 ampères.

The various types of Planté cells just described are a few of those best known in our own country, and most of these are being used more or less extensively for electric traction purposes.

Having now briefly described the original secondary cell and its developments, we shall turn our attention to a more widely known type.

Faure, or Pasted Cells.

Camile Faure, appreciating the inconvenience incidental to Planté's electrolytic method of producing battery plates, conceived the idea of accelerating the operation by applying a layer of chemically-prepared oxide of lead to their surfaces, and then converting it into active material by the action of an electric current. Owing to the defects which speedily developed in Faure's original plates, they never came into commercial use. Much ingenuity has been exercised by various workers in devising methods of holding active material, and many of these devices have been made the subject of patents.

Messrs. Sellon, King, Volkmar, Phillippart, Parker, Swan, and others have each devised methods of holding active material on grids, frames, or plates. These methods, combined with Faure's original discovery, constitute that group of inventions owned by the Electrical Power and Storage Company, and are well known shortly as the E.P.S. patents. The elements as originally made and largely used by the above Company were perforated with a large number of square apertures, tapered inwards from both surfaces, thus forming a double dove-tail. Owing to their peculiar shape, the pellets of active material tend to key themselves firmly into the countersunk holes. The metal frames are cast in a metal chill or mould, and when cleaned up the frames are filled in with the material to be rendered active. The positive frames are filled or "pasted" in with red lead made into a paste by the addition of a solution of 1 part sulphuric acid to 8 parts water. The material used for the negative element is litharge mixed with sulphuric acid, 1 part added to 20 parts water. When dry, the plates are placed in a bath containing dilute sulphuric acid, where they are partly formed, or what is known as "hardened," by means of an electric current. After being hardened, the plates are removed from the bath and placed in a suitable frame, and their connecting lugs are lead-burned together. When treated as above, the elements are fit for sale purposes. In all cases the actual forming is done by the purchasers.

Of late years improvements have been made in the original E.P.S. plates. The King-Faure plate, now much used, has a series of ledges cast upon it on both sides, and these ledges are filled in with the active material. Plates made on this principle are much thicker than those originally made, and are said to give a greater capacity per pound of plate. The accumulators made by the E.P.S. Company, and so extensively used for electric light purposes, are so well known that they scarcely need further description here. We shall, however, have occasion to again refer to this Company's traction cells later on.

A form of accumulator which has been received with much favour on the Continent is known as the "Tudor." Of late years this form of cell has been introduced into this country, and is now manufactured by the Tudor Accumulator Company. The elements are not of the grid form, but consist of lead plates deeply grooved, made by being passed between a pair of suitably-made rollers. The grooves in the negative plate are narrower than those on the positive. When prepared in this way the plates are coated by electrolysis with a thin layer of peroxide, and the interstices are then filled in with the usual paste of lead oxide. The reason for treating the plates in this way is to prevent the formation of sulphate of lead at the junction of the metal holder and the active material. After the above treatment the plates are allowed to dry and are passed through smooth rollers. This last process closes up the grooves, and tends to key the active material in.

According to Professor Kohlrausch, who made some tests of the original Tudor cell, he found that a capacity of 1·6 ampère hours per pound of plate was obtained by a cell of the following dimensions:—The weight of the elements was 29·3 lbs., the total active surface of the positive plate was 1·29 square feet, the amount of electrolyte was 6 pints. Such a cell was stated to have an internal resistance of 0·015 ohm when charged, and 0·02 ohm when discharged. The best charging rate was found to be 5 ampères, and the discharging rate 6·5 ampères. As a mean of six ordinary charges and discharges a current efficiency of over 90 per cent. was said to be obtained. We believe that since the above test, and owing to improvements made, far better results have recently been obtained.

A material for making the elements of secondary batteries quite distinct from any of those already considered is known as lithanode. The credit of devising lithanode is doubtless due to Mr. Desmond FitzGerald, whose labour in the field of electro-chemistry is well known. Batteries, with improvements made on Mr. FitzGerald's original invention, are now made by the Lithanode Electric Storage Company.

Lithanode may be obtained in varying degrees of porosity. For high discharges it is made of a highly porous nature, the porosity being produced by incorporating in the material crystals of some salt, which is practically inert, and which is dissolved out during the forming operation.

The rate of discharge obtainable from lithanode batteries varies between very wide limits, and is regulated by the character of the lithanode, whether made hard, medium, or soft. The ordinary working rate of discharge is one-fourteenth of an ampère per square inch of lithanode plate, but owing to recent improvements very much higher rates of discharge can be obtained.

The electrical capacity of lithanode, when discharged at the above rate, is almost exactly one ampère hour per ounce, so that in a lithanode element weighing 1 lb. a current capacity of 16 ampère hours is obtained. In practice, however, this high capacity is never reached.

Thinking it may be of interest I have prepared the following particulars taken from one of the Company's most popular types of portable battery:—

Data of Complete 30 Ampère-hour Lithanode Batteries, including Wood Cases.

No. of cells.	Outside dimensions of battery.			Open E.M.F. of battery.	Approximate gross weight of battery.
	Length.	Width.	Height.		
	ins.	ins.	ins.	volts.	lbs.
1	3·75	7·00	6·37	2	8¼
2	5·12	7·00	6·37	4	16
3	7·27	7·37	7·00	6	22¼
4	9·50	7·37	7·00	8	29
5	11·60	7·37	7·00	10	36
6	13·75	7·37	7·00	12	43
7	15·78	7·37	7·00	14	50
8	18·00	7·37	7·00	16	56¾
9	20·12	7·37	7·00	18	63¾
10	22·24	7·37	7·00	20	70¾
11	24·36	7·37	7·00	22	77¾
12	26·50	7·37	7·00	24	84¼

Detailed Particulars of Cell.

Vulcanite containing cell	6·25 inches long. 2·12 ,, wide. 5·25 ,, high. weight, 10 ozs.
Positive element ..	Two plates in each cell, 5·9 inches long. 3·9 ,, wide. 0·25 inch thick. weight, 1 lb. 1½ ozs.
Negative elements ..	Three plates in each cell, 5·9 inches long. 3·9 ,, wide. 0·13 inch thick. weight, 11½ ozs.

Weight of connectors, 3 ozs.
Weight of cover, vent plug, sealing, and separators, 2 ozs.
Quantity of electrolyte, 15·5 fluid ozs.
Gross weight of complete cell, 6 lbs. 7 ozs.
Normal charging rate, 3 ampères.
Normal discharging rate, 3 to 4 ampères.
Maximum safe discharging rate, 9 to 12 ampères.
Approximate internal resistance, 0·015 ohm.

The data given will give a fair idea of what is obtained in actual working with this form of cell. Other batteries of larger capacity are, of course, made, and as the capacity increases, the proportional weight and bulk slightly decreases. These batteries have been used extensively for lighting vehicles, actuating coils for X-ray photography, and for propelling electric launches and light forms of motor-cars.

The Chloride Electrical Storage Syndicate make their accumulator plates on a somewhat similar plan to that adopted by the Lithanode Company. In this case, however, instead of using litharge, chloride of lead is employed to make the pellets. The method of making chloride plates is somewhat as follows:—Litharge is dissolved in acetic acid, which gives the resultant compound of acetate of lead. By adding hydrochloric acid to this solution, chloride of lead is precipitated. The precipitate is next passed through a filtering press, which squeezes out the acetic acid and leaves the chloride of lead in the shape of cakes. The cakes of chloride of lead so prepared are dried and put into melting pans with a small percentage of zinc. When melted the salt is run into a suitable mould, the result being the production of small hexagonal pellets. The pellets are next arranged in a metal chill, and an alloy of lead and antimony in a molten state and under pressure is forced into the interstices. The next process is to reduce the chloride. This is done by placing the plates in a reducing tank, alternately a cast plate, and then a plate of zinc. The zinc combines with the chlorine, forming chloride of zinc and reducing the lead salt into pure spongy lead. Originally both the positive and negative elements were made in this way, the spongy lead in the positive plate being converted into peroxide by the usual electrolytic method. Now, however, following out the prevailing fashion, the chloride plate is only used as the negative element, the positive is of different construction and is of the Planté type. The positive plate, which is cast in a mould, has a large number of holes in it. These are about three-quarters of an inch in diameter, and slightly tapered outwards on both sides of the plate. Into the cast holes are pressed small rosettes of lead. These, which exactly fit the holes, consist of lengths of pure lead strip gimped, and rolled up in the form of small coils. When all the apertures are filled in the plates are submitted to pressure in a hydraulic press, which operation keys in the rosettes. The formation is effected by joining up the plates to dummy negatives and peroxidising in an electrolytic bath in the usual manner.

Chloride cells are well known and largely used for traction purposes in America, and they are very well received in this country also.

A form of cell which is just now exciting much attention on the Continent is known as the "Marschner" cell. The Marschner battery is at present being used on the Dresden tramways, and it is said to be behaving in a very satisfactory manner. The plates are stated to consist of the ordinary oxides of lead, incorporated with powdered amber and an essential oil. This mixture is said to "set" very hard, the resultant plate being of a tough metal-like nature. On the Dresden car 144 cells of this type are being used. Each cell contains 13 plates, and is said to weigh only about 28 lbs. The weight of the complete battery is given as 5,290 lbs. Its efficiency is stated to be over 90 per cent., and if discharged at its normal rate —that is, 65 ampères—an energy capacity of 13 watt hours per pound of cell is obtained.

When devising cells for traction purposes many difficulties have to be overcome. Owing to their high initial cost, a small number of cells should be made to suffice, and these should be so constructed that they will run a vehicle for a reasonable number of hours with one charge. They should be capable of being charged and discharged at rapid rates. Above all, they should be able to withstand the jolting and jarring incidental to their being run over rough and uneven roads. The cell should be so constructed that the wash of the electrolyte does not remove the active material.

There is at the present moment an enormous field for an inexpensive cell which will combine large capacity with small weight and great solidity. Some form of mechanically solid cell seems to offer the best solution for this problem. Some little time ago great hopes were entertained that the solidity problem had been solved by the introduction of Dr. Schoep's solid electrolyte. This so-called solid electrolyte was made by adding silicate of soda to the ordinary solution, which caused it to set and become of a gelatinous nature. In this country some practical tests have been made with Mr. Barber-Starkey's method of making solid cells by substituting for the electrolyte a mixture of wood sawdust and plaster-of-paris, which when set was moistened with dilute sulphuric acid.

The accumulator known in America as the "Hatch" is of a mechanically solid nature. In this case metallic frames are not employed for supporting the lead salts, as they are held within a porous earthenware grid serrated on one side, and having small square recesses on the other. Plain lead plates are used as conductors, and these are bedded on the moist lead salts. According to this arrangement there is no clear liquid space between the elements, as the serrated earthenware plates touch one another, and are so placed that the ridges on one plate are placed at right angles to those on the other. Wooden clamping plates with indiarubber bands placed around them are fixed on the outside of each end element, and these serve to give the requisite elasticity. The "Pumpelly" cell is another American production, and in this case the mechanical solidity of the cell is arrived at by inserting plain, thick, porous earthenware plates between the elements. In this case, however, the plates are placed horizontally instead of vertically as in the "Hatch."

One great drawback to the employment of a viscous, gelatinous, or semi-solid electrolyte arises from the fact that when such substances are interposed between the plates no free circulation of the liquid is possible. In all secondary batteries, as already shown, the activity of the elements depends entirely upon chemical action, and as the electrolyte is a medium through which all these reactions occur it seems highly probable that anything which prevents its free access to the active material, or in any way impedes its circulation, must be detrimental, and consequently lead to less of efficiency and capacity.

To accurately test a storage cell is no easy matter, and unless great care is exercised very fictitious results may be obtained. A laboratory test as a preliminary may be very well, but for practical results such tests should not be relied upon. Testing under actual working conditions and for an extended period is the only reliable means of ascertaining the capabilities of cells intended for traction work.

We have already shown that no one type of cell is capable of doing all the very varied kinds of work accumulators are now called upon to do. Before building up a battery it is, therefore, wise to ascertain definitely the class of work it is intended to do, and construct accordingly.

To obtain a capacity test by discharging through a constant resistance, noting the fall of current and potential, is quite easy of manipulation, and is much used when comparative tests only are required. A more reliable method, however, is to discharge at a constant current, stopping when a prescribed fall of potential occurs. For traction work, where a uniform output for a given number of hours is required, it is very much the best plan to take the capacity of the cell in terms of watt-hours. Under these circumstances the discharging rate in watts must be kept constant. Testing for local action, noting the effect of high rates of charge and discharge, are more serious matters and require careful manipulation.

The internal resistance of a cell depends upon the total active surface area of the opposing plates, the nature of the electrolyte and its condition and temperature, and the distance between the plates.

There are many methods for determining the internal resistance of batteries. If the cells be as nearly as possible of the same dimensions, capacity, and state of charge, then two cells may be placed in opposition (poles of like polarity joined together) and their joint resistance may be measured by the ordinary Wheatstone bridge method. If the cells be exactly similar, then one-half the resistance indicated will represent the resistance of each cell.

A far more reliable and accurate means of ascertaining the internal resistance of cells is the differential method, as expressed by the following formula—

$$r = \frac{D - D'}{D} R$$

where r is the resistance required, D and D′ are the values of deflections obtained on a high-resistance sensitive galvanometer, and R expresses the value of a small but known resistance, used as a shunt.

When making tests by this method, a high-resistance potential galvanometer should be used, and one whose scale readings are either of uniform value, or whose tangents are strictly proportional to the angle of the deflections. To determine r we have to obtain a deflection, D, when the cell is on open circuit, and then obtain another reading, D′, when the cell is shunted by R, then by the formula given the internal resistance may be ascertained. The shunt resistance, R, should be small in comparison with the galvanometer coils. Good results may be obtained if the resistance of the galvanometer is, say, 5,000 ohms, and the shunt not more than 1 to 5 ohms.

The total current, or energy capacity, of a storage cell is the maximum amount of current or electrical energy which it is capable of storing, without reference to any loss that may occur by it being allowed to remain idle, nor does it take into account the rate or manner of its discharge.

The working current, or energy capacity, is that amount of current, or electrical energy, which can be obtained from the cell at any specified rate of discharge. When estimating this, the discharge is always stopped as soon as the cell ceases to do useful work. The working capacity of storage cells may vary between very wide limits.

The absolute current, or energy efficiency, of an accumulator cell is the ratio between that amount of current or energy put into it and that obtained by a total discharge, without reference either to its rate of charge or discharge, or to the time allowed to elapse between these operations.

The working current, or energy efficiency, of a storage cell is the ratio between the value of the current or energy expended in the charging operation, and that obtained when the cell is discharged at any specified rate.

In a lead storage cell, if the surface and quantity of active material be accurately proportioned, and if the discharge be commenced immediately after the termination of the charge, then a current efficiency of as much as 98 per cent. may be obtained, provided the rate of discharge is low and well regulated. In practice it is found that low rates of discharge are not economical, and as the current efficiency always decreases as the discharge rate increases, it is found that the normal current efficiency seldom exceeds 90 per cent., and averages about 85 per cent.

As the normal discharging electromotive force of a lead secondary cell never exceeds 2 volts, and as an electromotive force of from 2·4 to 2·5 volts is required at its poles to overcome both its opposing electromotive force and its internal resistance, there is clearly an initial loss of 20 per cent. between the energy required to charge it and that given out during its discharge. The normal discharging potential seldom exceeds 2 volts, and as this pressure is continually being reduced as the rate of discharge increases, it follows that an energy efficiency of 80 per cent. can never be realised. As a matter of fact, a maximum of 75 and a mean of 60 per cent. is the usual energy efficiency of lead-sulphuric-acid storage cells.

What the ordinary commercial man will be most interested in are tests which give him reliable information as to the cost of the up-keep and life of the battery; also data as to the initial cost and as to the mode of it doing its work. Such information cannot be obtained in a laboratory and has to be obtained by actual trials.

Perhaps a short description of one or two of the present applications of secondary batteries for propelling motor-cars will best serve to show the usual method of practically dealing with them.

In this country the vehicles put upon the London roads by the London Electrical Cab Company may be looked upon as a pioneer enterprise, and its development will be watched with the closest interest by all those concerned.

One of the chief novelties claimed for these cabs is the double winding of the electric motor. By adopting this system great economy of battery power is said to be effected. The starting lever on its first outward step connects the two armature windings and the two field windings in series, a small resistance being also thrown in. The second step cuts the resistance out. The third places the armature coils in parallel, but leaves the field coils in series. The fourth and final step places the field coils in parallel, and gives the vehicle its maximum speed. The first step is only used for starting. When the lever is brought to the second, third, and fourth steps, the cab attains speeds of 3, 7, and 9 miles per hour respectively. By the employment of the stepping up and down arrangement the cab is brought under complete control, whilst the reversing mechanism, in addition to a foot-brake arrangement which is fitted, enables stopping and backing operations to be more quickly carried out than would be possible in a horse-drawn vehicle.

The current from the accumulators is made to pass through a switch attached to the foot-brake, so that whenever the foot is applied to the brake the current is disrupted, thus avoiding all possibility of damage to the motor should the cab be brought to a standstill while the current is still on. As another safeguard, the driver of each cab is supplied with a special key-plug, which he carries about with him. This plug is used as a switch, and makes or breaks the battery circuit whenever it is inserted or withdrawn, the obvious advantage being that if the driver leaves his cab, taking the key with him, it is impossible for anyone to tamper with or start the vehicle.

As a means of regulating speed in a self-contained motor-car, actuated by batteries, two methods are at present in vogue. The first is by splitting up the battery into sections by a suitable commutating arrangement, thereby putting the sections either in series or parallel as required. The objection that may be raised to this plan is that the cells may be unequally discharged. A more practical method, and one adopted on the London cabs as explained, is using the battery as a complete unit, and obtaining the various speeds by commutating the coils in the fields and armatures of the motor. It is possible that some method may be adopted by which the motor may be run at constant speed, while the speed variations in the car are obtained by suitable gearing. According to present practice the motor, when starting the vehicle, is running slowly, and therefore in its most inefficient condition. If the constant speed idea were utilised, the motor might be of smaller power, and it could also be run at a higher and more uniform efficiency.

Methods of recharging will have to be seriously considered. There seems no reason why in all our large towns charging centres should not be established. The ordinary cab is stationary a great part of the day, and there seems no valid reason why the charging operation should not be rendered so simple that a cabman of ordinary intelligence could easily perform it. With an "in-and-out" electricity meter placed on the vehicle in a convenient position on the battery circuit, the driver could see at a glance how much energy had been put in and taken out of his battery; therefore, would know when a recharge is required; also, when charging, by reference to the meter he could see when his battery is satisfied. Such a measuring instrument with the small range required need not be an expensive addition. A supply system worked on the penny-in-the-slot principle could easily be arranged. The battery, of course, would not be removed, but would be connected up to the source by suitable flexible mains. Under these conditions the driver could buy his supply of electricity much in the same way as a carman can now buy fodder for his horses.

The form of battery required for driving a self-contained motor-car over common roads may need to be of a different nature to that required in cars running on a permanent way, where the tractive force remains more nearly constant and where there is less jolting and vibration. Possibly some form of mechanically solid cell with a Faure type negative and a Planté type positive element will fulfil the requirements.

As to the probabilities of the self-contained electric motor-car comparing favourably with horse haulage, this will entirely depend upon its economic aspect. However great the convenience of electric haulage, however great its reliability, ease of manipulation, sanitary aspect, and general convenience, the question as to whether it is best or not has still to be satisfactorily answered. In its present experimental stage trustworthy figures of the daily or weekly cost of up-keep cannot be expected. It is only by taking the average expenses incurred during months or years that anything like an accurate estimate can be arrived at. The initial cost and cost of maintenance of the batteries employed will, we believe, be the controlling factor. Whatever turn the idea of electrically-propelled motor-cars may take, it must necessarily always involve the use of some apparatus for storing and giving out electrical energy.

The modern secondary battery leaves very much to be desired, but still there are several very good batteries for this purpose obtainable, and these may serve to tide the electric traction man over the period intervening before the advent of the ideal cell which we all wish to see.

VALVES OF SMALL STEAM MOTORS.

Messrs. Easton, Anderson, and Goolden, the well-known engineers of Erith, have recently effected some important improvements in the arrangement of valves for small steam engines, by which they diminish the clearance in the H.P. cylinder very considerably, and also make the engine more compact. The following drawings show the method of fitting the piston valves and the steam parts.

According to this invention two valves are used, about the same diameter, and which should both be worked by the same eccentric. 13*, in the valve chamber, 12. The valves, 3 and 4, are connected to, and operated by, a single eccentric, or valve gear (not shown). Live steam from the boiler is admitted to the chamber, 9, of the high pressure valve, 3, through a passage, 13, the steam passing into the high pressure cylinder, 1, either at the upper end or at the lower end, governed by the valve faces, 6 and 5, respectively, according to the position of the valves. In the drawings the valves are shown in central position, and closing all the ports in the chambers, 9 and 12, the piston, 1*, of the high pressure cylinder, 1, having just completed its down stroke, and the piston, 2*, of the low pressure cylinder, 2, having completed its up stroke. On the valves moving downwards from the position shown, the ports, 5*, 6*,

Fig. 3.

Fig. 1.

The parts in connection with these valves, and with the respective cylinders are so arranged that one of the valves only distributes the steam to and from the high pressure cylinder, whilst the steam exhausted from the high pressure cylinder to the low pressure cylinder passes through both valves and the exhaust from the low pressure cylinder is controlled by both valves.

Referring to the drawings, Fig. 1 represents in longitudinal vertical section high and low pressure cylinders and their valves, while Fig. 2 is a horizontal section on the line *a b*, Fig. 1, and Fig. 3 is a transverse vertical section on the line *c d*, Figs. 1 and 2. 1 is the high pressure cylinder and 2 the low pressure cylinder, between which cylinders are arranged two valves, 3 and 4, by which the passage of steam to and from the cylinders is controlled. The valves are of the piston type, the high pressure valve, 3, having four collars, or valve faces, 5, 6, 7, and 8, governing four ports, 5*, 6*, 9*, 9**, in the valve chamber, 9. The low pressure valve, 4, has two collars, or valve faces, 10, 11, governing two ports, 12*, 9*, 9**, in the chamber, 9, will be opened and allow the live steam to enter, by the port, 5*, the cylinder, 1, beneath the piston, 1*, whilst the steam in the cylinder, 1, above the piston, 1*, will pass, by the ports, 6*, 7*, and 10*, into the low pressure cylinder, 2, above the piston, 2*. The high pressure piston, 1*, will now make its up stroke under the action of the live steam whilst, by the expansion of the steam from the upper end of the cylinder, 1, acting on the piston, 2*, of the low pressure cylinder, the piston, 2*, will be caused to make its down stroke whilst the steam in the cylinder, 2, below the piston, 2*, will pass through the port, 11*, 12*, in the low pressure valve chamber 12, also through the ports 8*, 9**, in the high pressure valve chamber, 9, into a chamber, 14, communicating with the exhaust passage, 15. On the reverse movement of the valves the port, 6*, is opened to the live steam entering the valve chamber, 9, by the passage, 13, the steam passing through the said port, 6*, into the high pressure cylinder, 1, above the piston, 1*, the steam contained in the cylinder beneath the piston, 1*, passing through the ports, 5*, 8*, and 11*, in the chamber, 9, into the low pressure cylinder, 2, beneath the piston, 2*, whilst the steam contained in the cylinder, 2, above the piston, 2*, passes therefrom through the ports, 10*, 13*, in the valve chamber, 12, and through the ports, 7*, 9*, in the valve chamber, 9, into the chamber, 16, communicating with the exhaust passage, 17.

By the arrangement it is claimed that a free passage for the exhaust steam is provided and compactness is obtained.

FACT AND FICTION.

Fact.

The well-known *Daily Graphic* electric cab, which has been running about the streets now for upwards of six months without accident, broke down recently through the insulation of some of the leads being rubbed off, with the result that a short circuit was set up and there was considerable sparking, until the battery connections were switched out. The cab was at work again within six hours.

Fiction.

Says the *Financial News*:—"The march of the motor-car, which is being watched with such interest by nearly everybody, may be temporarily checked by the awkward accident which happened in Oakley Street, Lambeth. 'Something went wrong with the works,' an explosion followed, the car caught fire, and the bottom of the vehicle was completely destroyed. Happily, there was no passenger within, and the driver escaped without any serious injury; but the incident will probably act as a skid on the progress of the motor-car as a rival to the gondola of London streets."

The *Daily Telegraph* (of course) goes one better. In its own special florid and Salacsque style it says:—"Jehu will rejoice at a misfortune which overtook a motor-cab in Oakley Street, Westminster Bridge Road. It was leisurely going along on the look-out for fares, when it was seen to be emitting smoke and flames. It was pulled up to the side of the road, and half a dozen people tried to put the conflagration out; but as no one understood the internal mechanism, there was nothing to be done except to stand and watch the destruction of the cab. In time the fire burned itself out, after everything that would burn had been destroyed. What was left of the vehicle presented a very sorry appearance, which seemed to cause much amusement to the ordinary cab-drivers, who indulged in a good deal of chaff at the expense of their unfortunate rival."

The *Evening Standard* could not resist the temptation, and delivered itself thus:—"Whilst a motor-car, which plies as an advertisement for the *Daily Graphic*, was proceeding along Oakley Street, Lambeth, an explosion occurred in the works, and the car caught fire, the bottom of the vehicle being completely destroyed. The driver fortunately escaped without serious injury, and luckily there was no passenger inside the car at the time."

And journalists complain that the public does not sufficiently appreciate them!

PIONEERS OF THE FRENCH MOTOR-VEHICLE INDUSTRY.

(*From "La Locomotion Automobile."*)

MM. Panhard et Levassor.

Messrs. Panhard and Levassor were the principal promotors of the petroleum vehicular industry in France; not that other trials had not been made before, which we have not by any means the intention of overlooking, but because they were, we believe, the first to come before the public. It was about 1890 that they made their first carriage, and immediately after they constructed 10 motor-cars to seat two, provided with two cylinders of $1\frac{1}{4}$ H.P. At that time, already so far distant in the memory of automobilists, these builders used the "Daimler" motor, of which they had undertaken the manufacture. They made fixed motors for industrial purposes and lighter motors for carriages, tramways, boats, &c.

From the commencement the form of the car resembled the Victoria, in which the driver's seat is replaced by a box containing the machine. The rear wheels are the driving ones, and the front ones are the steering; the transmission is made by means of a Galle chain, and the change of speed by cogged pinions. The wheels are of wood, and the box placed in the front of the carriage gives a characteristic air to the vehicle, which has varied very little during the last eight years. At the commencement three different speeds were attained—three, six, and ten miles per hour. Added to this also, the price of a car to seat two was then, judging from their catalogue of August, 1891, 3,500 francs.

In October, 1892, the firm Panhard-Levassor constructed four principal types of carriages—dogcart, to seat four; wagonette; break, to seat six; and a carriage to seat two, with or without a little seat at the back. They began at this time to use indiarubber tyres, which gave very good results, but were rather expensive.

About the same time the builders were actively employed in applying the Daimler motor to the propulsion of boats. Since then the public are more in favour of the new mode of locomotion, and this nautical branch of the industry has been a little neglected, although the advantages of it are very considerable.

If the successive improvements of the Panhard-Levassor carriages were to be described it would mean relating all that has been done in the way of wheels, tyres, frames, and especially the distillation of light petroleum. The motor itself has been very little changed. In the primitive Daimler model each piston had a valve opening on the side of the chamber of compression, intended to prevent the back pressure which might have existed at the end of the run, in direct proportion with the capacity of the cylinders. The first modification suppressed that feature.

For a long time the manufacture of motors was confined to those of small power, taking every means of reducing the passive resistance as much as possible. Afterwards motors were used with $2\frac{1}{4}$ H.P., then some were made giving $3\frac{1}{2}$ H.P. But, beyond that, a stoppage occurred on account of the weight of the Daimler motor. A carriage with a Daimler motor giving nearly 4 H.P. was seen in the Paris-Bordeaux race of 1895. That date marked the end of the Daimler, so far as the firm were concerned, and the advent of the Phœnix motor.

It must be remembered that the Phœnix weighs but 200 lbs. per $4\frac{1}{2}$ H.P. (with four cylinders). The two cylinders are parallel instead of being inclined 15°, as with those of the Daimler. The ignition is effected by incandescent tubes. Each cylinder includes a jacket for water, and works on the four-cycle or Otto system in alternate periods.

In the old Daimler carburator the float delivered a constant volume of petroleum, through which passed a current of air to a tap with three openings, which regulated the quantity of hydrocarburated mixture; this method is replaced now by a Phœnix carburator, which is composed of two parts—the regulator, by which a constant level is obtained by a ball-cock which actuates an obturator; and the diffuser, where the carburation is, so to say, made. To effect that, the liquid is drawn up with every stroke of the piston, and goes out by an opening of a few millimetres opposite; this opening has a conical surface intended to break the flow. The coming of the air in contact with the essence so pulverised can, besides, be regulated. As for the mechanism of transmission, it has remained very much the same as it was at the commencement. The movement of the motor-shaft is transmitted by a conical spindle with friction, and the second shaft placed in the rear of the first. Thanks to this progressive traction the motor can be worked without working the second shaft, and the starting is not jerky. Upon the motor-shaft is an intermediary shaft, used in changing speed. It can go at a rate of 31 miles per hour for certain special vehicles. All the vehicles are provided with brakes upon the hubs, and with one ordinary brake acting on the tyre.

The Panhard-Levassor carriage is represented in many aspects. The most characteristic types are too well-known, and many of our readers must have remarked them in the different celebrated races. We give in Figs. 1, 2, 3, and 4 different models of delivery carts, wagonettes, and omnibuses.

Although the motor is always the same it is as well to mention that it is made now with 6, 8, 10, and 12 H.P., allowing reasonable speeds for the heavy carriages to seat six, or the powerful one for goods delivery, and to obtain also higher speeds for a carriage to seat two.

A truck, Fig. 1, provided with a Phœnix motor, is shown, and a small mail-cart, Fig. 2, for the Compagnie du Nord. It may be mentioned on behalf of the first one that they can be constructed now with more room for the goods than the one of which a drawing is here given. Besides, it is easy to understand that the builders have had little leisure to think of the useful part of the industry, when there is so much to be done in private carriages.

Every one realises the active part that the firm Panhard-Levassor has taken in the motor-vehicle displays during the last four years.

Their first public success dates from the competition of the *Petit Journal*, Paris-Rouen, 1894. In the race Paris-Bordeaux-Paris, in June, 1895, the first vehicle that arrived in Paris was the celebrated

Fig. 1.—Goods Lorry.

"No. 6." It gained the second prize, the first only being granted by the regulation of the course to a car to seat four. It did the 738 miles in 48 hours 47 minutes, or at the rate of 15·13 miles per hour. Two other carriages of the same firm took sixth and seventh prizes.

In May, 1896. in the race Bordeaux-Agen, the Panhard-Levassor carriages were classed second and fourth.

In the race Paris-Marseilles, September, 1896, the three first prizes of Class "A" (carriages to seat two, three, and four) were given to the Panhard-Levassor carriages.

In the race Marseilles-Nice-Monte Carlo, January, 1897, Messrs. Prevost, De Knyff, Giraud, were classed respectively third, fourth, and fifth, driving carriages made by this firm.

In July, 1897, Mr. Gilles Hourgiere drove successfully a carriage that was classed in Paris-Dieppe first of the carriages to seat two. This carriage can be taken as a type of cars for races, all the parts not strictly indispensable having been reduced to the most simple form.

Fig. 2.—Post Office Van.

In the recent Marseilles-Nice race the first three winners rode Panhard-Levassor carriages. This long train of success is abundant evidence of the superiority of these vehicles.

In a word, all our readers will still remember the good appearance of the Panhard omnibus during the competition of Les Poids Lourds. It was the only one, with the camion Dietrich, that supported successfully the reputation of petroleum.

This firm, not yet old, has also had its private history. The death of the lamented Mr. Levassor changed the firm into a limited company, with a capital of 5,000,000 francs. Messrs. Panhard, Perron, Clemont, De Knyff, Krebs, &c., are among the directors.

The workshops are always increasing, but are insufficient, and cover now an immense area. They are now completing new workshops, the area of which is about 400 metres carrées.

In conducting their business the firm require a long notice before delivering, and their terms are very high. They intend, it is said, to think seriously about heavy traffic vehicles. Other omnibuses will be built larger than the one at present at work.

Fig. 3.—Waggonette.

The Orleans Railway Company are awaiting a delivery of 12 goods vans, with which experiments will be made for the transport of small parcels. Several business houses now use these cars for delivery. In Paris there are cars belonging to Mackenstein, Demarson-Chetelat, the Louvre, Bon Marche, and the Printemps. With regard to cab competition, they intend to place on the ranks five carriages of different forms—coupé, victoria, landau, station omnibus, &c. These vehicles will be provided with a new Krebs's magnetic traction device. They are also busy with improvements in changing speed gears which are now rather noisy. The firm does not try to attract buyers, and the managing director is not pleased, so it is said, when new customers appear—at least for the present.

Fig. 4.—Omnibus.

Profiting by the experience acquired the new firm will be able to sell to the public at cheaper rates, as the tools are less expensive and the workmen more skilful. In conclusion, the public owe a debt of gratitude to the Panhard firm for appearing first, and for having borne the enormous expenses incurred by experiments and trials.

NOTICES.

Contributions and articles likely to prove of interest to our readers will receive due attention, but in all cases the name and address of the writer must be given, not necessarily for publication.

All matter intended for publication should reach us not later than the 10th of each month, and be addressed to The Editor of "The Automotor and Horseless Vehicle Journal," 62, *St. Martin's Lane, London, W.C. Stamped envelope must be sent if the manuscript is required to be returned. The Journal is published the middle of each month.*

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When any difficulty is experienced in procuring the Journal from local newsvendors, intending subscribers can obtain each issue direct from the Publishing Office, by forwarding remittance of 7s. for 12 months' subscription, post free (or at the rate of 7d. per copy).

Most of the back numbers can still be obtained at 6d. per copy, or 7d. per copy post free.

INDEX TO VOL. I

Is Published Free with the October Number.

NOTICE.—A few copies of Volume I, bound complete, can still be supplied at One Guinea net, in consequence of our having purchased some of the numbers out of print, enabling us to make up some more complete sets.

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The Automotor and Horseless Vehicle Journal.

A RECORD AND REVIEW OF APPLIED AUTOMATIC LOCOMOTION.

APRIL 16TH, 1898.

DIARY OF FORTHCOMING EVENTS.

Notices to be included under this heading should reach the Office not later than the 12th of each month.

1898.	
April 24 ..	Paris Motocycle Critérium.
May 2, 9, 16, 23	Society of Arts Cantor Lectures—"Electric Traction," by Prof. Carus Wilson.
May 24–27 ..	Self-Propelled Traffic Association (Liverpool Centre) Heavy Vehicle Trials.
May 25 ..	"Concours de Fiacres," Paris. Organised by the Automobile Club of France.
June	International Italian Exhibition of Motor-Vehicles (Turin).
June 10 to 25..	Motor-Vehicle Exhibition, Paris. Automobile Club of France. Sections—(*a*) Automotor vehicles which have given proof of their practical efficiency; (*b*) Industries connected with automobilism; (*c*) Motors adapted for automotors; (*d*) Vehicles adapted for automotors.
June 15 to July 15	International Concours of Automobile Tricycles and Bicycles in connection with the Turin (Italy) Exhibition.
June 25 and 26	Brussels to Spa Race. Organised by the Automobile Club of Belgium.
July 3 to 11 ..	Race from Paris to Amsterdam, under the auspices of the Automobile Club of France.
1899	Race from Paris to St. Petersburg, under the auspices of the Automobile Club of France.
1900	Paris International Exhibition—Great Display of Automotor-Vehicles and Allied Trades.

ANSWERS TO CORRESPONDENTS.

DR. W. LATTEY (Southam, Warwickshire).—We have received your letter and drawings; the latter we have returned. Your idea is ingenious but not new, and in the present state of the law it cannot be practically applied. Article II, sec. 3, of the Regulations of the Local Government Board says:—"The tyre of *each* wheel of the light locomotive shall be *smooth*, and shall, where the same touches the ground, be *flat*." Want of adhesion is only likely to be experienced in very light vehicles when ascending an abnormally steep and greasy gradient. If slipping occurs it will best be prevented by trailing the "devil," or by the time-honoured zigzag course. A spiked wheel which you suggest (by the way, it reminds us of a road scarifier), would not be economically advantageous, as it would be so rarely used and would mean extra power in carting about a mass of metal.

LUBRICANT.—Do not use the oil in question without a guarantee from the vendors that it is pure, unadulterated mineral oil. Put no faith in fancy names of oils. Specify the fire point. If you send us a sample we will tell you. On no account use vegetable or animal oils.

JEHU.—We could not say unless we made an inspection. Consult a good engineer who makes this work a speciality.

W. SMITH.—Liquid fuel was first applied to ocean-going steamers, so far as we know, in Messrs. Suart's oil-tank steamer, "Baku Standard." The arrangement was not altogether successful, as it has not been repeated.

MESSRS. HITCHEN AND CO., Stockport.—Why not communicate with Mr. Brown direct? We understand the boiler to be a vertical multi-tubular. Unfortunately builders of successful motor-vehicles display a perfectly natural but inconvenient reticence as regards the publication of details which may have cost much time and money to perfect.

ELECTRICAL STUDENT.—According to the best and most recent practice the weight of secondary or storage cells as applied to vehicles such as cabs, &c., is about 430 to 450 lbs. per E.H.P., or, in other words, storage cells weigh per H.P. about as much as the heaviest types of marine machinery; so there is plenty of room for improvement.

E. W. (Winchester).—No. The English agents are so full of orders that they cannot possibly supply you with a car. Try the Daimler Company, or Roots and Venables.

OMNIBUS (Gloucester Road).—It is not a Panhard and Levassor. The motor is a Daimler, although not built by the English Company. The omnibus had a trial trip to Ealing and back on Monday, the 4th inst., we understand with satisfactory results to those interested.

THE PERFORMANCES OF THE POST OFFICE MOTOR MAIL VANS.

THE *St. Martin's le Grand*, the Post Office organ, contains in its April number an article on motor mail vans, which, while readable and interesting enough in its way, is yet singularly deficient in those details regarding consumption, speed, power, and endurance, cost of maintenance, &c., without which it is difficult, if not impossible, to form any accurate opinion of the merits of the various vehicles. It seems that the first motor-van was supplied by the British Motor Syndicate, of Holborn Viaduct, the motor being a "Daimler." Its daily journey was 27½ miles, carrying 6 to 8 cwt. of mails. It was allowed 23 minutes for each journey between the G.P.O. and the South-Western District P.O. We are told "it not only kept better time, but as a rule reached its destination at each end before it was due." Another trial of the van on the route to Kingston-on-Thames was also successful, and then we come to this significant remark: "This van has not since been employed for mail services."

The "Lifu" steam van, introduced to the Post Office by Messrs. Julius Harvey and Co., was tried on the London and Redhill route. It started on its service on December 16th, and ran with great success till January 26th, when it was taken off the road for a general overhaul, taking up the service again on February 14th, and we learn "was even more successful than during the first trial, *performing every journey without mishap and always within the time allowed.* On some nights it carried as much as 16 cwt. of mails, and could easily have carried a ton." The official view seems to be thus expressed:—"The steam motor-van would, therefore, appear to combine strength with speed, and in these respects there is no doubt that at present it holds the field."

We may remark that this opinion merely confirms the results of Les Poids Lourds trials, which, as our readers know, we have so fully discussed in our columns.

The third motor-van was one in which the energy was derived from a battery of secondary cells; in other words, it was what is termed an electrical motor-van, and was supplied by the Electrical Cab Company, of Lambeth. From our own private information we know that this van, for reasons which need not be stated, did not, and could hardly be expected to, run with uniform success, the official verdict being that "it proved, *on the whole*, a great success"—a very qualified meed of approbation.

There are various points in the design of this vehicle which seem to indicate, to say the least, extreme crudity of design. We are, however, sure that an electric motor-van for city and surburban service can be produced which will abundantly satisfy the Post Office officials. But such a vehicle would differ materially from the Electrical Cab Company's design.

In an official organ one does not expect to find either reasons, deductions, or conclusions, and the article from which we have quoted is no exception to this rule of official reticence. We have, however, said enough to enable those who are familiar with the three types of motors tried to form a pretty accurate conclusion of their own. For official work, as distinct from ordinary commercial or private work, a delay means a penalty of some kind. Absolute certainty of manipulation and absolute endurance are absolute essentials if commercial success is to be expected. From this point of view, light petroleum oil-motors, such as the Daimler, evidently do not satisfy official requirements. Electrically-propelled vehicles, if of good design, *ought* to. But so far the steam motor is superior to either the internal combustion motor or to the electric motor, and this seems to be the official view, inasmuch as the Lifu was accorded two distinct trials as against one each for the other vehicles. We have some reason to think, however, that the official opinion is that, notwithstanding the not altogether satisfactory performances of the Electrical Cab Company's vehicle, enough was learned to satisfy the authorities that for traffic in the metropolis an electric motor-vehicle is the more suitable; while for suburban and country work the advantages are in favour of the steam van.

The article concludes with the following truly official pronouncement:—"The trials are over for the present, but further developments will, no doubt, take place shortly. To what extent, however, motor-vans will supersede the ordinary mail vans time alone will prove." We may remark that time is not an important factor in solving the problems of mechanical traction, but commercial and official enterprise, scientific mechanical knowledge, and lastly, but not least, capital are. If the Post Office does not yet save the public money by carrying the mails in motor-vehicles—if the London County Council, with a conservative tendency worthy of the best or worst days of the City Corporation and the Metropolitan Board of Works still carts about the municipal street refuse in horse-drawn vehicles, and endeavours feebly enough to extinguish our all too frequently recurring City fires by obsolete inefficient steam-squirts, also drawn by horses, the public must not conclude that motor mail vans and motor steam fire-engines are not to be had. On the contrary, the French trials and the trials carried out by their own officials, and to which we have referred, have profoundly convinced the postal authorities that mechanical traction will enable a great reduction to be made in the cost of carriage of mails and parcels; and when the present contracts for horsed mail-vans expire makers of motor-vehicles will be given every opportunity of tendering upon what we believe will be liberal terms. Whether the new London County Council will emulate the Post Office and endeavour to lessen the present very heavy rates by the employment of motor dust and water carts and motor fire-engines we, of course, do not know, but sufficient evidence is before the public to show, as in the case of Chiswick, that for all municipal purposes horse haulage can be superseded by mechanical traction with a very considerable saving of the ratepayers' money. We may then expect the more intelligent and progressive members of the Council to press this matter if on no other grounds but those of economy of working, to say nothing of greater efficiency.

THE AUTOMOBILE CLUB OF GREAT BRITAIN

Among the names of the many distinguished persons who have recently joined this Club we observe that of Mr. Alfred Suart. This gentleman is a large petroleum tank steamship owner, and was one of the first to build and own this type of vessel. By his enterprise and energy he made this new trade a peculiarly British one. Mr. Suart is well known and highly respected not only in London but in New York, Paris, Vienna, and in the Caucasus, in fact in nearly every centre of the oil trade; while his house-flag, a flying fox, can be seen in nearly every sea. With such members as Mr. Suart, Prof. Boverton Redwood, and others, the Automobile Club will, in addition to its ordinary functions, be able to exercise a powerful influence in preventing any hysterical petroleum legislation such as that we are threatened with.

THE LANCASHIRE STEAM MOTOR COMPANY'S HEAVY TRAFFIC VEHICLE.

As will be seen from the interesting account of the trials of this vehicle which we publish elsewhere in this issue, the difficulties in design and construction imposed by the Locomotives on Highways Act have been surmounted in a very clever and mechanical way. Everyone will congratulate the builders and their manager, Mr. Spurrier, on the great success they have attained. We—and we are sure our readers also—are particularly pleased with this result, as it forms such a curious and unanswerable reply to the very pessimistic utterances of various speakers at the recent meetings of the Liverpool Centre of the Self-Propelled Traffic Association. We have been assured by "authorities" that the construction of vehicles intended for heavy traffic was not at present a practical possibility. We have been urged to stick to wooden wheels, wooden frames, impossible boilers, and to discard water tubes, liquid fuel, channel steel, and every other adjunct of modern scientific engineering. We have been told that if you get your wagon it will slip through insufficient adhesion, and not a few London and Liverpool engineers have metaphorically wrung their heads and hands and bewailed the difficulties in the design of vehicles intended for heavy traffic. In the meantime the Lancashire Steam Motor Company have practically solved the problem, and that in the only way it can be solved—viz., by taking full advantage of up-to-date engineering knowledge as exemplified in torpedo-boat practice. We have every respect for those who design and build machinery, such as locomotives, traction-engines, and mercantile marine machinery, in which weight is really of no consequence, or rather an advantage, and which are distinctly slow-speed motors. The ideas governing such designs are no doubt all very well, but they will never enable one to design a practical motor-vehicle intended for heavy traffic. We are the more pleased with the success of the Lancashire Steam Motor Company for a personal motive, which we may be pardoned for mentioning. In the paper "On Some Points in the Design of Motor-Vehicles intended for Heavy Traffic," read before the Liverpool Centre of the Self-Propelled Traffic Association by the Technical Editor of The Automotor, several features in design were advocated which it had evidently been previously decided to adopt in the present vehicle. Thus steel frames, 5-inch tyres, high-pressure steam, and high revs. per minute were advocated in the paper in question, as was the use of aluminium bronze for parts which are usually cast in iron. There is no question but that it is by an intelligent combination of these features that the Lancashire Steam Motor Company have achieved their success, and we cordially congratulate them.

THE CONGESTION OF THE TRAFFIC IN THE CITY.

In many respects we are a singularly illogical people, and usually welcome a public benefit by heartily damning it. Our streets are often impassable through the congestion of traffic. Horse-drawn vehicles are so long that they occupy, as compared with motor-vehicles, practically twice the space. Any tradesman or other citizen who employs automotor vehicles instead of horse-drawn ones is conferring a distinct boon upon the community, because he is doing his part in lessening the congestion, to say nothing of the saving in wear and tear of the street. Yet, do we welcome and encourage him? Not a bit. Magistrates and police, with a natural obtuseness, seem to make rather a dead set against all vehicles not drawn by horses. As our readers are aware, in more than one provincial town this action has been so pronounced as to savour of actual illegality. Of late the London police have, with a singular lack of intelligence, been endeavouring to exclude cyclists from the City, and, of course, recourse was had to that good old remedy the "bye-law." It does not occur to the average City Father that he may be ever called upon to satisfy a High Court as to the legality of a bye-law that he and his colleagues in their wisdom may impose upon a long-suffering community. However, the attempt has failed, the Court of Common Council, at their last meeting, having definitely agreed to adopt the report of the Police Committee to the effect that no new bye-laws were necessary. Some of the City magistrates, nevertheless, entertain pronounced opinions upon the wickedness of the tradesman's tricycle. In a case which came before Mr. Alderman Bell at the City Court lately a young man was charged with riding the tricycle to the common danger. He averred that he rang his bell, and further pointed out that the machine was plain-geared, and that any pace beyond what he could do on his legs was impossible—a clear statement of fact, perfectly intelligible to anyone who understands machines. The young man also stated that the machine was heavily laden. Notwithstanding these statements, against which no rebutting evidence was brought, the Alderman remarked that tricycles were a "constant source of danger," and imposed the outrageous sentence of seven days' imprisonment in default of payment of a fine and costs. To contend that a tricycle is a source of danger, whereby implying that a hansom cab is not, is too absurd.

WHY NOT TRY MOTOR-VEHICLES?

It is well known that in the Midlands the greatest dissatisfaction prevails among manufacturers of iron goods with the heavy rates that the railway companies charge for transport. Notwithstanding all the classification and revision of rates that has been effected in recent years, the fact remains that the rates of freight are so high as to seriously handicap the manufacturers, who find that they are losing their hold on many foreign markets, especially in the East. In order to avoid these heavy charges, a few of the leading firms have removed their businesses to places nearer the shipping centres. Thus some firms have gone to Cardiff, and other places in that neighbourhood, where coal and iron are cheap, and where smith and forge work can be done just as well as in the Midlands, and without incurring the heavy charges for shipment. As we have pointed out before, the railway companies cannot materially reduce these latter. They have very expensive roadways and rolling stock to maintain, and, in fact, supply a needlessly expensive means—as far as goods are concerned—of transport. It is obviously absurd to carry such things as rods, bars, nails, galvanised iron, and such like goods on an expensive railway track. Yet a goods train from Sheffield or Birmingham is sent through to Cardiff or Liverpool with the same care and cost as an express passenger train. Really, the solution lies in one of two ways—either the seat of the Midland manufactures must be transferred to the seaports, or the goods must be carried by less costly means. The former is possible, but difficult of realisation. Of the latter, canals, light railways, and motor-vehicles using the ordinary roads suggest themselves. The canals are mostly in the hands of the railway companies, thanks to the unwise and impolitic railway legislation of the past, and so are out of the question. Light railways are also, as they would not, according to our way of doing things, materially reduce the expense of transport. If sanctioned at all, in face of the powerful railway interest in the House of Commons, the capital would, it is certain, be indirectly found by the companies, who would, in any case, manage to exert a controlling influence. Motor-vehicles, owned by the manufacturers, offer the cheapest and easiest solution of the problem. There is nothing whatever to prevent a manufacturer from being his own carrier, and before taking a step so serious as removing to another district, and one so likely to be disastrous to the prosperity of many inland towns, we would suggest that a trial should be made of transporting merchandise by motor-vehicles. True, the roads would have to be put in better order to enable them to carry the traffic, but local bodies would cheerfully undertake this rather than a lucrative industry should leave their district. In a short article on this subject, *The Engineer* says:—"It is becoming increasingly plain that the future of the British iron trade will have to be sought for round the coasts of this country rather than, as hitherto to a considerable extent applied, in the interior. The capitalists who have in their hands by far the largest output of manufactured iron of any part of the United Kingdom—we refer to the iron-masters of Staffordshire and East Worcestershire—tired of useless contention with the railway companies, are just now turning their gaze with growing definiteness to the seaboard. The transplanting of works, with their accompanying equipment, heavy plant, and machinery, is no easy matter. It is a step not to be undertaken without grave consideration. If, however, the rising race of Midland rolled iron producers are to preserve their industry at all, and to add to the fortunes which their fathers have made for them, no alternative seems to be left to them. The latest event which is making their existing condition rapidly untenable has been the entry of South Wales and Cheshire into the common sheet-iron and galvanising sheet business. Robbed of this branch, the Black Country loses one of its most important sources of activity, and unless the present works owners are to find themselves stranded, they must, it is clear, follow the trade to the coast. There, and there alone, it would appear, the question of burdensome railway rates ceases to trouble. But one final effort is to be made to prevent migration wholesale. The mayors of five of the leading Staffordshire towns, headed by Wolverhampton, have united in a representation to the three leading railway companies serving the Midlands—the London and North Western, the Great Western, and Midland—urging them to reduce the rates without a moment's longer delay on raw and manufactured iron. Unless a substantial reduction immediately takes place, nothing, it is urged, can prevent the extinction of the sheet-iron trade. The railway managers are invited to meet the traders of the district in conference, and the most earnest consideration of carriers is asked to the position. The situation of the traders is the worse, since, of course, the railway companies continue the control of the canals which they have obtained, and thus not only are makers saddled with rates by rail, which are now clearly proving unsupportable, but they are denied adequate facilities for water carriage."

We say, again, why not try motor-vehicles? We can assure the traders that the forthcoming trials next month in Liverpool will show that vehicles can be produced that will answer all ordinary requirements. We do not say that armour plates and propeller shafting can be transported by road *just yet*, but goods up to 5-ton parcels can. Here, then, is a splendid chance for an enterprising capitalist—the establishment of a line of motor-vehicles from the Midland manufacturing towns to the coast.

THE FLASH POINT OF PETROLEUM.

The Select Committee on Petroleum met at the House of Commons on the 23rd ult. to elect a chairman (in the room of the late Mr. A. J. Mundella), and to decide on the course of procedure. Mr. Jesse Collings, the Under-Secretary of the Home Office, was chosen as chairman, and it was decided to take the evidence of Colonel Sir V. D. Majendie, the Chief Inspector of Explosives, at the first meeting of the Committee on the 25th. On that day that gentleman attended and was examined. He suggests that, instead of raising the flash-point of American explosive oil, lamps should be regulated—an opinion in which we heartily concur. We discussed the question in our issue for January, and are pleased to see our opinions endorsed by such a distinguished authority as Colonel Majendie. The Government are not likely to introduce legislation on the subject, because, as we have pointed out, there is no danger in using ordinary petroleum providing, as is usually the case, ordinary common sense is used a'so. The accidents that have occurred are, in the vast majority of cases, due to the dense and impenetrable ignorance of the lower classes. With our common habit of beginning at the wrong end, we look to legislation to protect us when a few common-sense lectures in the Board schools would do more than any Act of Parliament to ensure the proper handling of petroleum. We would urge upon all automobilists the duty of resisting this senseless agitation against low-flash oil, because, if those who are seeking to impose a high test succeed in their object, it will mean the imposition of greater restrictions in the sale of the light oils such as are used in the Daimler, Panhard, Peugeot, Benz, and Beeston (De Dion) motors. It will also mean placing greater power in the hands of the local authority, who will, of course, have power to make "bye-laws" at its own sweet will and pleasure. Shareholders in motor companies which use what is usually termed "light oil" in their motors should exert all their influence to combat this agitation, as, should petroleum legislation ensue, it will become a matter of extreme difficulty to run a light-oil motor in many districts.

A MOTOR OMNIBUS.

A new omnibus, which, we understand, is intended for suburban traffic, has lately been tried in the western districts of London. This vehicle, as will be seen from the above illustration, is somewhat similar to the familiar Continental diligence. It is very well built and not unpleasing in appearance, suitably furnished for the comfort of passengers, of which it will accommodate about 20. The motor mechanism is of the Daimler type and consists of two vertically-inclined engines, which give off apparently between 8 and 10 B.H.P. The transmission gear has been somewhat modified from that which is used in the ordinary Daimler vehicles, and is altogether of a stronger and more substantial build. We understand that this vehicle has been directly imported from the Continent on behalf of the British Motor Syndicate.

The American Petroleum Oil Trade.—It is believed in many quarters that the agitation against the use of low flash-point oils in this country is responsible for the decreased shipments of mineral oil from America during the past year. The total exports were valued at £10,925,670 in 1897, as compared with £11,519,583 in 1896. Of this amount the United Kingdom took £2,389,195 as against £2,760,699 in the previous year—a decrease of £371,504. The exports to Germany also show a similar falling off, but an increased trade has been done with France and China.

Royalty and Automobilism.—The King of the Belgians has become the happy possessor of a motor-vehicle, a Panhard we believe, and H.R.H. the Prince of Wales is manifesting a keen desire to employ the new means of locomotion but is not quite decided as to the type.

!" Cuando escribe, refiérese Al "The Automotor and Horseless Vehicle Journal."

NEW INVENTIONS.

Claiming particularly to apply directly or indirectly to Motor Vehicles, &c.

Compiled for "THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL" by HERBERT HADDAN and Co., Registered Patent Agents, of 18, Buckingham Street, Strand, W.C., London.

Patents Applied For.

Abbreviations: Impts., Improvements in; Relg., Relating to.

1898.

Mar. 2. 5,100. A. B. DE BOUVAUD. Impts. steam, gas, petroleum, acetylene, and like motors. (Date applied for, 30th September, 1897.)
,, 3. 5,232. H. H. NEALE. Impts. steering heads and handle bars.
,, 3. 5,259. BRITISH MOTOR CO. (LTD.) (L. Didier). Impts. self-propelled vehicles.
,, 3. 5,265. H. G. SADGROVE. Checking movements of vehicles.
,, 4. 5,298. C. ROE, H. ROE, and H. KNIGHT. Impts. motors.
,, 4. 5,318. J. R. RICKARD. Impts. reltg. motor-vehicles.
,, 4. 5,388. BRITISH MOTOR CO. (LTD.) (Daimler Motoren Gesellschaft). Impts. driving gear.
,, 5. 5,440. J. G. T. LEE. Impts. driving gear.
,, 7. 5,570. J. T. JOHNSON (A. L. Riker). Impts. self-propelled or motor-vehicles.
,, 9. 5,825. A. HERSCHMANN. Impts. controlling mechanism for motor, &c., cars.
,, 10. 5,858. C. G. PARROTT. Impts. reltg. velocipedes and motor-cars.
,, 10. 5,865. W. WATT. Impts. reltg. cycles, motor-cars, &c.
,, 11. 6,045. A. M. CLARK (La Société Anonyme des Voiturettes Automobiles). Impts. motor-vehicles.
,, 11. 6,046. A. M. CLARK (La Société Anonyme des Voiturettes Automobiles). Impts. motor-vehicles.
,, 12. 6,067. C. and H. JONES. Impts. driving bands for motor-vehicles.
,, 15. 6,247. P. W. NORTHEY and THE ELECTRIC MOTIVE POWER CO. (LTD.). Impts. mechanically-propelled vehicles.
,, 15. 6,345. LA SOCIÉTÉ FRANCAISE D'AUTOMOBILES). Impts. driving gear. (Date applied for, 20th September, 1897.)
,, 15. 6,357. W. P. THOMPSON (T. von Zwelgbergk). Impts. connected with electric motors.
,, 15. 6,370. C. H. SIMS and W. Y. STREADER. Impts. steam and other fluid-pressure engines.
,, 17. 6,471. W. A. TAYLOR and E. PERKS. Impts. reltg. driving gear.
,, 19. 6,721. R. DEMEUSE. Impts. motor-cars.
,, 21. 6,829. J. PENDER. Impts. motors and mechanism.
,, 22. 6,947. G. E. WHITNEY. Impts. motive-power engines.
,, 22. 6,999. W. T. CARR. Impts. change speed and reversing gear.
,, 23. 7,077. G. NORGA. Carburetting apparatus.
,, 25. 7,256. R. L. SCOULLER. Impts. sprocket wheels.
,, 26. 7,387. F. R. SIMMS. Motor-driven car for warfare.
,, 30. 7,597. J. D. ROOTS and C. E. VENABLES. Impts. transmission and other gear.
,, 31. 7,754. J. T. ROBSON, C. H. MARSDEN, and H. W. HEADLAND. Impts. connected with electric motors.

Specifications Published.

THE following is a List of Specifications recently published, and obtainable at the Patent Office, 25, Southampton Buildings, London, W.C., at the uniform charge of 8*d*. per copy. Owing to the enormous pressure upon our columns it has been found impossible to deal in any other form with the accumulation of patents now being taken out in connection with automobilism. As far as possible, a selection for special mention is made by the Editor from the more prominent inventions:—

Applied for during 1896.

28,514. T. TOMLINSON, 128, Stephen's Green, Dublin. Internal combustion and compressed-air engines.
29,062. J. FAVETS, 103, Hatton Garden, London. Driving gear.
29,486. BOULT (P. A. Darrac), 42, Boul. Bonne Nouvelle, Paris. Road-vehicles and motor mechanism.
29,578. F. BRYAN, 87, Wellesley Road, Gunnersbury, London. Combined internal combustion and compressed gas or air engines.
29,854. E. C. L'HOMME, Central Rouen, Lower Seine, France. Explosion-engines or motors.
30,010. W. G. POTTER, 36, Durand Gardens, Clapham Road, London. Engines actuated by oil, petroleum spirit, or other gas-generating liquids.
29,799. F. J. GIBBS and W. WRIGHT, 70, Lower Hurst Street, Birmingham. Frames.
29,933. The Hon. R. T. D. BROUGHAM and W. C. BERSEY, 22A, Dorset Street, Portman Square, London. Controlling apparatus for electrically-propelled vehicles.
29,747. E. S. HIGGINS, H. A. BESSEMER, and W. B. NICHOLSON, 402, Brixton Road, London. Engines or motors, and application of same for propulsion of vehicles.
30,045. J. VAN TOLL, 13, Heathfield South, Twickenham, Middlesex. Valve mechanism of explosion engines.
24,912. V. E. PRETOT, 21, Boul. Poissoniere, Paris. Speed and reversing gear.

1897.

19,625. A. VON BONSTETTEN, Switzerland. Motor-cars.
8,986. C. GOUCHON, Paris. Motor-cars.
9,002. J. P. ERIE, California. Motor road vehicles.
18,210. GARDNER, Manchester. Oil-motors.
1,400. J. DOUGILL, Manchester. Gas, &c., motor-engines.
7,639. T. G. BOWICK, London. Motor-cars.
16,339. C. BRACKLOW, Germany. Gas and oil motors.
16,810. TATIN and TANIERE, Paris. Steam road vehicles.
20,617. L. MARTHA, Paris. Gas, petroleum, or mineral oil.
13,734. W. R. LAKE, London. Explosion engine. Motors.
18,161. R. C. SAYER, Bristol. Electric motor-vehicles.
12,438. LA SOCIÉTÉ DES GENERATEURS, &c. Liquid fuel burners.
1,827. W. E. HAYS, Manchester. Electric motor-cars.
6,688. T. MYERS, Weybridge. Explosive vapour engines.
7,522. J. F. McELROY, New York. Electric cars.
13,621. S. STRAKER, London. Oil-motor engines.
2,310. E. DRAULLETTE and E. CATOIS, Paris. Autocar.
8,466. E. TAYLOR, Birmingham. Frames.
13,514. M. E. HERTEL, Chicago. Motor-cycles.
14,814. T. WHITE, Surbiton. Explosion motor.
16,074. C. A. G. GALLICE, Paris. Explosive fluid motor.
675. A. H. BECKS, Hastings. Propulsion.
15,411. R. BOSCH, Würtemberg. Electric igniter.
495. W. P. THOMPSON (J. Pielon, 72, Rue de Clichy, Paris). Variable speed gearing.
679. F. LISTER, Keighley, Yorkshire. Oil-engines.
2,534. R. BELFIELD, 32, Victoria Street, Westminster, London. Systems of electric traction.
3,113. G. R. VON BEEKS and J. R. REUGER, VI Gyarutcza 20, Budapest, Hungary. Electrical accumulators.
7,189. M. OTT and A. SILBERMANN, 75, Augustenstrasse, Munich, Germany. Means for supplying currents to electric cars.
19,846. L. GUELZOW, 41, Prince George Road, Stoke Newington, London. Manufacture of plates for electric accumulators.
21,704. S. W. HART, Oakdene, South Woodford, Essex. Secondary electric batteries or accumulators.
23,792. F. W. SCHNEIDER, Triberg, Baden, Germany. Electric propulsion of vehicles.
95. E. DAGNALL, 30, Mande Grove, Fulham Road, London. Internal combustion engines.
245. H. S. CARR and E. SCHUTT, 4, Sydenham Place, Otley Road, Bradford. Wheels and brakes.
378. T. GRIFFITHS, Iron House, Kinver, Stonrbridge. Hot-air engines.
462. J. J. DUFFY, Carrickmacross, co. Monaghan, Ireland. Axle spring.
619. F. J. GIBBS and W. WRIGHT, 70, Lower Hurst Street, Birmingham. Wheel rims.
4,299. R. M. PATERSON, 78, Broadhurst Gardens, Hampstead, London. Petroleum and like engines for motor-cars.
4,313. E. J. CLUBB and A. W. SOUTHEY, 16, Elm Street, Gray's Inn Road, London. Carriages.
5,526. E. J. CLUBB and A. W. SOUTHEY, 16, Elm Street, Gray's Inn Road, London. Firing device for internal combustion engines.
13,736. J. SCOTT, 39, Lombard Street, London. Tyres.
23,541. G. CRIBBS and A. F. ROSS, Logie Green Works, Edinburgh. Means of obviating or suppressing the noise caused from the exhaust gases escaping from gas or other engines.
24,096. C. W. WEISS and A. MIETZ, 87, Elizabeth Street, New York, U.S.A. Explosion engines.
1,011. J. E. WIMSHURST, 84, Billiter Buildings, London. Gas and explosive vapour engines.
1,598. A. WINTON, 37, Bolton Place, Cleveland, Ohio, U.S.A. Explosion engines.
1,912. E. GOOLD and W. ROBERTS, Clovelly Lodge, Adelaide Road, Leamington, Warwick. Combined brake, mud guard, and dress guard.
23,622. W. D. ROWLINGSON (La Société Diligeon et Cie., 48, Rue de Malte, Paris). Cooling arrangement.

43. H. T. Joel, 74, Windsor Road, Forest Gate, Essex. Electric motors.
900. A. Winton, 37, Bolton Place, Cleveland, Ohio, U.S.A. Explosion engines.
1,160. C. Lake (La Société A. Fritscher et Houdry, Crovins, France). Gas and petroleum engines.
2,925. C. T. Crowden, Vernon Lodge, Eastnor Grove, Leamington, Warwick. Devices for tightening belts or other driving gear.
3,053. E. S. New, The Voltage, Woking, Surrey. Separator for the plates of secondary batteries.
4,528. E. C. Caley and W. W. Stephenson, Burton Pidsea, Burstwick, Yorkshire. Gas, oil, and other explosion engines.
4,580. A. Ollivier, 2, Rue Manuel, Paris. Explosion engines.
4,889. J. Bunn, C. W. Bunn, and T. Brettell, Herbert Street, West Bromwich. Elastic tyres.
5,024. W. Baines, W. Norris, and D. Fergusson, 5 and 6, Great Winchester Street, London. Speed gear.
20,623. T. B. Marchant, Verney Wharf, Verney Road, Rotherhithe. Elastic tyres.
736. M. H. C. Shann and R. E. C. Shann, Westfield, Bromley. Explosion engines.
1,028. R. Green, 2–6, Horse Fair, Birmingham. Tyres and rims.
4,556. E. J. Pennington, Motor Mills, Coventry. Cooling of cylinders.
4,605. J. H. Ball, 7, Queen's Road, Beeston, Nottingham. Oil and gas engines.
6,291. E. S. Higgins and others, 127, Brixton Hill, London. Self-propelled vehicles.
6,561. E. B. Ludlow, The Brewery, Oundle, Northampton. Road motor-vehicles.
6,753. F. R. Simms, Amberley House, 12, Norfolk Street, Strand, London. Governing explosion motors.
6,755. F. R. Simms, Amberley House, 12, Norfolk Street, Strand, London. Wheels.
6,887. A. H. Huth, Bolney House, Ennismore Gardens, London. Spring metal tyres.
7,098. S. A. Reeve, 210, West Street, Worcester, Mass., U.S.A. Gas or liquid fuel engines.
7,972. E. Dagnall and A. W. Southey, 30, Mande Grove, Fulham, London. Instantaneous steam generators.
8,064. G. C. Marks (A. Bouvier, Laval, France). Vaporisers.
9,419. W. H. Woodcock, 25, Auckland Hill, West Norwood, Surrey. Roller bearings.
23,361. W. P. Thompson (C. H. P. de Von, Uccle, Belgium). Gas-engines.
23,808. La Société Diligéon and Co., 48, Rue de Malte, Paris. Mechanism.
24,813. C. H. Barrows, 41, Bank Street, Willimantic, Windham, Conn., U.S.A. Motor road vehicles.
30,098. G. Rivierre and L. Girardot, 2, Rue Brunel, Paris. Mechanically-propelled cycles.
30,243. L. Katzenstein, 223, West 133rd Street, New York, U.S.A. Metallic packing.
4,640. H. Vallee, 60, Rue de l'Australie, Mans, France. Autocar with special petroleum motor.
4,888. A. Ollivier, 2, Rue Manuel, Paris. Gas, petroleum, or like motors.
5,212. A. J. Thompson, 9, Rose Lane, Norwich. Driving or transmitting power.
5,258. L. Epstein, 28, Victoria Street, Westminster, S.W. Electrically-propelled road vehicles.
5,445. G. Baldwin and C. Crastin, 9, Electric Parade, Holloway, London. Apparatus for manufacture of acetylene gas.
5,618. W. Bowden and R. P. Urquhart, Merlewood, Wardle Road, Sale, Cheshire. Internal combustion engines working with liquid hydrocarbons and air.
5,736. J. Lees, Union Road, Hurst, Ashton-under-Lyne. Explosion engines.
5,882. J. Roots and E. C. Venables, 100, Westminster Bridge Road, London. Petrocars or motor-vehicles.
6,800. H. M. Martin, 39, Guilford Street, London, W.C. Method of and means for the production of motive power by the combustion of oil or gas, or solid fuel.
8,529. A. Dougill and J. Marks, 5, Vernon Road, Leeds. Gas and like engines.
10,005. A. Fritscher and A. R. Houdry, Provins, France. Gas and hydrocarbon motors.
2,714. H. Workman, Dunluce, Dullatur, Dumbarton. Water tube boilers.
5,501. R. H. Radford, 15, St. James Row, Sheffield. Steam generators.
5,516. G. G. M. Hardingham, 191, Fleet Street, London. Change speed mechanism.
6,281. F. G. Adams, 1, Fentiman Road, Clapham Road, London. Chain wheels.
6,342. F. Lamplough, Glen Ridge, New Jersey, U.S.A. Steam motors.
7,083. W. A. P. Werner, Ashlands, Silver Hill, St. Leonards-on-Sea. Steam generators.
7,148. M. J. Oliver and J. Oliver, Tremeare House, St. Tudy, Cornwall. Tyres.
7,526. C. A. Sundberg, Hornzgatan, 186 B, Stockholm, Sweden. Regulating devices.
8,318. C. W. Pinkney, 77, Raglan Road, Smethwick, Staffordshire Oil engines.
9,784. A. H. C. Grivell, 6, Rue des Poissonnieres, Neuilly, France. Carburetting apparatus.
9,907. P. G. A. Peugeot, Valentignay (Doubs), France. Oil engines.
9,912. J. St. Bickford, Tredouvra, Falmouth. Burners.
17,204. J. Southall, Woodleigh, Selborne Road, Worcester. Gas and oil motor-engines.
27,819. W. Davy, Greenfield Place, Ryton on-Tyne, Durham.

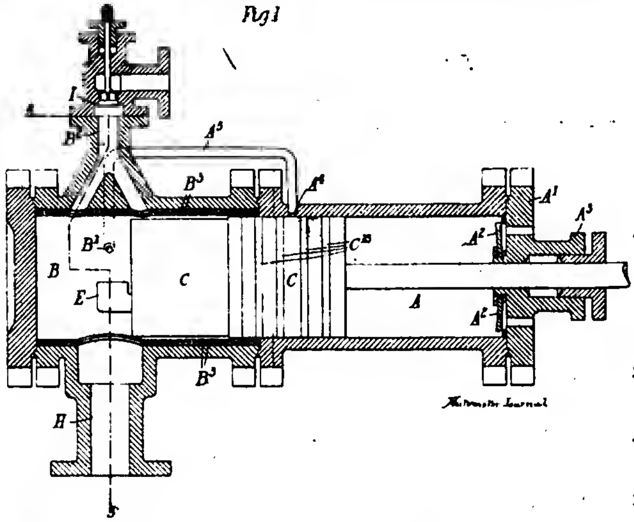
1898.

1,521. Simpson, Strickland, and Co., Dartmouth, Devon. Water tube steam generators.
1,617. J. Nelken, 21, St. Mary Axe, London. Oil vapour burners.
2,012. E. Capitaine, Frankfort-on-the-Main, Germany. Device for the production of the explosive mixture in oil-engines.

736. Explosion Engines. Montague Herbert Churchill Shann and Richard Ernest Churchill Shann, Westfield, Bromley, Kent. January 11th, 1897.

Relates to explosion engines, in which the fuel is supplied in the form of oil adapted to be vaporised in the cylinder. A cylinder is employed closed at both ends, the end which would usually with engines of this description be open being supplied with atmospheric valves preferably in the cover, so that as the piston travels on its

Fig 1

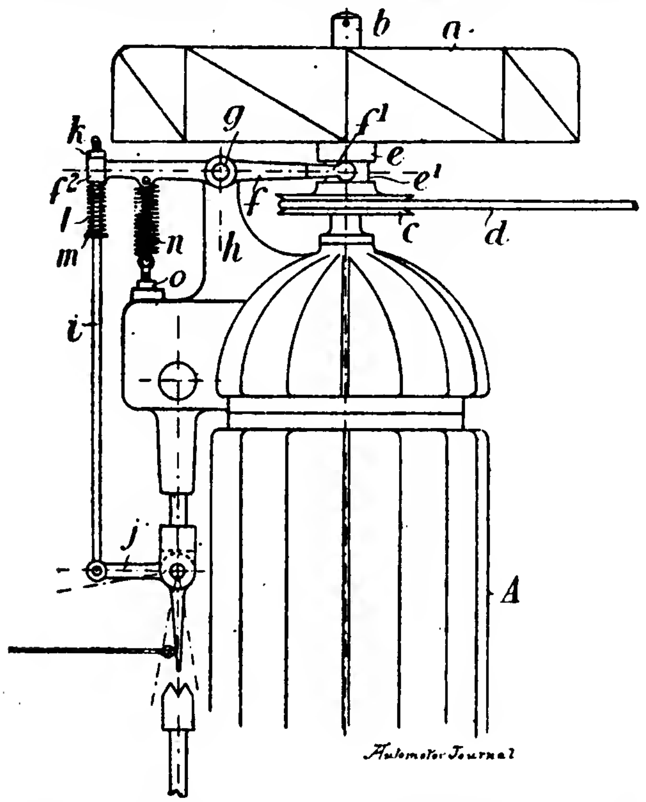


inward stroke atmospheric air will be sucked into the cylinder. The piston is hollow and is provided with valves at its forward or outer end, so that the air sucked into the cylinder upon the inward stroke will be compressed inside the piston upon the outward stroke. The back of the cylinder is employed as the combustion or explosion chamber, and the air from the interior of the piston passes into this space by means of a valve, and impinges upon the oil which enters the cylinder through the cylinder wall or back end or cover, thus spraying or vaporising it, and mixing the air and vapour so as to form an explosive mixture. The valve is adapted to be operated by a movable weight or pendulum inside the piston, arranged so as to obtain advantage of leverage whereby it will have sufficient power to open the valve against the pressure of the air, notwithstanding that the weight itself is a comparatively light one. To facilitate the opening of the valve there is a port or channel in the wall of the cylinder opening into a passage to the interior of the piston at a certain portion of the stroke, which would have the effect of approximately equalising the pressure between that at the back of the piston and the same side of the valve. This pressure would be somewhat less than that in the inside of the piston, so that when the valve was opened the pressure from the interior would rush through to the cylinder behind the valve, impinging upon the oil as already described, and raising that pressure to the maximum before the explosion. The difference between the two pressures being thus relatively slight no great power is required to open the valve.

In the piston is also another valve, which would serve to prevent the access of the pressure from the back of the cylinder to the underside of the former valve excepting when that was desirable, in which case it would be effected by means of the bye-pass. The object of this second valve is to allow the excess of pressure at the inside of the piston to reach the back of the piston when both valves are open.

6,753. Governing Steam Engines, Explosion Motors, and the Like. Frederick Richard Simms, Amberley House, 12, Norfolk Street, Strand, London. March 15th, 1897.

Relates to novel means for governing steam-engines, explosion motors, and the like. Instead of employing a centrifugal device actuated by the crank-shaft of the engine or motor, a fan is so mounted on a spindle, driven from the engine or motor, that it revolves with the said spindle, but is at the same time free to move



axially on the same. The boss of the fan is grooved, and one end of a lever, which controls the admission of steam, vapour, or air to the engine or motor, or the exhaust of the said engine or motor, engages in the said groove. The lever is provided with a spring, the tension of which may be adjustable, and which exactly counterbalances the tendency of the fan to move axially on the spindle when the latter is revolving at normal velocity. With this arrangement, when the velocity of the spindle rises above or falls below the normal, the fan moves axially on the spindle, thus regulating the supply of steam, vapour, or air to the engine or motor, or the exhaust of the same, through the medium of the lever.

567. Motor Road Vehicles. Louis Antoine Jules Tony Krieger, 168, Boulevard Malesherbes, Paris. January 8th, 1897.

Relates to improvements on Letters Patent 24,941 of 1896. The present invention relates, in the first place, to an improvement in the means for operating the steering apparatus, the object in view

FIG. 1.

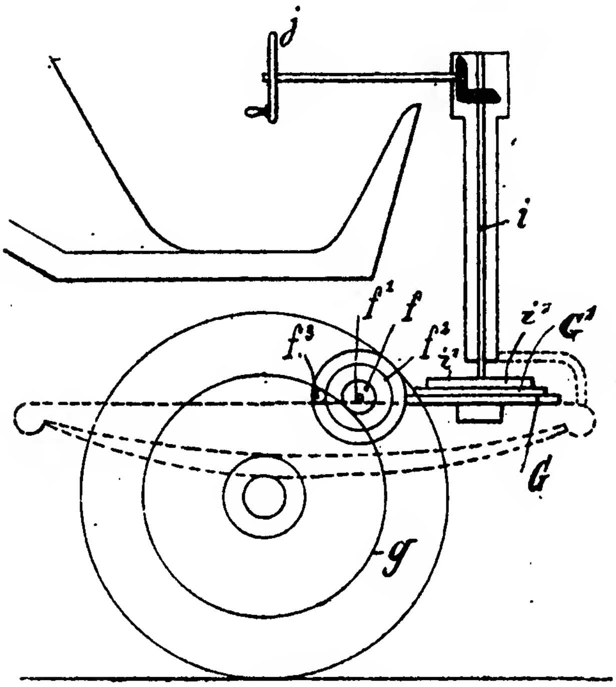
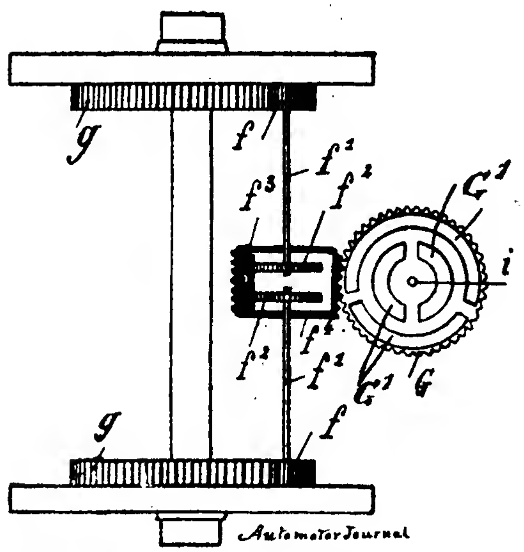


FIG. 2.



being to neutralise all action of the rear carriage upon the steering of the fore carriage; and, secondly, to the application of the invention to the case where the wheels of the fore carriage are mounted on pivots.

Figs. 1 and 2 thereof are respectively an elevation and a plan illustrating the improvement in the means for operating the steering apparatus. The pinions, *f*, which gear into the toothed wheels, *g*, rigidly fixed to the front wheels, are keyed on independent shafts, f^1, carrying at their other ends two small toothed wheels, f^2, of equal size. The latter gear into a long pinion, f^3, or into two pinions keyed on the same axle. The journals of this pinion or of this axle are carried by a box, f^4, which is provided externally with a worm, and revolves idly on the shafts, f^1. The worm gears into the plate, G, carrying the contact pieces, G^1, of the steering apparatus. If the ratios of the gears are suitably chosen, any difference in the speeds of the two driving-wheels will cause the plate, G, to turn, and the latter will be able to turn through an angle equal to the angle which the driver will have imparted to the handle. The spindle, *i*, carrying the rubbing contacts, i^1, is mounted to rotate in a suitable position, fixed in relation to the fore carriage, and it moves with the latter. It is provided at its upper part with two bevel pinions, that are driven by a horizontal shaft ending in a hand-wheel, *j*, situated in a vertical plane. The whole is supported in place by means of a tube that encases the spindle, *i*, and is fixed to the fore carriage.

In steering, instead of short circuiting the armature of one of the motors, the excitation of the corresponding field magnet may be increased either by increasing the number of the convolutions of its winding, or by applying an auxiliary excitation to its circuit. The arrangement of the steering apparatus is not altered in such cases, except that the field magnet circuits, and not the armature circuits, are connected to the apparatus.

A modified arrangement is described, in which the electrical apparatus may be applied not only to a fore carriage having a king-bolt, but also in those cases where the driving wheels are mounted on pivots.

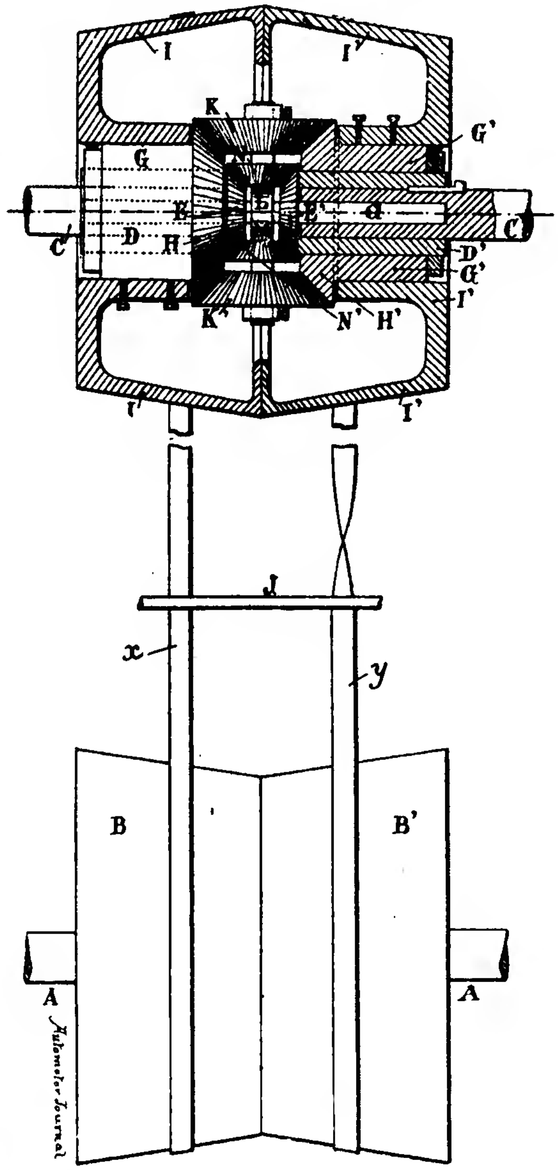
5,802. Differential Motion-transmitting Gear. Count Albert de Dion, Georges Bouton, and Frederic Chaplet, all of 12, Rue Ernest, Puteaux (Seine), France. March 4th, 1897.

On the crank-shaft, A, of the motor-engine two cone or bevel pulleys, B B^1, are keyed with their smaller ends adjacent or facing each other. The axle is in two parts, C C^1, connected together by an axial pin or pivot, *a*, entering axial recesses in the two parts of the said axle. On the adjacent ends of the two parts of the divided axle are rigidly-mounted bevel wheels, E E^1, and mounted loosely on the sleeves or bosses, D D^1, of these wheels are two other bevel wheels, H H^1, and on the bosses, G G^1, of these last-mentioned bevel wheels cone pulleys, I I^1, are mounted and secured by screws, the slope of which last-mentioned pulleys inclines in a direction opposite to that of the inclination of the pulleys, B B^1, carried on the motor-shaft. The cone pulleys, B B^1, are arranged opposite those, I I^1, on the axle of the vehicle, and passing round one of these pairs of cone pulleys is an open belt, *x*, whilst passing round the other pair of these pulleys is a crossed belt, *y*, so that the two pulleys, I I, on the axle, C C^1, of the vehicle are caused to revolve in opposite directions. In consequence of the respective pulleys sloping in inverse directions, variable rates of speed within the limits can be imparted to the two pulleys, and to the bevel wheels to which they are fixed, by shifting the straps or belts on the said pulleys by means of any suitable strap shifter, J, so as to move both straps or belts simultaneously.

Gearing with the bevel wheels, H H^1, are bevel wheels, K K^1, which are loose on a shaft or spindle, L, arranged transverse to the axis of the axle of the vehicle or driven shaft, and provided in its centre with an eye, M, through which the pin or pivot, *a*, connecting the two parts of the said axle or shaft is passed. On this transverse shaft or spindle, L, are also, loosely mounted, two equal pinions, N N^1, gearing with the bevel wheels, E E^1. By adjusting the position of the driving straps, *x*, *y*, on the conical drums or pulleys, I I^1, by means of the strap shifter, J, the said pulleys can all be caused to rotate at the same speed.

As the said drums or pulleys on the driven axle or shaft revolve in opposite directions, together with the bevel wheels, H H^1, keyed thereto, it follows that these wheels cause the wheels, K K^1, which are loose on the shaft, L, simply turn about their axes, the axle, C C^1, of the vehicle or the like remaining stationary, although the motor-engine is in operation at its normal rate of speed.

If the driving-straps be shifted so as to cause the pulleys, I I^1, on the two portions of the divided axle or shaft to rotate at different speeds, the wheels, K K^1, loose on the transverse shaft or spindle, L, will be caused to start a planetary motion about the pin or pivot, *a*, and carry with them the said transverse shaft, L. By this rotary motion of the shaft, L, in a plane perpendicular to the axis of the pin or pivot, *a*, the pinions, N N^1, which are loose on the said shaft, will act as a rigid key between the teeth of the wheels, E E^1, keyed on the axle, and will thus compel the said wheels to turn about their



axes, and with them the axle of the vehicle, and, consequently, the vehicle itself. If from any cause the resistance of one of the wheels should differ from the resistance sustained by the other wheel, this inequality of strains will simply cause the loose pinions, N N^1, to turn upon the said spindle without in the least interfering with the general motion of the conveyance.

The Automobile Club of France.—*Truth* says this club is about to move from the Place de l'Opéra to the Place de la Concorde. It has arranged to hire there one of the finest houses in Paris, that left to the Pope by the late Marquise de Plessis Bellière for a Nunciature. It was sold by auction for nearly £80,000. The internal decorations of this house are by the great artists of the eighteenth century. The walls and ceilings of a small salon were painted by Fragonard.

LAW REPORTS.

The Capsize of a Motor-Vehicle.—The record was closed in the Hamilton Sheriff Court on Friday, the 18th ult., in the action by James B. Struthers, clothier, Larkhall, against the Scottish Motor Omnibus and Car Company (Limited) for £2,000 for personal injuries. The averment is that in December, on the way from Larkhall to Hamilton, while pursuer was on one of the defender's motor-cars, it swerved and capsized, the pursuer being thrown violently on the road, and sustaining severe injuries. The defence is a denial, and that the damages are excessive. They tender £250. The case has since been settled on terms not made public.

Is Acetylene Gas Dangerous?—BOND AND COOPER *v.* THE MIDLAND CYCLE AND MOTOR-CAR EXHIBITION COMPANY.—This case was heard in the Nisi Prius Court, Birmingham, before Mr. Justice Kennedy, on the 23rd and 24th ult. The plaintiffs are cycle lamp manufacturers, of Handsworth, Birmingham, and brought this action against the Midland Cycle and Motor-Car Exhibition Company (Limited), to recover damages for breach of contract. The plaintiffs' case was that they entered into a contract with defendants on the occasion of the cycle exhibition at Bingley Hall to rent a stall for the purpose of exhibiting acetylene lamps. After using the stall for a couple of days the defendants requested them to remove the lamps on the ground that they were dangerous. Expert evidence was called, from which it was gathered that acetylene was not dangerous except from contact with water or when under exceptional pressure. Plaintiffs were awarded £15 damages, the jury holding that acetylene gas under such conditions was not dangerous.

TENTING'S PETROL OMNIBUS.

FOR many of the particulars relating to this petrol motor-omnibus, which is in successful operation between Nantes and Velheuil, we are indebted to our esteemed contemporary *La Locomotion Automobile.* This omnibus (*see* Fig. 1) weighs, when filled with 18 passengers, 6 tons. It presents several advantageous points, to which attention may usefully be drawn. The motor, with its system of pipes, transmission, and accessories, is placed in front of the vehicle. It consists of four cylinders, each of 140 mm. diameter by 220 mm. stroke, coupled direct to the crankshaft. This arrangement permits of an impulse at each semi-revolution of the shaft, and also tends to minimise vibration. The cylinders are provided with jackets, in which a measured circulation of water, stored in a box in the car, allows the lessening of the temperature of the cylinders. The working by the hot water system has given the best results, and the average consumption has not exceeded, so it is said, 250 grammes of oil, at the rate of 680 grammes of gasoline per H.P. per hour.

In the omnibus the motor attains to 16 H.P., or 12 poncelets. The ignition of the mixture of oil, gas, and air may be effected either by means of electricity or by an incandescent tube; and the essence, enclosed in a reservoir at the back, feeds the carbonator at a constant level, and suffices for a run of six hours without stopping. The escape-valve, shown on the drawing, is placed on the roof of the vehicle, so as to avoid all unpleasant smells. Mr. Tenting, satisfied with the results he has obtained with all his automotors by his system of transmission by friction, has retained it in this omnibus, and we understand the working is extremely well.

By manipulating one lever only the motor can be set in motion without jerking, and two speed gear permit of changing the speed at will, according to the winding of the road. The system of steering is specially remarkable by reason of the reliability of its action and the security it offers. Instead of steering wheels being placed in the ordinary way, a vertical support is bent in the form of C, in such a way that the axle in the plane into which the wheel turns is connected with the point of support taken on the ground by this wheel. An absolute firmness is thus obtained at all speeds, and irregularity in steering is thus rendered quite impossible.

FIG. 1.—TENTING'S OMNIBUS.

The mechanism is controlled by very powerful breaks, one of which, with a collar and a wheel and axle fitted on a box, of the differential motion, is worked by means of a pedal placed at the foot of the conductor.

The Tenting omnibus has already made numerous trials, which have been of the most satisfactory nature. In one of these trials, during the winter, it carried 22 people, conductor included, through muddy and sticky roads, at a speed of 20 to 30 kilometres per hour (12 to 18 miles per hour), and the hills were ascended with little difficulty.

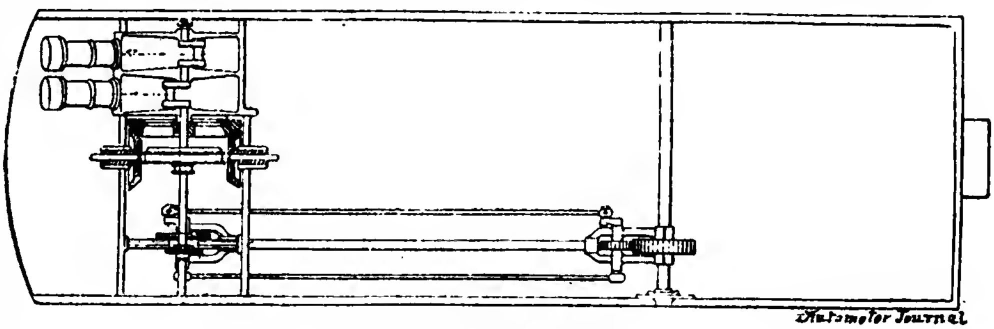


FIG. 2.—TENTING'S OMNIBUS.

It must be added that the tractive effort (and, accordingly, the consumption of petroleum) is regulated by the number of cylinders required. The entrance of carburetted air into one or the other of its cylinders is prevented by simply closing a cock. The Tenting omnibus seems well designed in every detail, and to be capable of rendering very good service—the more so, as the consumption of petroleum is very moderate. It would have been desirable that this vehicle had taken part in the last trials of Les Poids Lourds, where it would certainly have demonstrated its value in competition with the Panhard omnibus; but it is to be hoped that this is only deferred, and that Mr. Tenting will furnish proof of the superiority of his construction.

THE AUTOMOBILE CLUB OF GREAT BRITAIN.

A MEETING of the Committee of this Club took place on Monday, the 4th inst. The following, amongst others, were elected members of the Club:—The Right Hon. Viscount Templeton (Carlton and Marlborough Clubs), the Right Hon. Sir Richard Paget, Bart. (Carlton Club), H. J. Swindley, Esq., Baron d'Avernas-Salvador (Automobile Club de France), M. Oscar Gregoire (Automobile Club of Belgium), Captain F. E. Dyke-Acland (late R.A., Junior United Service Club), Professor Vivian Lewes (Royal Naval College, Greenwich), Alfred Suart, Esq. (Boodle's Club), M. Marc B. Rey (Automobile Club de France), Pryse Hamilton, Esq. (Royal Yacht Squadron), Percy W. Northey, Esq. (Constitutional Club), William Diggle, Esq. (Royal Yacht Squadron), J. Broughton Dugdale, Esq. (Wroxall Abbey, Warwick), Herr Max Meyer (Automobile Clubs of France and of Belgium), Alleyne Reynolds, Esq. (Sports Club), Arthur E. Greville, Esq. (Northampton County Club), R. E. B. Crompton, Esq. (Garrick Club), Herbert E. Greville, Esq. (Junior Conservative Club), Archibald Weir, Esq., M.A.

The meeting was followed by the monthly house dinner, at which Mr. Roger W. Wallace, Q.C., took the chair. Afterwards a discussion took place on "Motor Touring at Home and Abroad." A paper prepared by Mr. Frederick R. Simms was, in his unavoidable absence, read by Mr. C. Harrington Moore. Mr. Sturmey, Mr. Clarkson, Mr. Estcourt, and others took part in the interesting discussion which followed.

The Easter Tour.

THE Automobile Club of Great Britain is showing vitality and vigour.

The Easter tour on motor-vehicles has proved to be very successful, and all who took part in it are delighted with the result of the experiment. The tour was in no sense a race or competition, but a pleasure journey pure and simple. The company numbered about 30 gentlemen, including Viscount Bangor, Sir Somers Vine, Mr. Linley Sambourne (*Punch*), Mr. Roger Wallace, Q.C., Mr. Holland Tringham (*Illustrated London News*), Prof. Boverton Redwood, Mr. Worby Beaumont, &c., &c. The route, full details of which appeared in the March number of THE AUTOMOTOR, was through Guildford, Winchester, Chichester, Arundel, Littlehampton, Worthing, Brighton, Lewes, Uckfield, Tunbridge Wells, and back to London by Sevenoaks.

The following are a few particulars of the carriages participating in the tour:—

(1) *Mr. Frank Butler's Benz* ($2\frac{9}{10}$ H.P.), a pretty little carriage fitted with a hood, to carry two people, behaved badly at first by stopping in St. James's Street, but overtook the remainder of the carriages at Esher, and, except for a twisted axle owing to tram lines at Southsea, ran well throughout the remainder of the tour.

(2) *Mr. W. M. Hodge's char-à-banc*, which is built by the Motor-Van and Wagon Company, is handsome and comfortable. Bad luck attended this vehicle's engines during the earlier stages of the tour, but not sufficiently to prevent its carrying out each day's programme. It carried six persons throughout the tour.

(3) *Mr. Instone's wagonette* (built by the Daimler Motor Company) also carried a party of six, and showed splendid qualities until the last day, when it was troublesome for awhile, but eventually ran up from Tunbridge Wells to London in fast time.

(4) *Mr. Herbert Capel's Coventry motette* (with Mr. Thomas Clarkson as passenger) showed very good pace throughout the tour.

(5) *Mr. Carter's Bollée voiturette* only joined the tour here and there, as the distances set out in the tour programme were not sufficiently long to satisfy the ambitions of the owner. The voiturette was seen at Winchester on Saturday morning and at Worthing on Sunday night, having in the interval run to Bournemouth and from thence, viâ Southampton, to Worthing.

(6) *Mr. Hewetson's Benz* ran as far as Brighton, where it left the tour route and returned direct for London.

(7) *Mr. Harrington Moore* accompanied the vehicles in his *Hurtu* sociable as far as Esher.

(8) *Mr. Estcourt's Daimler* did not behave well after Worthing, but completed the whole tour.

(9) *Mr. Heyerman's Mors carriage*, with its four cylinders, attained great velocity. This carriage also left the tour route at Brighton and went to London direct

(10) *The wagonette* hired for the Club was a well-known *English Daimler* which has run some 6,000 miles. The carriage ran up from Brighton on the day of the start and throughout the tour behaved admirably until Tunbridge Wells was reached, where a valve required some attention. But as soon as this was put right she ran through to London in capital time.

(11) *Mr. Armstrong's Coventry motette* accompanied the tour only as far as Winchester.

(12) *Mr. Buttemer* only entered his *Benz* for the run from Guildford to Cosham, and the carriage covered this distance excellently.

(13, 14, and 15) *Mr. Edge's Coventry motette* and two *de Dion tricycles* ran from Fareham to Chichester in splendid time.

(16) *Mr. House's steamer* ran up from Southampton on Good Friday, met the tour at Alton, and accompanied it to Worthing, working extremely well.

(17) *Mr. Tinne's Daimler* ran from Brighton to Tunbridge Wells, but was not very lusty.

(18) *Mr. Eyre's* large *Benz*, which ran from Hastings to Crowborough, was not entered for the tour, but joined it for the run from Uckfield to Crowborough.

It will be seen that six carriages completed the whole tour route and that three others left it at Brighton, while in all 18 motor-vehicles took part in it.

The complete journey was about 221 miles. The Club is to be congratulated that this the first organised pleasure tour on motor-vehicles has been carried out without accident and with such eminently satisfactory results.

It is contemplated to organise a further tour in the Eastern Counties at Whitsuntide, and to make arrangements for members who have not motor-vehicles to have seats in carriages to be secured by the Club. It is further intended to have "evening runs" for dinner at various hotels within 15 or 20 miles of London.

Motor-Car Machinery.*

MOTOR-CAR machinery may be taken to cover all the mechanical appliances on a motor-car, and the purpose of this paper is to promote a general discussion upon motor-car machinery; but in the short time available to the opener there will be more than sufficient subject-matter if the paper is confined to the propelling machinery of motor-cars.

It was pointed out at our last meeting that past inventions should not be ignored by the modern motor-car designer. The most successful of past inventions is the horse, and there is, perhaps, a danger of ignoring the peculiar features and excellences of its propelling machinery, which make the horse so difficult a motor to supersede. The horse can, without any change of gear, alter its pulling force to anything from zero up to 700 or 800 lbs.; there is no immediate trouble in getting rid of the products of combustion; all the machinery and bearings are most efficiently encased and protected against dust; and vibration does not cause it to leak at the joints. If, instead of ignoring these good points, the constructor carefully studies them, they may all be realised and embodied in the tireless motors that it is our business and desire to improve.

An engineer starting out to design the propelling machinery of a car has first to select the form of potential energy of propulsion that he can best employ. It may not be necessary to point out that the best form of potential energy for a particular service will depend upon the conditions. For example, if oil is obtainable in a particular district, and electricity is not to be had without putting down special plant for its generation, he would probably decide upon oil if satisfied as to the efficient working of the means available for its utilisation.

The forms of potential energy at present available are practically limited to fuels—solid, liquid, and gaseous—compressed air, and electric storage batteries. A few words on each may not be out of place, and first as to fuels.

The energy that is locked up in fuels is got out and made evident

* Excerpt of paper read on March 21st by Mr. T. CLARKSON, A.M.I.C.E., before the Automobile Club, London.

by burning it, but the burning may be conducted in a variety of ways. Solid fuel may be consumed as on an ordinary grate, or it may be pulverised and then delivered automatically by a mechanical device along with a regulated air-supply, and then burnt in the combustion chamber—or its active chemical parts may be previously converted into a gas before it is burnt. Solid fuel was the source of power in nearly all the "past" inventions, that it may still satisfy some people if they do not mind occasional smoke, sulphurous fumes, clinkers, and more or less irregular firing. The title liquid fuel covers all combustible oils and spirits, but commercial considerations practically limit it to the lighter mineral oils or volatile essences—ordinary lamp oil of domestic use—and the heavy residues from the refinery. These three severally require different treatment for their complete combustion. The heavy residue is the cheapest form, and may do for some of the heavier types of car, but is not likely to come up to the standard of cleanliness and silence in operation that is required in a pleasure car. Therefore, the choice of fuel for lighter traffic practically rests between volatile mineral spirits and ordinary domestic lamp oil. The former burns readily, either inside or outside of an engine, as practically the whole of it is volatilised at a temperature of only 60° F. The ordinary lamp oil is more complex in its combustion; if a little of it is boiled and ignited in a water-jacketed saucepan it would burn for a time and then go out, and, however vigorously the surrounding water may boil, the oil that remains cannot be ignited until it is heated to a much higher temperature, either over an oil bath or directly over a flame. This demonstrates that the oil is not a homogeneous substance, but that it is really a mixture of oils of different degrees of volatility, and this fact, doubtless, accounts for the unsatisfactory results that have sometimes been obtained especially in internal combustion engines. This oil can, however, be consumed completely without smoke, smell, or noise in a suitably-designed burner, and giving either a luminous or a bluish flame, the heat being utilised either to generate steam or, when the appliances are improved, for the direct generation of electricity.

Lamp oil is much safer than the more volatile oils now commonly used; it is about half the price and can be obtained anywhere. Very much could be written on this burner question, but as it is only one detail I am obliged to pass on to the others.

Gaseous fuel is clean, but does not give the potential energy in a very concentrated form, and supplies of compressed gas are not generally obtainable. The same remarks apply to compressed air.

Electric energy is very desirable in many ways, but it will not be suitable for general purposes until charging stations are abundant all over the country, even when the accumulator leaves nothing more to be desired.

It must not be forgotten that there is a reciprocal influence between the design of car and type of machinery best suited for it. In some cases, as in a van, it is easy to remove the products at the top, but for a pleasure carriage I have doubts whether anything in the nature of an uptake, even when disguised by a hood or canopy, would be taken kindly to by the public. It is obviously the most natural way to remove heated air at the top as it always tend to rise. If an uptake is considered to be an eyesore the products can be removed downwards, but at the expense of a superior impelling force which may sometimes fail and cause trouble. It is useful to remember the old saying that "Nature is only conquered by obedience," and the tastes of both designers and users of cars need to be developed in the light of this truth.

A word on the internal combustion engine. It is simple, there is no boiler or stoking, and this has appeared to many to supply the shortest cut to the building of a motor car. Further consideration of the power conditions on a motor-car reveals that the principle of intermittent impulses is about as unsuitable as anything can be, and the unsuitability is not diminished by the fact that the engine must be kept running at nearly full speed all the time, and cannot be started from the seat. It is easy to point out what has been done by this type of motor notwithstanding these unsuitable conditions, and this I fully appreciate, but all the same I do not regard this as the ideal type or as representing finality of design.

Furious Motor Cycling.—John Wilson Taylor, of Weybridge, was fined £5 at Chertsey Petty Sessions, on the 13th inst., for furiously driving a motor-cycle on the highway. A police inspector said that the motor was being driven at a rate of 18 miles an hour. When asked how he arrived at the speed, the inspector said he was riding a high-geared cycle, weighing only 25 lbs., and could not catch the motor.

REVIEWS OF BOOKS.

"The Contour Road Book of England." By HARRY R. G. INGLIS. (London: Gall and Inglis, Paternoster Square, 1897.) Price 2s.

WITH the extension of cycling and locomotion by motor-vehicles, there has arisen a desire to know something of the nature of the roads and districts traversed. It is a striking instance of the degrading influence of animal traction and the cultivating and refining influence of mechanical traction upon mankind, that whereas our forefathers, who travelled by mail coach, knew little and cared less about local geography, those who employ cycles and motor-vehicles exhibit a keen and intelligent interest in not alone the roads but in the surrounding country. Formerly travellers were content to know that the next stage was so many miles off, and that the road was good and the hotel accommodation likewise. Nowadays we require to know distances and gradients of roads, climate, scenery, and industrial capabilities of districts. With this knowledge we convert what would otherwise be an uninteresting peregrination into an educational influence of great value. Road books and maps have now reached a point of considerable excellence, but hitherto little has been done in contour mapping, information of a reliable nature about gradients being difficult to obtain. Local surveyors in many cases regard such information in the light of a State secret. Thus we ourselves recently had occasion to learn something of the gradients in and around Liverpool, but on application, the local or municipal surveyor actually could not supply it unless be was directly instructed to do so by the Liverpool Town Council! Needless to say we did not trouble that august body, but got the data from another source. In a really civilised town the geography of each street would be verbally and graphically exhibited at each street corner. Thus a traveller would see at a glance the direction, length, breadth, grade, paving, and general topography of a street and district. Although this municipal improvement is not yet likely to be realised, not even by such an advanced body as the London County Council, private enterprise is helping to disseminate such useful information. Thus in France the Automobile Club exhibits such notices on boards; the Cyclists' Club and the British Automobile Club are also working in the same direction, and now Mr. Inglis has compiled, evidently at great pains, a series of small handbooks, which enable the intending visitor to obtain all the necessary local geographical information and arrange accordingly. Thus for each town a short description is given of the roads and their gradients; then follows a table with distances from surrounding towns. The principal objects of interest and the very important information relating to hotels are also stated. Each route is graphically illustrated by contour sections. This is a very decided and welcome addition, and greatly enhances the value of the book. Unfortunately, the scale adopted is too small: thus the abscissæ are spaced ¼-inch to the mile, and the ordinates are ⅛-inch to 1,000 feet. Such scales are much too small for scientific automobilism, but no doubt useful enough to cyclists. The great merit of these charts is that they convey by a glance the nature of the route, and that without any study or special knowledge. Altogether, the work is one of distinct value, and we can cordially recommend it.

Transactions of the American Institute of Electrical Engineers.—The issue for January contains some valuable papers, the principal being one by Mr. Richard Lamb on "The Development of Electric Cableways." This is a form of automobilism little known in this country, and only of recent growth in the States. As a means of effecting cheap transport in new countries this system has much in its favour. It differs from ordinary telo-dynamic transmission in that each trolley or carriage carries its own electric motor. According to the paper this system consists of a carriage with grooved wheels in tandem that move upon a cable or suspended trackway. From this carriage is hung a frame pivoted to the carriage so that it can maintain a vertical position regardless of the grade of the track. This frame holds an electric motor, preferably of an iron-clad cylindrical type. The motor is geared to an elliptically grooved sheave. A steel cable is wrapped around this sheave two or more times, and is anchored at both ends. For the sake of economy in conductors the upper or bearing cable is insulated from the lower or traction cable, and is used to carry the electric current. The carriage is insulated from the suspended frame and motor. An insulated wire is attached to the carriage and conveys the current to the rheostat. The other pole of the rheostat is connected with a convenient part of the suspended frame. The rheostat is designed to control the speed and reverse the current. A circuit-breaker is put in circuit. The current from the generator passes along the bearing cable to the carriage, thence through the insulated wire, through the rheostat, through the motor, to the frame of the motor, thence through the traction cable back to the generator. The paper is very full of detailsland is worth study. "Sparking, its Cause and Effects," will appeal to those in charge of dynamos and motors, and also to those engaged in running electric motor-vehicles. But should a properly designed dynamo spark at all? There is also an interesting but not very instructive paper on "Wireless Telegraphy," in which the Marconi, or, as we prefer to term them, the Hertzian, experiments of electric pulsations are described.

Der Motorwagen Zeitschrift des Mitteleuropäischen Motorwagen-Vereins.—Automobilism in Germany has progressed sufficiently to warrant the issue of a journal devoted to its interests, and we cordially welcome this latest addition to our library on the subject. The first number contains illustrations and descriptive matter of various Benz vehicles, electric cabs, electric railway carriages, &c., and is well printed on excellent paper. It is published monthly in Berlin, by Druck von Pass and Garleb, and its price is 1·50 marks.

Revue de Méchanique.—This high-class publication is as usual replete with good matter. The January number contains an excellent essay upon turbines by M. Flamant, the theoretical analysis being very complete. The practice in the design and cutting of teeth, as prevailing in England and the United States, is described by M. Lecornu, who points out that the American methods are in many respects better than those prevailing on this side. Just now the question of superheating is attracting the attention of engineers, and M. Sinigaglia contributes an article on the subject. This is followed by an excellently illustrated article by M. Camille Roche, describing the machinery of the French battleship "Brennus." M. G. Richard discusses the various applications of gas and oil motors. For pumping and irrigation work these are largely superseding steam-engines. Light oil-motors are most successfully applied to fire-engines, but, needless to say, our London County Council Fire Brigade is not alive to the advantages of this new method of obtaining increased efficiency. Petroleum (heavy oil) motors are also used in operating mechanical ploughs. The motor is of 12 H.P., and runs at 420 revs. per minute. The Howard and Bousfield portable motor is also described. We learn, too, that oil-motors are most successfully employed on board lightships for compressing air for the fog-horns or sirens, while in small craft it is much used, as is well known, in propulsion. The article is well worth perusal by automobilists. There is a good description of a duplex petrol-motor for vehicles. This we shall reproduce in our next issue.

In the February number the principal articles of interest to our readers are one on "Turbo Machines," by M. Rateau, and one on "Mechanical Traction," by M. Barbet; in the latter the various systems of compressed air for tramways are described and discussed.

The Engineering Magazine.—The number for March contains, among other matter, a useful article on "The Economical Utilisation of Exhaust Steam" in which the merits of condensers are examined. This article being by Mr. Bryan Donkin, it is needless to say that the subject is most scientifically examined, but while the learned author describes jet, surface, and air and water surface condensers, and discusses their respective merits, he does not tell us how to solve a problem that is now occupying very largely the attention of many readers of THE AUTOMOTOR, viz., How to condense the steam from the exhaust of steam motor-vehicles. We would suggest to our contemporary that an article from Mr. Bryan Donkin on this subject would be extremely welcome.

Nautical automobilism is treated by Mr. Jas. McKechnie, the engineer-in-chief of the naval shipbuilding firm at Barrow, in the shape of an article entitled "Shipbuilding as a Productive Industry." This is copiously illustrated. The author takes a rather pessimistic but, we think, justifiable view of the industry in this country. Say what we may about the evil results of strikes, it is out of the question to expect working men to cease to agitate for higher pay and shorter hours. We all strive for this. Mr. McKechnie speaks of British mechanics being driven to foreign employment through the "unscrupulous exactions of trade unionism." There is no doubt a great deal of tyranny exercised by these bodies towards members of their own class, but it is not likely that a trades union will ever exercise a preponderating influence on all industry to the extent of making all the workers join it and obey its behests. It is now recognised by leading economists that the influence of a trades union is strictly limited, and as education becomes more disseminated among working men the limitations of trade unions will be more apparent.

"The Construction of Slow-Burning Buildings" is rather *apropos* in the light of the recent City fire. "British Railway Fares" is an exhaustively discussed subject by Mr. W. J. Stevens, and may be read with advantage by travellers and shareholders. "The Development of Metal Stamping" is a most useful article and one which appeals to automobilists who are particularly interested in associating lightness and strength. Needless to say, metal stamping has been brought to its present state of perfection mainly by the efforts of American engineers. We have, however, led the way in the production of heavier stampings. Thus the Leeds Forge Company press or stamp out all the framing of railway wagons and carriages, and no doubt this enterprising firm will devote its attention to the stamping of frames for motor-vehicles when these latter shall have become "selected" into distinct types.

CATALOGUES.

WE have received from MM. Th. Cambier et Cie., of Lille, a neatly got-up catalogue and price list of their motor-vehicles. This firm manufactures 10 distinct types of vehic'e, and the motor is either a one, two, three, or four-cylinder one, according to the power required. Light petroleum (petrol) is used as the source of energy. According to the illustrations which are given, the light vehicles seem to be rather elegant, but the heavy ones do not err in this direction.

THE FLYING CHARIOT.—Under this somewhat ambitious title Messrs. W. H. Dunkley, of Birmingham, who manufacture nearly everything connected with automobilism, have issued a catalogue descriptive of their perambulators and bassinettes (which can hardly be designated as flying chariots) and cycles. Not being in the position to utilise the domestic "pram" we can only judge of Messrs. Dunkley's specialities in this direction by taking feminine opinion. Having conscientiously done so we are pleased to say that they are all that the fondest mamma and the most captious nursemaid could desire. As regards the cycles we are on firmer ground. The designs seem to be very good, especially those of the delivery cycles, which are now becoming so much used by shopkeepers and others.

IVEL CYCLES.—Mr. Dan Albone, of Biggleswade, Beds, is a well-known cycle manufacturer who more than holds his own, in spite of the fierce competition that prevails. His models are characterised by lightness, elegance, and strength. His catalogue is well illustrated and his prices remarkably low.

WE have so fully described the advantages of roller bearings in our pages, particularly the system as fitted by the Roller Bearings Company, that we need say little more than that this Company has lately issued a well-got-up catalogue illustrating the various uses to which roller bearings are applied. These include vehicles of all descriptions, and generally all kinds of shafting. Railway companies, generally the most conservative of institutions, are slowly adopting roller bearings, while the Liverpool Overhead Railway is fully equipped with them. The address of the Roller Bearing Company is 1, Delahay Street, Westminster, S.W.

WE have also received:—*The Journal of the Society of Arts, The Indian Engineer, Industries and Iron, The Practical Engineer, Coach-Builders' and Wheelwrights' Art Journal, The Journal of Acetylene Gas Lighting, Knowledge, Machinery Market Review, The London Chamber of Commerce Journal, Indiarubber World, Cyclist, Scottish Wheel, Irish Field, The Yachting World, The Engineering Magazine, La Revue de Méchanique, La Locomotion Automobile, La France Automobile, L'Industrie Vélocipédique et Automobile, L'Automobile Illustré, Les Sports, L'Energie Électrique, Der Motorwagen, Samokat, Horseless Age, American Wheelman, The Motocycle, Australasian Coach-Builder and Saddler,* &c., &c.

CORRESPONDENCE.

*** *We do not hold ourselves responsible for opinions expressed by our Correspondents.*

*** *The name and address of the writer (not necessarily for publication)* MUST *in all cases accompany letters intended for insertion or containing queries.*

*** *Correspondents are particularly requested to write on one side of the paper* ONLY, *to place the subject of their letters as a headline at the top of the sheet, and their names and addresses at the foot. Attention to these matters saves much time and ensures the insertion of the letter.*

THE PRICE OF PETROLEUM.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

SIR,—In your AUTOMOTOR POCKET-BOOK, p. 105, you give prices of oils. We should be glad if you can give us names of firms who can supply us with Royal Daylight or American Ordinary at the prices named. We cannot buy as low at present in this neighbourhood.—We are, yours faithfully,

THE LANCASHIRE STEAM MOTOR COMPANY,
Leyland. F. J. P., Secretary.

[The prices quoted by us are fair average values. We have ourselves purchased in Liverpool petroleum by the barrel at something like 3½*d.* per gallon. We would recommend you to apply to the Anglo-American Oil Company in Liverpool. This Company quotes us as follows:—Tea rose, ex-wharf, in own tanks, 4*d.*; in barrels, 4¾*d.*; allowance for empties, 4*s.* 4*d.*; which makes the price 3½*d.* per gallon.—ED.]

THE DAIMLER MOTOR AND WHO SUPPLY IT.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

SIR,—I shall be glad if you will kindly insert the annexed correspondence under the above heading in the next issue of your JOURNAL. In making this request I take the opportunity of stating that not only is my Company able to supply Daimler motors ranging in size from 2 to 10 H.P., but it is *the only Company manufacturing Daimler engines in this country*, other suppliers either procuring from us or importing under certain conditions from the Continent. The motors manufactured at my Company's well-known Coventry works are of British workmanship and materials throughout, and embody all the most recent improvements, except such as have not yet passed the experimental stage.—I am, yours faithfully,

ERNEST M. C. INSTONE, Secretary.

Daimler Motor Co. (Ltd.),
219 to 229, Shaftesbury Avenue, W.C.,
April 2nd, 1898.

[Correspondence enclosed.]

The Secretary,
The Motor Carriage Supply Co. (Ltd.),
Donington House, Norfolk Street, W.C.

Dear Sir,—The attention of my Board has been called to your letter of the 23rd ult. to the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL, which, together with copy of its enclosure, appears in the current number of that paper.

I am instructed by my Board to point out to you the inaccuracy of the statement in your letter to Mr. Wrightson, which is to the effect that he will find there is no firm besides yourselves able to supply Daimler motors of 4, 6, 8, and 10 H.P. As my Company is in a position to do this, I am directed to request you to withdraw the statement referred to as publicly as it has been made.—Yours faithfully, (Signed) E. M. C. INSTONE, Secretary.

March 22nd, 1898.

E. M. C. Instone, Esq.

Dear Sir,—We are in receipt of your letter of the 22nd inst., pointing out that a statement made by us in a letter to Mr. Wrightson that we were the only firm in this country who can supply Daimler motors of 4, 6, 8, and 10 H.P. is inaccurate.

If your Company are manufacturing motors of more than 4 or 6 H.P., we need not say that we regret if we have been misled into making a statement which is inaccurate so far as your Company is concerned. We shall take the earliest opportunity of rectifying the error, and shall have no objection to your giving what publicity you wish to this letter.

We may be excused if we have fallen into an error, inasmuch as we do not remember having seen any price list or circular of your firm referring to any motor-vehicle of more than 4 H.P. ready for delivery.

We are interested to hear from you that you are prepared to supply 10 H.P. vehicles, and would like to know within what period you could deliver, as we have ourselves numerous enquiries for vehicles of this capacity for immediate delivery.—We are, yours obediently, (Signed) E. E. LEFEBURE, Secretary.
For the Motor Carriage Supply Co. (Ltd.).

March 23rd, 1898.

E. E. Lefebure, Esq.

Dear Sir,—I placed your favour of the 23rd inst. before my Board, at a meeting held on Thursday last, and am instructed to inform you that my directors accept with pleasure your expression of regret, and appreciate your kind promise to take the earliest opportunity of rectifying the statement complained of.—I am, yours obediently, (Signed) E. M. C. INSTONE, Secretary.

March 26th, 1898.

AUTOMOBILE CLUB DE BELGIQUE.

À Monsieur le Rédacteur AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

MONSIEUR,—Nous vous serions obligés de bien vouloir insérer dans votre estimable journal l'information suivante :—

La course Bruxelles-Spa, qu'organise l'Automobile Club de Belgique pour les 25 et 26 juin produit à l'étranger un vif mouvement de curiosité. Sir David Salomons, le promoteur du mouvement automobile en Angleterre, a offert à l'Automobile-Club un prix de 500 francs destiné aux concours qui suivront la course à Spa. Ceprix sera décerné à la voiture la plus élégante et laplus comfortable parmi celles qui auront été inscrites. C'est la une heureuse idée, car l'on a souvent reprobé aux voitures automobiles leur aspect disgracieux, et il est bon d'encourager également les efforts des constructeurs danz cette voie.

Veuillez agreer, Monsieur le Rédacteur, avec nos remerciements, l'expression de nos sentiments distingués.—Pour le Comité Directeur,

Le Secrétaire Général,
COMTE F. DE VILLEGAS DE ST. PIERRE.

14, Place Royal, Bruxelles.

THE "DAILY NEWS" AND THE TRANSMUTATION OF METALS.

To the Editor of THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

SIR,—On p. 141 of your January number you very rightly condemn the opinions of the daily Press on scientific matters as usually erroneous and misleading. But in the course of your remarks reference is made to some statements in the *Daily News* under the heading of "Transmutation of Metals," and you state that this paper has been "had." If, however, you refer to Professor J. J. Thomson's paper on the Cathode rays in the *Philosophical Magazine* for October, 1897, you will see that he considers that *all* matter is broken up into particles of the *same* substance by these rays, which particles may recombine to form *any* other substance.

We have, then, the possibility of not only converting silver into gold, but anything else into gold, under suitable conditions. To prevent any of your readers from investing in a plant and setting up a gold factory, it will be well to mention that Professor Thomson also says that the coil he used, "if kept working continuously for a year, would only produce about one three-millionth part of a grain of altered substance," which, of course, might not even be gold.

It is probable that his remarks have been well magnified by a double passage across the Atlantic, hence the article in the *Daily News*.—I am, &c., H. H. FRANCIS HYNDMAN.

Trinity College, Cambridge,
February 26th, 1898.

THE BICKFORD PETROLEUM BURNER.

To the Editor of The Automotor and Horseless Vehicle Journal.

Sir,—Having been from the first number a constant reader of your most valuable paper, and seeing how vital the question of what means shall be adopted to raise steam so as to give the best result, I feel anxious to add my little word, so as to help some who are undecided what means to adopt. We have a boiler at work: the dimensions are these:—Vertical, no tubes, holds 40 gallons of water. Now, in the usual way we use coal; it took us 45 minutes to raise 40 lbs. steam from cold. Now, having a desire to use petroleum to get up steam, we applied to the firm of Bickford and Co., Camborne, Cornwall, for one of their burners, which they sent on approval. We have given this burner six weeks' severe testing, and we have found it to work without trouble. My son, 13 years of age, has on several occasions entirely started this burner and raised 40 lbs. of steam in the above boiler in 25 minutes. Now, I affirm that this proves that petroleum, if properly applied, gives off a very great deal more heat than fire from coke or coal in the same class of boiler.

Trusting these few remarks *re* oil fuel may be of some service to your many readers in directing them to a firm who can supply them with an oil apparatus capable of doing the work they require.—I remain, yours very truly, H. Evans.

Worcester, *March 17th*, 1898.

[The experience of our correspondent is useful as confirming the well-known superiority of petroleum as a fuel when properly burnt. On p. 104 *et seq.* of The Automotor Pocket-Book will be found a very full account of the heating values of various fuels and descriptions of petroleum burners.—Ed.]

CYCLE GEARING.

To the Editor of The Automotor and Horseless Vehicle Journal.

Sir,—What is meant by a cycle being "geared to 60," and how can I find out how far my machine will go in one revolution of the crank? I never see practical rules given in the cycling papers which contain mostly gossip and "records." I have also looked up "Modern Cycles," by Wallis Tayler, but do not find the information. I have tried a cyclometer but find it unreliable. A reply in your next issue will oblige your subscriber, A. Jones.

Stratford, E., *March 31st*.

[The figure denoting the gearing gives the diameter of a wheel which bears the same ratio to the driving wheel as the crank wheel does to the hub wheel. Thus, suppose a hub wheel has 10 teeth and the crank wheel 25, and that the diameter of the driving wheel is 28 inches, then this relation obtains—$\frac{10}{25} = \frac{70}{x}$, whence $x = 70$, and such a machine is said to be "geared to 70," the 70 being the diameter of a wheel which has the same ratio to the driving wheel as the crank wheel bears to the hub wheel. In order to find out how far the machine will go during one revolution of the crank multiply the number it is geared to by π (3·14), thus $70\,\pi = 219{\cdot}8''$ = 18·3′. Another rendering of this rule is—multiply the number of teeth on crank wheel by circumference of driving wheel and divide by teeth on hub wheel. Cyclometers as at present made are of little practical value; they are mere toys, and useless for accurate work.—Ed.]

FLY-WHEELS FOR MOTORS.

To the Editor of The Automotor and Horseless Vehicle Journal.

Sir,—I note your reply to my letter in this month's Automotor, *re* the weight of oil-motor fly-wheel. I do not see why, if the French find a lighter fly-wheel answer, one should use a wheel as heavy as a French motor and fly-wheel together, especially considering the fact that it does not matter how irregularly the motor runs (as long as there is no fear of it stopping) when *out* of gear, and when *in* gear the momentum of the car would carry the engine over compression stroke without a fly-wheel at all. What would be the largest ratio of maximum to minimum speed per cent. allowable? I understand that the Daimler motor has an open water-jacket. This system has many advantages, but what are its disadvantages? The temperature could not rise above 212° F., but could the piston be kept properly lubricated at this temperature?

I cannot find any reference to an air-condenser in the March issue. Was it omitted? Thanking you for your previous answers.—Yours, &c., B. A. Payne.

Netley, Old Christchurch Road, Bournemouth,
March 28th, 1898.

[We are always pleased to answer questions on technical matters, but we cannot be expected to act as a consulting engineer in regard to machinery we have never seen and whose features of design we are unacquainted with. We also do not see why, if the French find a lighter fly-wheel answer, one should use a wheel as heavy as a French motor and fly-wheel together. It depends entirely upon what one requires. If you want uniform power, then a heavy fly-wheel such as we mentioned is necessary; if large fluctuations in power and speed are not undesirable then French practice is permissible. Our correspondent must bear in mind that in the very light French motors to which he refers the vehicle is relied upon to act as the fly-wheel. The momentum of the car does *not* carry the engine over the compression stroke, but the kinetic energy stored in the car *does*—a dynamical error very often made. It is quite out of the question for us to say what would be a permissible variation of speed. You had better consult a good engineer. There are no disadvantages in an open water-jacket; on the contrary, the Daimler system is good, and their water-jacket constitutes an excellent feature. The piston can be well lubricated at far higher temperature providing a good mineral oil of high flash-point is used. Owing to pressure of space the article on air condensers was crowded out in our last issue. It, however, appears in this. Our correspondent will find much valuable information in Grover's "Modern Gas and Oil Engines."—Ed.]

THE STEERING OF MOTOR-VEHICLES.

To the Editor of The Automotor and Horseless Vehicle Journal.

Sir,—In one of your recent issues you stated that the pivoted wheels carried in forks on the front of most motor-cars should always be normal to their respective radii of the curve in which the vehicle is turning. Can you tell me what kind of gear permits this to be done. Do you recommend forked wheels?—Yours truly,

Glasgow, *March 19th*, 1898. A. Adamson.

[Ackermann's and Bollée's steering gear fulfil this condition better than any we know of, but we do not think they comply with it for all curves. Forked wheels are undoubtedly the proper things to use, as they do not diminish the stability when turning. They require, however, to be strongly fixed, as in turning they are liable to be severely stressed.—Ed.]

CROWDUS STORAGE BATTERY.

To the Editor of The Automotor and Horseless Vehicle Journal.

Sir,—In reply to your remarks in your last issue (p. 236), I beg to inform you that I hold the British and foreign patents of this invention, and enclose data for your perusal. I last week received some cells from Chicago, which have been charged by, and are now with, Messrs. Cathcart and Co., Dorset Buildings, Salisbury Square, and they have my instructions to allow you or your engineer to test them whenever you wish to do so. After practical tests you may have a good opinion of this invention.—Yours truly,

John T. Bowden.

City Carlton Club, St. Swithin's Lane, E.C.,
March 23rd, 1898.

P.S.—If you refer to the *Electrician* of last week (p. 682), you will find a description of this battery.

[From the reports, &c., accompanying the above letter, we gather that a Crowdus cell, weighing but 8 lbs. complete, has a capacity of 75 ampère hours at a 10 per cent. rate of discharge—*i.e.*, for 10 hours it will give practically a constant current of 7·5 ampères at, we presume, a constant E.M.F. of 2 volts. One of the best-made British cells we know of, weight 8 lbs. complete, has a capacity of 30 ampère hours—*i.e.*, it will give, at a 10 per cent. rate of discharge, 3 ampères for 10 hours. In other words, the Crowdus cell is, other things being equal, two and a half times better than the

British cell. Again, according to the report of Mr. Jas. K. Pumpelly, "the 100 ampère-hour battery (we presume cell is meant) weighs but 14 lbs., and will give an output of 20 ampères for 4 hours, or 15 ampères for 6 hours"—that is, this 14-lb. cell has a capacity of 90 ampère hours, or 180 watt hours. A very well known British cell, much used in traction work, with a capacity of 100 ampère hours, weighs 35 lbs. Hence the Crowdus cell is again practically more than two and a half times better than one of the best British cells; or, if not two and a half times better, it is, at any rate, but two-fifths the weight of one of the best British cells. We are then told: "These batteries have been at work for months in propelling delivery wagons in Chicago six days a week, in all kinds of weather, and over the worst streets in the world, while under the control of drivers whose main desire was to finish the trip in the most rapid time possible; and, in fact, two delivery wagons of the Chicago Silk Store have been running daily since June last over these rough streets, and making runs of 30 to 42 miles daily, with stoppages averaging three to a mile; besides which, light carriages have been going constantly daily for the past six months. The wagons have 44 13-lb. cells, and the carriages 28 13-lb. cells." Taking the case of the wagons, and assuming the same rate of discharge as before—viz., 15 ampères for 6 hours—the H.P. given to the motor is 1·77, assuming no losses through extra resistance due to bad joints, &c. Now, a loaded "wagon" simply cannot be propelled through Chicago streets (some of the worst streets in the world, as is truly remarked in the foregoing excerpt, are to be found in that Western Babylon) at a reasonable speed with this power, and traversing the distance stated, viz., 30 to 42 miles. A London electrical cab (*vide* The Automotor, Vol. I, p. 485) has a battery of 40 cells, each with a capacity of 170 ampère hours when discharging at 30 ampères—that is, it delivers to the motor about 3·2 H.P., or this cab takes about twice as much H.P. as the wagon. Evidently there is some mistake, because a battery of 44 100-ampère-hour cells could only furnish 3 H.P. for 1·7 hours. Leaving this, however, merits are claimed for the Crowdus cell which have so far not been obtained in any cell yet made in this country. We have no wish to depreciate such claims, because we know as well as anyone the tremendous and unlimited scope there is for a cell as light and as efficient as the Crowdus cell is said to be. No useful purpose would be served by us accepting Mr. Bowden's invitation to test the battery, as, unless the claims made for it are substantiated by unquestioned scientific opinion, nothing less said in its favour would be believed. We would suggest to Mr. Bowden that he send a battery of his cells to the Electric Testing Department of the Board of Trade, or subject it to independent tests at the hands of some of those members of the electrical engineering profession whose names it would be invidious to mention, but whose report would be accepted by possible users.—Ed.]

THE MOTOR-CAR ATTACHMENT COMPANY.

To the Editor of the Automotor and Horseless Vehicle Journal.

Sir,—One of your inquirers in the current issue asks information *re* the Motor-Car Attachment Company. The Company is working under Carmont's Patent, and had works in 1897 in Kingston, and offices in Basing House, E.C. They claim patent for putting motor as a tractor—not for any specified mechanism, electric, gas, or oil, but merely motor in front.—Yours truly,

Jas. Melling.

Metalling for Roads.—According to some tests made recently by Messrs. Kirkaldy a stone known as "Rowley Rag" is superior in hardness to others. As is usual in testing stone, three cubes were submitted to the test with the following results:—No. 1 crushed at the enormous stress of 33,333 lbs. to the square inch; No. 2 crushed at 32,243 lbs.; and No. 3 at 25,052 lbs. This gives a mean stress upon the three cubes of 30,543 lbs. to the square inch, or a resisting strain of over 3,000 lbs. higher than that of any other class of stone selected from 16 of the principal quarries in the kingdom.

PROCEEDINGS OF TECHNICAL SOCIETIES.

Automobilism on Roads.*

(*Concluded.*)

Now, I believe improvement of our common roads to suit the possibilities of mechanically-propelled vehicles, and the design of the vehicles to suit the possibilities of high roads, will in the future make a change almost as vast as that which has been wrought by the mechanical horse on iron roads. We have our roads leading from everywhere we want to go or send goods to our houses and factories. We want to take advantage of the powers which the steam-engine will place in our hands, if we will but give a fraction of the ingenuity to the construction of roads which we have given to the construction of this world-changing motor.

There are at work at the present time no less than 100,000 horses in London alone. These horses are not only destroying our streets and roads at double the rate at which even the iron-shod wheels would do it, but they are themselves the origin of an enormous quantity of street haulage. Nearly all the food and fodder has to be hauled over some parts of the roads and streets. Food and fodder alone represent 20,000 tons per week; the street refuse, which employs an army of scavenging boys, and then scavenging carts and more horses, to carry away from the street boxes that which is not blown into the air we breathe or washed into the sewers, will represent another enormous quantity of street carting necessary to enable these horses to exist in London alone. All this will be avoided by the use of motor-vehicles that are possible even to-day.

This is not a statement of what is desirable; it is a statement bearing on changes which are becoming inevitable. If anyone is inclined to doubt it, let him go to any of the meeting places of our great lines of traffic, and see how nearly impossible has the movement of any vehicle become already. Oxford Street, Fleet Street, Cannon Street, Cheapside, Mansion House Place, Post Office, and many others, are hopeless blocks for several minutes at a time, which total up to many hours per week—hours that represent an enormous loss. At least one-third of the space now occupied by the horses of the vehicles, from great railway vans to hansom cabs, can be saved by the employment of motor-vehicles. This is shown by the electric cabs and the steam and spirit motor-vehicles now growing common. This saving of space is alone enough to increase the accommodation room of the main arteries sufficiently to prevent most of the loss of time.

Nearly half the street repairs and consequent stoppages would be avoided if horses' hammer hoofs were absent, and moderate loads allowed as a maximum per axle.

I said in the commencement of this address that many millions sterling—I might say between one and two hundred millions—might be expended with great profit on the construction of new roads, and the improvement and proper maintenance of our high roads. It is necessary to substantiate this by reference to fundamental facts. It is an indisputable fact that the number of horses required, or the distance which horses can haul a load, is inversely proportional to the road resistance, and it is equally well known that speed and load taken together decrease more rapidly than the increase of tractive resistance when that is excessive.

On the best surfaces the draught will vary from 25 lbs. to 30 lbs. per ton on the level. On good well-made macadam roads it may be from 38 lbs. to 60 lbs. per ton on the level. On broken stone road it rises to 90 lbs. to 100 lbs.; and on gravel road to 140 lbs. per ton on the level. On tram rails it varies from 15 lbs. to 40 lbs. per ton of load; and on railways from 6 lbs. to 12 lbs. per ton.

Thus the resistance on good ordinary roads, which might be in use everywhere, is less than one-third that which is met with on common roads everywhere; or, again, it is from three to six times that it need be for the heavier vehicles, if wheel-ways were laid and properly maintained. Hence horses can haul on an asphalte road double the load they can on macadam, or they can continue at work much longer; or 10 horses will do instead of from 15 to 20. Even on a grooved tramway, with its high resistance compared with a flat rail, two horses will haul from 60 to 100 per cent. more load than the same horses can with equal fatigue haul an omnibus on an average macadam road.

* Excerpt from the Inaugural address delivered by Mr. Worby Beaumont, M.I.C.E., M.I.M.E., &c., before the Society of Engineers, London, on February 7th.

This sort of difference obtains with reference to every kind of haulage done on common roads, and I want to point out that it is not the omnibus or other ordinary vehicle owners who suffer this loss, it is the public, and the removal of all this would be to the public advantage in lesser fares, lower freights, greater distance carried for same fares, and great saving of time.

An equally or more important question is that of traction resistance on gradients. This is even more important, in view of the coming of the mechanically-propelled vehicle, than it is with reference to horses, if we leave all humane considerations out of account, and also leave out the much greater rapidity of wear of roads on stiff gradients.

The increase in the power required to haul a load up a hill is directly proportional to the angle of inclination from the horizontal, and hence on a hill of 1 in 20, a very common gradient, the hauling power jumps from the average, on a good macadam road, of, say, 45 lbs. per ton to 45 + 125 lbs., or a total of 157 lbs. instead of 45 lbs. Bad as this is, it is insignificant as compared with the pull required on a gradient of 1 in 10 to 1 in 8, not at all infrequently met with. On 1 in 10 the hauling power required becomes 269 lbs., instead of 45 lbs., or no less than six times the power employed on the average nearly level road. It is to meet this heavy demand for power that two or three horses have often to be sent with a load which, but for the one or two short lengths of steep hill, could be taken by one horse, and it makes it necessary to put on a motor-vehicle, boiler and engine power of from 12 to 16 H.P., where from 3 to 4 H.P. ought to be sufficient.

Now see what all this means in respect of annual loss to the people of this country; or, on the other hand, the gain that would result from that application of capital which would prevent or reduce this loss. There are, it is estimated, in this country over 1,000,000 horses. There were about this number 60 years ago, but as no returns exist showing, even approximately now, the number of draught horses in use, I am taking the nearest approximation I can make and assume that about 1,200,000 draught horses are employed at the present time. In order, however, to under-estimate rather than over-estimate the advantages to be derived from the recognition of road improvement as a source of national income, I will assume that only 500,000 draught horses are at work.

There were at the end of 1896 in London alone 15,204 hackney and stage carriages under licence. Of these 7,585 were two-wheeled carriages, chiefly hansoms; 6,450 omnibuses of various kinds; and 1,169 tramcars. To work these not less than 58,000 horses are employed, and the horses employed in the thousands of trade carts and vans and wagons and the private carriages will be more than this quantity, so that in the London area alone there are probably 120,000 horses. Each omnibus has on an average ten horses to work it, and each hansom and cab two. For these, however, I allow in my estimate only thee horses to two hansoms or cabs to allow for some small proprietors whose cabs are only worked part of a day.

In the United Kingdom there are of licensed vehicles the following in round numbers:—

Hackney carriages	116,000
Other than hackney, with four or more wheels for mechanical or horse haulage	48,000
With four wheels for one horse only.. ..	77,000
With less than four wheels	305,000
Or a total of vehicles requiring licence of	546,000

These represent at least 1,200,000 horses.

I have no means of telling what the total number would be if all the agricultural horses and vehicles which do not need a licence were added. It would probably bring this to over 1,500,000.

Each of these horses will cost for food alone and stabling about £30 per year, and I think I am entitled to assume, from what I have already pointed out, that at least one-third this number of horses could be dispensed with, or that the existing number of horses might be enabled to effect at least 33 per cent. more transport than they do at the present time. Ignoring for the minute the increase in road traffic in the future, which must be provided for, this proves that about 170,000 horses less than the number now employed would need to be kept and fed. If we take only the cost of keep of these horses, and for the present say nothing of the reduced destruction of roads which would result from the removal of these horses, a saving of £30 per year per horse, or a total of £5,100,000, would be effected.

Now, this sum, capitalised at 3 per cent., is £170,000,000 sterling, and enormous as this sum appears, there is no doubt that such a sum might profitably be invested in the roads of Great Britain if we consider the advantages to be derived from mechanical traction. It may, however, be reasonably assumed that the road traffic will grow, so that even a larger sum than this may represent the possible saving.

It is, in fact, the great advantages to be derived from mechanical road transport which will make road improvement desirable, and it is useless to expect either the proper development of mechanical traction, or the possible improvement in the many kinds of ordinary road vehicles, without a corresponding improvement in the roads upon which they are to run.

The better the roads, the less destructive will be the vehicles and their tyres; for exactly the same reason as that which explains the wearing of thin light boots on the clean dry pavements of a well kept city, or perhaps in a drawing-room, by the man who finds it necessary to wear hob-nail boots on the rough roads of the country.

For another estimate of the saving which will result from the proposed improvement in roads we may proceed on the basis of the greater quantity of work every horse now in use could perform, the smaller number of relief horses necessary, and the smaller destruction of roads, horses, and vehicles on the heavy grades now common.

From a careful consideration of these points I am satisfied that at least one horse in every nine or ten could be saved, and that every draught horse in use could earn from £5 to £10 per year more.

If, then, the saving of a horse only represents the cost of its keep, or, say, £30 per year, and if only 2s. per week or £5 per year be taken as the greater average earning capacity of each horse, we have a saving per year on 500,000 horses, of 50,000 horse-keep at £30 = £1,500,000, and of £5 on the 450,000 horses, of £2,250,000, or a total saving of £3,750,000 per year. This sum capitalised at 3 per cent., the rate at which the Government or the country authorities could borrow money, is no less than £125,000,000.

Thus, after basing every gain on the lowest estimate, it is obvious that an enormous sum could be usefully employed in the improvement of our national ways of communication, and that if only the most pressing of the work were done from 50 to 100 millions of national capital, or from £5,000 to £10,000 per mile, could be expended by engineers to very great national advantage.

Where power is available, either electricity or the cable must be adopted, and almost always electricity will offer most advantages. The steam-engine or the gas-engine being then the prime mover in the great majority of cases, the question arises what system of propulsion will give the most economical power on the rails, which will earn the greatest return on the capital outlay and give the lowest fares. It may be taken as fundamental that that system which employs the prime motor most directly upon the rails is the best from the economic point of view. From this it follows that were there no qualifying condition favouring less economical methods, the steam-car and the gas-engine car must, unhesitatingly, be chosen as the best.

The first qualifying condition which may be mentioned is the working of very steep inclines, and this favours the cable system.

For very confined situations, as in tunnel lines, the products of combustion of the fuel for steam raising or of the gas in gas-engines may be disqualifying attendants of these two forms of power on the cars. Under ordinary circumstances of level or nearly level street and suburban lines, the possibilities of the modern small high-pressure superheated steam-engine and of the gas-engine appear to place the independent car propelled by these motors in the most advantageous position. The electrical systems are open to the objection, firstly, that the prime motive power must first be converted into electricity and that electricity must be converted back into mechanical power. This at once raises the cost of the motive power on the rails by from 15 to 30 per cent., without considering any intermediate losses.

In past days when the large engines used in electric generating-stations could be shown to give an effective H.P. for much less steam than the smaller engines required on the independent steam-car this loss might not only be considered as more than covered, but the small engines and boilers available were also in many ways objectionable. This difference, however, has now been removed by the experience of the past few years with very high-pressure superheated steam, by means of which engines of less power than those required on tramcars are working with less steam per H.P. than the large engines of some of the large electricity generating-stations.

OBITUARY.

SIR HENRY BESSEMER.

ALL interested in mechanical science will learn with regret that the most distinguished metallurgist of the Victorian era has at length succumbed to the common fate of humanity and expired on the 15th ult., at the age of 85, at his residence at Denmark Hill, Surrey. Sir Henry Bessemer was known all the world over as the inventor of the Bessemer process of steel making, whereby common cast-iron was converted into steel. At the time that his invention was, after many trials and disappointments, perfected, steel was a very expensive article. Most steel was made by the cementation process, which was tedious and uncertain in its action. Bessemer's invention produced high grade steel of uniform quality at a ridiculously cheap rate. The economic advantages of this invention have been incalculable, as it rendered possible the cheap railway and steamship travelling of the present day. In other directions he was a successful and prolific inventor. Thus he invented the first type-composing machine, and a machine for embossing velvet. He was not always, however, successful in his inventions, as his swinging saloon testified. This saloon, or cabin, was intended to remain perfectly steady when fixed on board ships. A vessel, called the "Bessemer," was built for the purpose of testing it, but the thing was a complete failure. His steel factory at Sheffield brought him a very large fortune, and he was honoured everywhere as an inventor whose works have done so much to advance civilisation and to promote the welfare of the community.

The first recognition of Bessemer's work came from the Institution of Civil Engineers, in the shape of the gold Telford medal in 1859. In 1871-73 he was president of the Iron and Steel Institute, and founded a gold medal to be given annually for the most important improvement of the year in the manufacture of iron or steel. The Society of Arts awarded him the Albert gold medal in 1872, and in 1877 the Civil Engineers made him a member of their body, at the same time presenting him with the first Howard quinquennial prize. Two years later he became a Fellow of the Royal Society, and received the honour of knighthood, while in 1880 he was presented with the freedom of the City of London. He was also a freeman of the City of Hamburg, an honorary member and gold medallist of the Society of Arts and Manufacturers of Berlin, and a Grand Cross of the Order of H.I.M. Francis Joseph of Austria.

COLONEL DYER, R.A.

OF all those who in any way participated in the late disastrous engineers' dispute none stand out so prominently and so bonourably as Colonel Dyer, who, to the deep regret of masters and men alike, expired at Manchester on the 21st ult. Colonel Dyer was an artillery officer, and saw much active service in the Crimea. When retired he became superintendent at Enfield Gun Factory, and afterwards joined the firm of Whitworth and Co., of Manchester. On the amalgamation of this firm with that of Armstrong, Mitchell, and Co., Colonel Dyer became a director of the combination. He was in every way a most distinguished Englishman, combining the *suaviter in modo* with the *fortiter in re*. His talent lay in organising, and the skill he displayed in uniting the masters in a powerful Federation was marvellous. His tact and courtesy and justice in dealing with the demands of labour were equally conspicuous. So desirous was he of doing right in the late great struggle that he worked unduly hard to this end, and his regretted death was the consequence.

The Automobile Club of Belgium.—As will be seen from the letter which we publish elsewhere in our present issue, Sir David Salomons, Bart., the respected President of the S.P.T.A., is exerting no little influence for the encouragement of automobilism on the Continent. He has offered the handsome prize of 500 francs to the Committee of the Belgian Automobile Club, to be awarded to that competitor in the forthcoming Concours on June 25th and 26th who produces the best—that is, other things being equal, the most elegant, comfortable, and well-appointed—vehicle. In contributing this prize Sir David Salomons is rendering a distinct service, as improvement in the directions indicated is much wanted. We have, it is true, the London electrical cab, for example, which, while not exactly a model of ugliness, might yet be very much improved. Even the most favourite type of voitures leave much to be desired in the matter of elegant design, to say nothing of the uncomfortable vibration with which so many of them are afflicted. We trust that, inspired by this example, builders will endeavour to evolve a design which, while satisfying the mechanical requirements, will also gratify the by-no-means unimportant æsthetic ideal.

President	Sir DAVID SALOMONS, Bart.
Secretary	ANDREW W. BARR, Esq.
President of the Liverpool Centre	The EARL OF DERBY, K.G., G.C.B.
Hon. Local Secretary	E. SHRAPNELL SMITH, Esq.
Semi-Official Journal of the Association	THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

SELF-PROPELLED TRAFFIC ASSOCIATION

(INCORPORATED).

LIVERPOOL CENTRE.

The Arrangements for the May Trials.*

THE object of this paper is to acquaint members of the Association, subscribers to the Trials Fund, and others interested in this branch of the Association's work, with the programme of the trials so far as the same may yet be divulged. It is hoped that it may provide a convenient means of circulating an outline of the arrangements at a date which will give ample time for interested parties to decide to attend the trials and to advise the Association of their intentions. The trials will begin on the morning of Tuesday, May 24th, 1898, and will conclude on the afternoon or evening of the Friday following.

By way of introduction it may not be out of place to remind you of the condition laid down in the "Particulars of Competition" whereby the minimum load consistent with the qualifying adjective "heavy" is stipulated as 2 tons. This regulation has had the not altogether unexpected effect of debarring from competition all vehicles propelled by internal combustion engines or oil-motors, the several constructors in this country having intimated that they consider 1 ton of goods to be the useful and satisfactory limit of load in the present stage of development of this particular form of prime mover. Whilst, therefore, of no practical value for our normal traffic, oil-propelled parcel-vans and light lorries will, in all probability, render a good account of themselves at the trials of the Royal Agricultural Society in June next.

Another of the regulations which has been subjected to adverse criticism is the one which imposes minimum average speeds of six and four miles an hour in Classes I and II respectively, the contention having been that an average of six miles an hour is too great a speed to guarantee with a load of, say, 4½ tons. After full consideration the Council, in order to encourage motor traffic and to give every scope for originality in design and construction, decided to allow vehicles to be entered in a third class, in which the only special regulation is:—"That the vehicle shall carry a minimum load of 2 tons during the trial runs."

Before proceeding to the list of entries it is desirable to touch upon the "weeding out" process that has been apparent as regards builders who at one time purposed taking part in the trials—the

* Excerpt of paper read before the Liverpool Centre of the Self-Propelled Traffic Association, by Mr. E. SHRAPNELL SMITH, Hon. Local Sec., on April 14th, Mr. Jas. A. Brodie, M. Inst. C.E., in the Chair.

names, it is scarcely necessary to add, are safe in the secrecy of secretarial confidence. At the beginning of January communications were addressed to about 60 firms of engineers engaged in the construction of self-propelled road vehicles, traction engines, agricultural machinery, &c. By way of acknowledgment some of the firms simply stated that they were not prepared to go into the matter, others pleaded that pressure of work for standard types prevented their building for the trials, and more than one regretted that the engineers' strike had most seriously interfered with their experiments and private trials. The replies received are, taken as a whole, of great interest, and serve to indicate that there already exists amongst our foremost engineers the good intention at least to apply their experience to the evolution of satisfactory motor-wagons for heavy loads. The net result of these inquiries led to the conclusion that we should have at least 12 British competitors taking part in the trials, but the appended list will show that the makers' estimates were too sanguine, for we have received entries from only six intending competitors, who have entered 10 vehicles.

ENTRIES.

CLASS I.—*Minimum load, 2 tons; minimum average speed, 6 miles an hour; minimum platform area, 60 square feet.*

Official No.
7 T. Coulthard and Co., Cooper Road, Preston.
9 Robert Cooke Sayer, 11, Clyde Road, Redland, Bristol.
1 The Liquid Fuel Engineering Company, 20, Abchurch Lane, London, E.C.
2 The Steam Carriage and Wagon Company (Limited), Homefield, Chiswick, London.

CLASS II.—*Minimum load, 5 tons; minimum average speed, 4 miles an hour; minimum platform area, 110 square feet; floor of platform to be not less than 3 feet 9 inches, or more than 4 feet 3 inches, from ground.*

Official No.
3 The Steam Carriage and Wagon Company (Limited), Chiswick.

CLASS III.—*Minimum load, 2 tons.*

8 T. Coulthard and Co., Preston.
10 Robert Cooke Sayer, Bristol.
5 The Lancashire Steam Motor Company, Leyland.
6 The L. R. Syndicate (Limited) (Serpollet System), 22, Chancery Lane, London, W.C.
4 The Steam Carriage and Wagon Company (Limited), Chiswick.

Electricity is unrepresented. The gentleman who, some twelve months ago, offered to carry 1,000 tons of goods weekly in 10 ton units, by means of accumulators at 2*d* per ton mile, is evidently still engaged upon the problem—or has given it up. However, seeing that the motors being made for the Paris electrical cabs give 8½ B.H.P. for 20 minutes, or 4½ B.H.P. in continuous running, without undue heating, and weigh only 170 lbs. each, there appears to be an opening for the application of one such to each wheel of a lorry. Taking the secondary battery of to-day as weighing 1½ cwts. per B.H.P. given off by the motor on a five hours' discharge, there is every reason to look for a commercial vehicle fitted with one large battery and constructed to use several motors as required.

It will be noticed that no entries have been received from French constructors. We had hoped for several, but the limit of 3 tons tare imposed by the Light Locomotives Act, 1896, has put all the Continental vehicles out of the competition. Some of the largest firms in France have been in correspondence with the Association, with respect to their taking part, if possible, and the Association has been reluctantly compelled to send a negative reply in every instance.

This opportunity is too good a one to be passed over, without an expression of regret that the framers of our Act thought it necessary to place a limit upon the tare of the vehicle. The existing maximum of 3 tons tare practically prohibits the construction of vehicles with platforms such as we require for much of our Liverpool work. It does not make one iota of difference, so far as the maintenance of road-surfaces is concerned, whether the weight is all tare or part tare and part freight, and the demand for commercial efficiency is a sufficient spur to constructors to keep the tare as low as possible. If, therefore, a limit there must be, let it be placed upon the total moving weight, or upon the total weight per axle.

Sufficient information has not yet been returned to justify the inclusion in this paper of any descriptive details, even were it desirable or expedient to publish the same at this juncture, as the "Lists of Particulars" may be lodged by competitors any time up to the 16th proximo. It is probable, however, that, as the practical tests to be applied during the trials are sure to be of infinitely greater value than the mere statement of theoretic points, none will resent the request that they wait till May 24th, and then judge for themselves.

The majority, if not all, of the vehicles entered are steam-propelled with oil-fired boilers, ordinary paraffin (sp. gr. about 0·800) being the fuel used. One of the vehicles is fitted with a boiler of the so-called "instantaneous generation" or "flashing" type.

The trials will open at nine o'clock on the morning of Tuesday, May 24th, with an inspection by the judges at the depôt to be used as the point of departure and arrival during the trials. Mr. Alfred L. Jones, vice-president, has very kindly offered to put Gregson's Mill, Caryl Street, at the disposal of the Association for this purpose, and his offer may be taken advantage of. In any case, the depôt will be in Liverpool, and it is hoped that the Mersey Docks and Harbour Board will grant the use of their yard at the south-west corner of the Prince's Dock. This position is very central, being right at the foot of Chapel Street.

The first vehicle will start from the depôt shortly after nine o'clock on each of the four days, and the others will follow at intervals of about ten minutes. Each vehicle will display its official number and carry an official observer appointed by the judges. It will be noticed—and possibly objected to by some—that an early start is to be made, but such a procedure is very necessary. If, say, in the case of a wagon carrying a 5-ton load, the speed attained averages only four miles an hour, on a 36-mile route, the journey will occupy nine hours. In order, therefore, that those following the competition may get back to Liverpool not later than 7 p.m., it is intended to despatch the heavier vehicles first and to endeavour to send the last away before 10.30 a.m.

Routes.

The conditions require that the routes shall not be announced until the date of the trials. At present it can only be stated that two routes have been selected which come within the prescribed limits—between 30 and 40 miles—and that, presuming eight only to be presented for trial, four vehicles will be put upon each route, two in each direction. Thus, when the runs are completed, each competitor—breakdowns, if any, excepted—will have traversed each route in each direction.

Sketch maps will be prepared and issued as stated, and it will then be found that the routes chosen are so arranged as to permit parties following the competition to cross between them at various points. The question of supplying fuel and water *en route* is receiving proper attention.

Visitors.

Formal invitations have been addressed to the Automobile Club de France, the Automobile Club Belge, the War Office, the Post Office, the Board of Agriculture, the Local Government Board, and other Government Departments.

We hope to see a number of the members of the French Club, including Baron Zuylen (President), Comte de Dion (Vice-President), Comte de la Valette, M. Pierre Giffard, M. Amédée Vernes, Baron Rogniat, M. Andre Michelin, and M. G. Forestier (Government Inspector of Roads and Bridges), but the complete notifications have not yet arrived. The Belgian Club has not, so far, acknowledged our invitation.

The Postmaster-General has instructed the Liverpool Postmaster to attend and report upon the trials. But singularly enough the Board of Agriculture does not intend to be represented at them.

The War Office have not yet replied beyond the first acknowledgment, but as the Royal Engineer Committee of this Department have recently appointed a sub-committee of their members to consider the adaptability of motor-vehicles for military transport, there is reason to expect that they will not allow the Post Office to monopolise the advantages to be derived from attendance at the trials. We are in correspondence with the Board of Agriculture and the Local Government Board, and other public departments, and the nature of their replies will be published in the next issue of our official journal.*

The Association will shortly issue invitations to a number of colonial representatives, mayors, chambers of commerce, merchants, engineers, and others likely to be interested to attend the trials. Intending visitors are recommended to engage rooms in advance to avoid disappointment, and in every case to notify the Association of

* *i.e.*, THE AUTOMOTOR.

the date on which they will arrive, the duration of their visit, and their address during the trials.

The headquarters of the Association will be at the Adelphi Hotel.

Owners of light self-propelled carriages are invited to bring them to Liverpool, as they will find them an advantage and convenience. The Association has arranged for the housing of such light vehicles at a central position convenient to the principal hotels.

Entertainment.

The members of the Liverpool Council will take every care of visitors. The nature of the competition does not permit of any definite programme, especially as the week ends with the Whitsuntide holidays; but all facilities will be afforded to any who desire to visit or inspect particular objects or places of interest connected with the city or port of Liverpool.

A Dinner will be held at the Adelphi Hotel, on a date embraced by the trials. As soon as the date is fixed, notices will be issued.

Exhibition of Vehicles.

In deference to a widely-expressed wish, the Council are considering the expediency of holding a short public exhibition of the vehicles after the trials. If it is decided to do so, the arrangements will be announced at as early a date as may be convenient.

Finance.

The subscriptions and entry fees combined now amount to close upon £500, and it is probable that £600 will be reached. We originally sought to secure £750, which amount was to include the expenditure in bringing across vehicles from the Continent, and to leave ample margin for contingencies. Since, however, as mentioned above, legal restrictions preclude the possibility of our having the pleasure of seeing any French vehicles, a considerable item is expunged from the estimates, and our financial position is perfectly satisfactory.

A special account has been opened with Messrs. Leyland and Bullins, under the title, "The Self-Propelled Traffic Association Trials Account." Accounts, duly audited, will be issued to members and subscribers as soon as practicable after the trials, and, should the amount collected prove to be in excess of the expenditure, the surplus will be returned to the subscribers *pro rata*.

By way of comment upon the donations given, it may here be remarked that Liverpool traders have not supported the Association as generously as the occasion warrants, it being left for comparatively few to provide the necessary funds.

Judges.

The following Members of Council were elected in February last:—

London Council: Sir David Salomons, Bart.; Mr. Boverton Redwood, F.R.S.E., F.I.C.

Liverpool Council: Mr. John A. Brodie, M. Inst. C.E.; Mr. Everard R. Calthrop; Prof. H. S. Hele-Shaw, LL.D., M. Inst. C.E.

Reserves: Mr. B. Cottrell, M. Inst. C.E.; Mr. Henry H. West, M. Inst. C.E.

Mr. Brodie has intimated that his duties as city engineer prevent his accepting any appointment which would involve such a demand upon his time, but that he will be pleased to do anything he can to make the trials a success. Mr. Cottrell will act in place of Mr. Brodie.

Vehicles.

Although the definite dimensions laid down by the Council in framing the rules somewhat prescribe the types that can be represented at the trials, it must be remembered that the interest taken in the competition will not be limited to those who wish to convey heavy loads of goods. The competing vehicles cannot fail to be of considerable interest for the purposes of heavy passenger traffic, as it is the class of body fitted—not the framing or machinery—that determines the use to which the vehicle shall be put. As a matter of fact, tipping-bodies, platforms, van-covers, sideboards, and numerous variations of superstructure, are applied to one and the same frame by several builders at the present time.

Before concluding this paper, it is worthy of remark that 69 years ago there was held in this neighbourhood a competition for locomotives on rails, at which the world-famed "Rocket" out-distanced all competitors. Whether the trials now being organised by the Liverpool Centre of the Association will bring to light the "Rocket" of self-propelled road vehicles remains to be seen. It is, perhaps, too much to expect that equally far-reaching advantages will be derived from the present effort, which, nevertheless, has involved no little work so far and may involve very much more before the competition is over. The Association may reasonably, in any case, congratulate itself that, of all the large centres of commerce in this country, Liverpool has proved to the fore, as in the past it did in the railway movement, in giving encouragement to a new movement which is calculated to improve, or possibly to perfect, the existing means of transport and thereby to confer a benefit upon the whole of the community.

TRIALS FUND.

The following subscriptions have already been remitted or promised:—

Sir David Salomons, Bart.	100	guineas.
Mr. Alfred L. Jones (Elder, Dempster, and Co.)	100	"
Mr. Alfred Holt	50	"
Mr. John A. Brodie	10	"
AUTOMOTOR AND HORSELESS VEHICLE JOURNAL	10	"
Mr. W. Worby Beaumont	10	"
Mr. Maunsell C. Bannister	10	"
Mr. Everard R. Calthrop	10	"
Mr. A. Bromley Holmes	10	"
Mr. Anthony G. Lyster	10	"
Mr. Arthur Musker	10	"
Mr. Henry H. West	10	"
Mr. S. B. Cottrell	5	"
Mr. W. A. Darbishire	5	"
Mr. E. Shrapnell Smith	5	"
Mr. J. K. Starley	5	"
The Autocar	5	"
Mr. Danson Cunningham	5	"
Mr. Geo. H. Cox	2	"
The Right Hon. Lord John Hay, G.C.B., Admiral of the Fleet	2	"
Mr. Geo. F. Ransome	2	"
Mr. John Simpson (Stirling)	2	"
Mr. R. J. Urquhart	2	"
Mr. James A. Bradshaw	2	"
Messrs. R. Burton and Son	2	"
Col. A. Hill Holme, J.P.	2	"
Mr. W. Rowlandson	2	"
Mr. J. Barkeley Smith, J.P.	2	"
	2	"
	2	"
	1	guinea.
	1	"
	1	"
and Co.	1	"
and Co.	1	"
Mr. E. Roscoe Harpin	1	"
Mr. W. F. Lawrence, M.P.	1	"
Mr. James Leslie	1	"
Messrs. Simpson, Roberts, and Co.	1	"
Mr. Edmund Townsend	1	"
Entry Fees	34	guineas.
The Liverpool Cotton Association	£25	

Steel Springs for Motor-Cars.*

IN speaking on the subject of springs for motor-cars I do not propose to go into the past history of the development of springs from the time when our forefathers were satisfied with the leather straps for carrying the bodies of carriages and other vehicles. I therefore pass directly to the kinds of spring used for railway rolling stock, roadway, and other purposes, now in general use.

The steel used for all descriptions of springs is made by the following processes:—

1. Bessemer—Acid steel.
2. Martin Siemens—Acid steel.
3. Converted Swedish iron bars.
4. Swedish Bessemer steel.
5. Crucible steel.

The steel in general use for railway engines, carriages, and wagons is made by the acid processes (Nos. 1 and 2), and as springs made

* Excerpt of a paper read before the Liverpool Centre of the Self-Propelled Traffic Association, on March 22nd, by Mr. J. BEDFORD of Sheffield.

from this steel are in general use for carrying the above-mentioned heavy rolling stock, it is quite safe to assume that springs made of the same class of steel will prove equally satisfactory for motor-cars for carrying any weight of load. Steel made by the processes Nos. 3, 4, and 5 are much more costly, and their uses are chiefly confined to the finer and more delicate class of springs, such as safety valves, watch springs, and also for landaus and light carriages.

The following is a brief outline of the method of producing bars suitable for making all kinds of springs for railway and other heavy springs:—When the hematite iron has passed through its operation, either in the Bessemer converter or the open hearth furnace to the finished steel, it is cast into ingot moulds, in varying weights from 10 cwt. upwards. These ingots are cogged into blooms, and the blooms rolled down as required for the various-sized plates, the carbon content in the steel varying from ·45 to ·60 per cent. for laminated, and from ·60 to ·90 per cent., and even 1·0 per cent. for spiral, conical, and volute springs.

The following is the analysis of acid steels used for laminated springs for all railway purposes, and steel of the same analysis will be found suitable for carrying any required loads on motor-cars:—

Analysis of Bessemer Acid Steel for Laminated Springs.

Carbon	·45 per cent. to	·60 per cent.	
Silicon	·03 „	·06	„
Manganese ..	·75 „	1·00	„
Sulphur	·03 „	·05	„
Phosphorus ..	·03 „	·05	„
Iron	By difference.		

Analysis of Martin Siemens' Open Hearth Acid Steel for Laminated Springs.

Carbon	·50 per cent. to	·65 per cent.	
Silicon	·03 „	·05	„
Manganese ..	·35 „	·60	„
Sulphur	·03 „	·05	„
Phosphorus ..	·03 „	·05	„
Iron	By difference.		

It is impossible to lay down a hard and fast line as to the absolute mechanical tests of steel suitable for laminated springs in the range of carbons given, but the following may be taken as the approximate tests of spring steels in the normal condition. By the words "normal condition" is meant the steel in the state as rolled down into plates or bars while hot, before being hardened and tempered:—

Bessemer Steel.

Carbons.	Tensile strains per square inch.	Elongation in 3 inches.
·45 per cent.	50 tons.	20 to 25 per cent.
·50 „	54 „	
·55 „	56 „	
·60 „	58 „	

Open Hearth Steel.

Carbons.	Tensile strains per square inch.	Elongation in 3 inches.
·50 per cent.	50 tons.	22 to 27 per cent.
·55 „	53 „	
·60 „	55 „	
·65 „	56 „	

Although these spring steels in their normal conditions show these mechanical properties, it will be well understood that it is impossible to give any formulæ of the same mechanical properties when the steel is in the hardened and tempered condition ready for fitting in the springs; as these properties will necessarily vary with the degree of tempering given to the finished plates. It would no doubt be extremely valuable if a formula could be arrived at for getting a uniform strength of steel in the hardened and tempered condition, but it is not possible to give this on account of the variations arising from the tempering of the plates.

Assuming, however, the chemical elements of the steel to be represented by the analyses given and also that the plates are uniformly hardened and tempered and accurately fitted, the following rlues (as published in Molesworth's Pocket-book) for estimating the strength of laminated springs will be found approximately correct. Let—

S = Span of spring in inches.
B = breadth of plates in inches.
T = Thickness of plates in sixteenths of an inch.
N = Number of plates.
D = Deflection in inches per ton of load.
L = Safe load on springs.

Then—

$$L = \frac{B\ T^2\ N}{11{\cdot}3\ S}$$

$$N = \frac{11{\cdot}3\ S\ L}{B\ T^2}$$

$$D = \frac{{\cdot}14\ S^3}{T^3\ B\ N}$$

Spiral springs are also made for carrying heavy loads, and if the design of the motor-cars admits of sufficient space for the larger base or bearing surface required it may be, in some cases, advisable to adopt this pattern of spring. Spiral springs are not infrequently built up in nests, as shown in Fig. 2, that is to say, one spring is inserted inside the other, usually to about three in number. These spiral springs, or nest springs, are mostly used on bogie wheels for heavy vehicles, such as the bogie wheels on engines, Pullman cars, &c. Many users of springs object to the conical-shaped springs (*see* Fig. 5) on account of the danger that might arise from the buckling of the spring.

I am indebted to Messrs S. Fox and Co. (Limited), Stocksbridge Steel Works, Sheffield, and Messrs. Ibbotson Bros. and Co. (Limited), Globe Steel Works, Sheffield, for the samples of springs I submit to this meeting. These springs are made from acid steel. Before the plates in the laminated springs were worked into shape, a portion of one plate was tested in the ordinary manner with the following results:—

Tensile strain	55 tons per sq. in.
Elongation, percentage in 3 inches ..	20 per cent.
Contraction of area at point of fracture with test piece	30 per cent.

The large, laminated spring made by Messrs. Fox and Co. (*see* Fig. 1) has been specially built for carrying a heavy load.

Length from centre to centre of holes in the straight, 4 feet.

Eight plates 3½ inches by ½ inch.

Top plate has solid eye, and is drilled to Whitworth gauge with 1-inch diameter hole for pin.

Each plate is properly fitted, ribbed and slotted to prevent the lateral disarrangement of the plates.

Cambre, 5⅜ inches.

The ultimate load of the spring is 7 tons.

The average deflection under load is ·729 inch per ton.

The deflection per ton on this spring is as under:—

	At Rest.	1 *Ton.*	2 *Tons.*	3 *Tons.*	4 *Tons.*	5 *Tons.*	6 *Tons.*
	ins.	ins.	ins.	ins.	ins.	ins.	ins.
Cambre	5⅜	4½	3⅜	3	2¼	$1\frac{7}{16}$	¾

The spring has been tested in the scrag or testing machine, and brought down ¾ inch beyond the straight 14 times. It has returned to its original cambre without showing any permanent set or injury whatever.

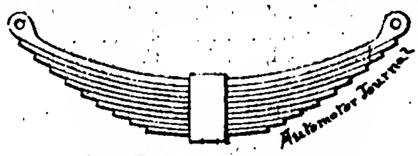


Fig. 1.—Forged Solid Eye Spring.

I have here springs of various patterns for carrying various loads. These represent standard springs in general use on English, Indian, Colonial, and various foreign railways. The springs have not been specially made for exhibition, and may be taken as representative of springs as made day by day in fulfilment of running contracts.

The tests of the springs as given in this paper are truly representative of the carrying powers of the several springs shown. All the tests have been obtained from the springs now exhibited. Springs of the various designs for carrying lighter and heavier loads than given are of course regularly made:—

List of Springs Shown.

		Ultimate Load of Spring.
No. 1.	Laminated spring made by Messrs. S. Fox and Co. (Limited), Stocksbridge Steel Works, Sheffield (Fig. 1)	7 tons.
No. 2.	Single spiral spring, also made by Messrs. S. Fox and Co. (Limited) .. .. .. (Giving a regular resistance of 32 cwts. for each 1 inch of deflection.)	5 „

The following springs have been kindly lent by Messrs. Ibbotson Bros. and Co. (Limited), Globe Steel Works, Sheffield :—

		Ultimate Load of Spring.
No. 3.	Laminated spring	2 tons.
No. 4.	Triple nest of coil springs (Fig. 2) ..	5 „
No. 5.	Single spiral spring (Fig. 3)	4 „
No. 6.	Single spiral spring of round steel ..	2 „ 8 cwts.
No. 7.	Volute spring (Fig. 4)	4 „
No. 8.	Conical spring of oval spring (Fig. 5) ..	4 „

The following are the leading particulars of these springs :—

No. 2. Single Spiral Spring—

Dimensions :
- 6¾ ins. high.
- 5 ins. diameter.
- 2¼ ins. hole.
- 6 coils.
- Steel, 1⅜ ins. by ⅞ in.
- Resistance, 1 ton 12 cwt. for each 1 inch of deflection.
- Ultimate resistance, 5 tons.
- Weight of spring, 22 lbs.

This spring is very extensively used on one of the Indian railways.

No. 3. Laminated Spring—

Length from centre to centre of eye	3 ft. 8½ ins.
Length under 2 tons load, namely, when straight	3 ft. 9 ins.
Cambre, free to centre of eyes	3 ins.
Cambre, under 1 ton	1⅜ ins.
Cambre, under 2 tons	Straight.
Weight of spring	3 qrs. 5 lbs.

The spring is built up as follows :—

1 back plate, 3½ ins. by 7/16 in.
8 other plates, 3½ ins. by ⅜ in.

In the laminated springs exhibited, the plates are temporarily held together by a nut and bolt, but in actual practice a buckle or hoop is always required for the fixing of the spring to the axle-box.

No. 4. Triple Nest of Coil Springs, made up as follows (Fig. 2)—

Fig. 2.—Nest of Spiral Springs.

			Section.
	ins. ins. ins.		ins. ins.
Outer spring ..	7⅞ × 6¼ × 5⅜, 4 coils, full tip to tip.		1¼ × 9/16.
Inner spring ..	7⅞ × 5¼ × 4¼, 5 coils, bare tip to tip.		1⅛ × ½.
Centre spring ..	7⅞ × 4⅜ × 3¼, 5½ coils, tip to tip,		1 × 7/16.

Total weight of springs, 28 lbs.

This nest has been tested with the following results :—

	Free	1	2	3	4	5 tons.	Home.
Inches ..	7⅞	7¼	6¾	6 1/16	5½	5⅛	5

This is the class of spring already referred to as used under Pullman and similar cars, in conjunction with elliptical or laminated springs.

No. 5. Single Spiral Spring of Rectangular Section (Fig. 3)—

Fig. 3.—Spiral Buffer or Spring.

Dimensions :

7¼ ins. high.	8 coils, tip to tip of steel.
4½ ins. diameter.	Section of steel, 1 3/16″ × ¾″.
2¼ ins. hole.	Weight, 15¼ lbs.

The following results have been obtained by actual test :—

	Free.	1	2	3	4 tons.	Home.
Inches	7¼	6⅝	6 3/16	5¼	4⅝	4¼

No. 6. Single Spiral Spring of Round Steel—

Dimensions :

6 ins. high.	6 coils, tip to tip of steel.
4½ ins. outside diameter.	Steel, ¾ ins. round.
2¾ ins. hole.	

	Free.	1	2 tons.	48 cwts.	Home.	Weight.
Inches ..	6	5	4¼	4	3 15/16	6¾ lbs.

No. 7. Volute Spring (Fig. 4)

Fig. 4.—Volute Spring.

Dimensions :

9½ ins. high.	2 ins. hole.
6 ins. base.	Steel, 4½ ins. by 7/16 in.

	Free.	1	2	3	4 tons.	Home.	Weight.
Inches ..	$9\frac{1}{8}$	$8\frac{1}{16}$	$6\frac{13}{16}$	$5\frac{9}{16}$	$4\frac{3}{4}$	$4\frac{1}{4}$	22 lbs.

No. 8. Conical Spring (Fig. 5)—

FIG. 5.—CONICAL SPRING.

Dimensions:
6 ins. high. $1\frac{5}{8}$ ins. hole.
$7\frac{1}{4}$ ins. base. Oval section, $1\frac{3}{8}$ ins. by $\frac{9}{16}$ in.

	Free.	1	2	3	4 tons.	Home.	Weight.
Inches ..	6	4	3	$2\frac{1}{8}$	$1\frac{3}{4}$	$1\frac{5}{8}$	$13\frac{1}{2}$ lbs.

[*A paper by* Mr. J. T. NIBLETT, M. Inst. E.E., *read on March 29th before the Liverpool Centre of the Self-Propelled Traffic Association, will be found on p.* 255.]

Commendable Enterprise.—On March 25th a meeting was convened in the Court House, Stowmarket, by the leading inhabitants and tradesmen to consider the desirability of connecting Stowmarket with the surrounding villages by means of a service of motor-vehicles. Mr. Holley presided. Particulars respecting the advantages of different kinds of motor-vehicles were given by Mr. Julius Harvey, of Mansion House Chambers, London, who, having conveyed Her Majesty's mails for some thousands of miles successfully, was able to give accurate and interesting statistics. He also exhibited photographs and drawings of vehicles running in other towns. The scheme was supported by a large majority of those present, who promised to take a pecuniary interest in the venture.

Narrow v. Broad Tyres.—Narrow tyres for vehicle wheels have long been popular in America, but some recent elaborate experiments carried out at the Missouri agricultural station go to show that the practice has little or nothing to recommend it, the tractive force necessary to propel a wagon being usually much increased thereby. Thus, on a macadam road it was found that a load of 2,518 lbs. could be hauled with the same tractive effort as was needed for a load of 2,000 lbs. with narrow tyres. On a gravel road, except when the surface was very wet and sloppy, similar figures were registered, six trials showing that with broad tyres a load of 2,482 lbs. could be hauled as easily as one of 2,000 lbs. with narrow tyres. With dirty roads the results varied according as the surface was wet or dry. When firm, hard, and free from dust, a load of 2,530 lbs. on broad tyres required no more hauling effort than one of 2,000 lbs. with narrow tyres. When the road was very loose and dusty, however, the narrow tyres had the advantage, and with clay roads the same was the case when the surface was sticky on top and firm below; but when deep in mud and drier on top, or dry on top and spongy below, the reverse was the case, the broad tyre showing an economy of 52 to 61 per cent. in the tractive power necessary. Off the road, and in pasture, meadow, stubble land, or corn ground the broad tyre proved much superior to its rival. As a result of the experiments it was settled that 6 inches was about the best width of tyre for a combination road and farm wagon, and, further, that in four-wheeled wagons the hind wheels should run in the same track as the leading ones.—*Engineering.*

PETROL STORES.

WE have received so many enquiries as to where petrol can be obtained throughout the country that we have very much pleasure in publishing hereunder a first list of firms who stock this oil and other accessories needful for automobilists:—

ALTON—Hetherington and Son, ironmongers.
ANDOVER—T. Lynn, ironmonger.
ASHFORD, Kent—J. Broad, 24, Park Street.
BASINGSTOKE—Julian and Sons, Church Street.
BRIGHTON—Brighton Cycle and Motor Co. (Ltd.), 9, Marine Parade.
CANTERBURY—Court Bros, 12, Butchery Lane.
CHICHESTER—A. Ballard, 7 and 8, East Street.
COLCHESTER—Kent, Blaxill, and Co., 102, High Street.
DORKING—C. J. Peirson and Co., 22, High Street.
Stone and Turner, 98, High Street.
DOVER—M. Pepper, High Street.
DUNSTABLE—H. Brown, 6, High Street.
EPPING—Wm. Cottis and Sons.
FAREHAM—H. Clark, ironmonger.
FARNHAM—M. and J. Tily, Castle Street.
J. H. Knight, Barfield.
FOLKESTONE—W. Francis, 66, High Street.
GUILDFORD—R. Shillingford and Co., 135, High Street.
Lawes and Co., Bridge Street.
HERTFORD—J. Cooper and Sons, 13, 15, and 21, Maidenhead Street.
HUNTINGDON—R. W. Cater and Son, 95, High Street.
LANDPORT—Wm. Smith, 316, Commercial Road.
LEIGHTON BUZZARD—S. Cooper, 14, Market Square.
LEWES—J. Broad and Sons.
LITTLEHAMPTON—Ockenden Bros., High Street.
MAIDENHEAD—Thompson and Walton, chemists.
MAIDSTONE—E. Allcorn and Co., 30, Stone Street.
NORTHAMPTON—Johnson and Wright, Gold Street.
OXFORD—R. Foort, 19, Queen Street.
READING—J. H. Fuller, 50, Minster Street.
RYDE—Geo. Turner, 134, High Street.
SAFFRON WALDEN—Robson and Sons, Freshwell Street.
SEVENOAKS—G. Humphrey, 166, High Street.
SITTINGBOURNE—H. Penteny, 21, East Street.
SOUTHAMPTON—J. G. Fay and Co., 80, High Street.
Summers and Payne, Belvedere.
SOUTHSEA—S. Rose and Co., Castle Road.
ST. ALBANS—R. Norman, Victoria Road.
ST. IVES—Turner and Sons, chemists.
TONBRIDGE—Wightwick and Son, High Street.
TUNBRIDGE WELLS—J. Willmot, 16, High Street.
WINCHESTER—H. W. Frampton, 1, Jewry Street.
WINDSOR—W. H. Brooks and Sons, 28, Peascod Street.
WOODBRIDGE—R. H. Rowland, hardwareman.
WORTHING—Thos. Page, 3, South Street.

Brighton Objects to Motor-Cars.—The Brighton Cycle and Motor Company (Limited) applied last week for a license for a motor-car to run to Rottingdean, Shoreham, and Patcham, from a station in the open space on the Old Steine. The Watch Committee have resolved that the application be not complied with, which decision the Council duly endorsed. It would be interesting to know on what grounds the Council object.

AT the Clacton District Council last week a letter from the London Motor-Van and Wagon Company (Limited) was read, stating that they were proposing to place motor pleasure carriages at various seaside resorts, and Clacton had been suggested as a suitable town to commence with. It was proposed at Whitsuntide to start four carriages, capable of carrying eight passengers each. These carriages would ply for hire, with the permission of the Council, which they now asked. The matter was referred to the Improvement Committee.

THE AUTOMOTOR

AND

HORSELESS VEHICLE JOURNAL

A RECORD AND REVIEW OF APPLIED AUTOMATIC LOCOMOTION.

Circulates amongst Makers and Users of Motor-Cars, Cycles, etc., in the United Kingdom, the Colonies and the Continent.

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CONTENTS.

THE FULMEN STORAGE CELL FOR MOTOR-VEHICLES.

THAT distinguished electrical engineer, M. Hospitalier, is contributing a series of most valuable articles on electromobiles to the pages of our esteemed contemporary, *La Locomotion Automobile.* In a recent issue he describes the Fulmen cell, and as this is deservedly very popular on the Continent, a description of it will be of interest to our readers, as they will thus be able to make a comparison between it and others. Says M. Hospitalier, whom we render freely:—

We know that the accumulators intended for electrical motors ought to present, as primordial qualities, a large specific power (watts per kilogramme of total weight) and a great specific energy (watt hours per kilogramme of total weight), in order to permit the reduction as much as possible of the dead weight carried and to thus increase the length of the route traversed which the battery permits without recharging.

These propositions are to-day well established for a certain number of types of accumulators, and we have personally had the opportunity, at the electrical laboratory of l'Ecole de Physique et de Chimie Industrielles de la Ville de Paris, to follow experimentally, step by step, the progress made by the appliances for storing electric power during the past 15 years, and in particular the Fulmen accumulator used in France by M. Jeantaud and M. Kriéger.

Owing to the kindness of M. Brault, the managing director of the Fulmen Accumulator Company, we have been able to completely study a type of element (cell) specially arranged for vehicles, and carefully noted its construction and working.

The type we have tried is known as Type B, and comprises 13 plates (6 positives and 7 negatives). The rectangular plates are 18·5 centimetres high, 9·5 centimetres wide, and 4 millimetres thick. They form a square of 24 rectangular cells, in which are deposited the active matter. Thin strips of perforated celluloid prevent the plates from coming into contact.

The wet plates, cut close to the attachments, have given us the following weights respectively of the grating (or divisions) and of active matter in grammes:—

	Positive Plates.	Negative Plates.
Grating (or Divisions)	135	135
Active Matter	340	255
Total Weights..	475	390

The area of each plate is 1·75 decimetres, which corresponds to 21 decimetres of total area for the 12 areas of the six positive plates. The box (in celluloid) and the separation of the plates weigh 600 grammes.

The total weight of the complete element with the liquid is 7·5 kilogrammes = 16·5 lbs.

M. Brault considers the normal rate of discharge to be a current of 21 ampères, corresponding to a continuous discharge in five hours, say, a density of current of 1 ampère to the square decimetre of the area of the positive plate, but the accumulator can supply at the cost of its capacity as much as 50 ampères in continuous discharge and as much as 100 ampères on a short circuit.

At the normal discharge in five hours the average difference of the potential of the element is about 1·9 volts and the capacity about 105 ampère hours. Each element of 7·5 kilogrammes has an output of 40 effective watts, and retains a disposable energy equal to 200 watt hours.

The detailed particulars of the element reduced to total weights are as follows:—

The specific output in ampères ..	per kilogramme	3
Useful specific power in watts ..	" "	5·3
Specific capacity in ampère hour	" "	14·6
" useful energy in watt hour	" "	26
" weights in kilogrammes ..	per kilowatt	190
" weights in kilowatt hour ..	.. ..	37·5

At the rate of 5 watts per kilogramme, the Fulmen accumulator retains, then, more than 25 watt hours per kilogramme. These two figures are sufficient to calculate the weight of accumulators necessary to work an automotor of a total given weight, at a given speed, and upon a given road, knowing the yield of the motor and of the transmission as well as of the route it has to travel between two successive charges.

If one doubles the rate of specific continuous discharge, and one brings it to 10 watts per kilogramme, the specific energy lowers to 20 watt hours per kilogramme. If it does not want more than 100 kilogrammes of accumulators to produce 1 kilowatt, it will consequently need 50 kilogrammes (instead of 40) to store up per 1 kilowatt hour. If, on the contrary, one reduces by half the specific rate of continuous discharge, the disposable specific energy increases, and reaches 30 watt hours per kilogramme.*

It must then be remembered, in calculating the weight of a battery, that you lose in energy what you gain in power, and, inversely, that the accumulators keep much better in proportion if submitted to a more moderate rate of discharge.

In the special application with the vehicle accumulator, the discharge is not continuous, but, on the contrary, extremely variable, and the intervals of alternate action and rest are favourable to the diffusion of the liquid, a diffusion that is equally brought about by the agitation of the elements during the run. The figures indicated for the normal rate can then be accepted as representing really the available energy in spite of the variations of the output.

With regard to the duration of the elements, we cannot give a figure for this because the conditions of the working of the accumulators in the laboratory and on the route differ too much. The working of motor-vehicle accumulators will soon bring us the information wanted on this important point.†

We had intended to publish the mode of working other types of accumulators used for automotors, when we discovered that they were nearly all too greatly inferior to those we have just been giving for the Fulmen accumulator. As each maker or inventor claims for his apparatus advantages of solidity, durability, cheapness, and easiness of putting together, &c., which compensates more or less for the inferiority of the output and capacity, it seems to us best not to pave the way for any claims and vindications.

The figures which we have given, and which are the result of our personal experience, represent the maximum of what one can obtain with the present accumulators. In waiting for better, and in spite of the proverb which says that "better is the enemy of good," the question of the accumulators is studied a little everywhere to-day, and we agree to think that the present maximum is but very provisory. Such as it is to-day, it is sufficient, however, to produce practical motor-accumulators capable of running daily over a track of from 50 to 60 kilometres without recharging.

THE PRÉTOT MOTOR-VEHICLE.

Among other types of motor-vehicles which are bidding for public support the Prétot stands a good chance of obtaining a fair share of patronage, in that it enables ordinary four-wheel vehicles of the usual construction to be easily and inexpensively converted into motor-vehicles. The principle adopted is well known to most of our readers, but for the benefit of others we may say that the Prétot system consists in mounting a motor and its accompanying gear on a two-wheeled axle, the whole being placed under the forepart of any ordinary carriage or cab, replacing the ordinary wheels. The system has much to recommend it, as the connection can be so easily made. An ordinary four-wheeled cab or tradesman's cart could in the course of a couple of hours' work be readily converted into a motor-vehicle. Little alteration is required: all that has to be done is to disconnect the front axle and its gear and connect with the Prétot. The footboard has to be cut in two places, to enable the starting lever, steering gear, &c., to be placed within convenient reach of the driver's hands. As regards the mechanism, this consists of a pair of horizontal cylinders placed nearly opposite each other and working on the usual Beau de Rochas cycle, that is, in each cylinder there is an explosion at every second revolution. Hence, in this motor there is an impulse for each revolution of the main shaft. Light petroleum or gasoline is the fuel used. The motor runs at from 700 to 800 R.P.M., and indicates about 4½ H.P. Fixed to the driving shaft is a nest of epicyclic gearing,* which allows three different speeds to be transmitted and one reverse motion. There is also the usual differential motion. The carburator is of a simple and effective kind and requires but little attention to keep in order. All the mechanism is enclosed in a kind of box, which not only allows the gearing to run in oil but also keeps out dust, &c. This box is, by means of springs, attached to an axle, and, as before explained, the whole is easily fixed to any ordinary vehicle.

A company is being formed to place this motor on the market, the representative of M. Prétot being Mr. J. Melling, Dashwood House, New Broad Street, London, E.C.

ACETYLENE AND CARBIDE OF CALCIUM.

In an article on the cost of acetylene our contemporary, *l'Industrie Velocipédique*, expresses the opinion that under the most favourable conditions the price of carbide of calcium in France cannot yet fall below 300 francs per ton, or 1 franc per cubic metre of acetylene. Professor V. Lewes, R.N., is quoted as having said at the Royal Institution that 1,816 kilogrammes of a mixture of 100 parts of lime and 68 parts of coke will give 10·15 kilogrammes of carbide of calcium, and that the E.H.P. per hour, obtained by means of a waterfall, would cost about 25 francs per annum in England. It is, perhaps, incorrect to fix a yield per E.H.P. by reason of the loss due to breaking and packing of the carbide; thus, in an industrial undertaking it has been proved undeniably that the yield after leaving the electric furnace was 0·504 lb. per kilowatt hour, and that it had been reduced to 0·400 lb. per kilowatt hour when the carbide had been broken, sorted, and packed in air-tight packages. This loss of 20 per cent. is attributed to a bad quality carbide which formed a crust on the ingots and may be considered as a waste product.

Another point on which the professor insisted was the extreme importance of the purity of raw material. It is easy to find chalk fairly pure, and good coke with only traces of phosphorus and sulphur. But if the chalk and coke contain combinations of phosphorus, silica, and sulphur, the carbide and, naturally, acetylene will be impure, and it is not surprising if the latter would contain a very appreciable proportion of phosphoric hydrogen, silica, and sulphur. This is what will occur with impure carbide and a possible danger of spontaneous combustion, and would also produce an unhealthy and noxious combustion. Professor Lewes speaks of silicated hydrogen although the other authors do not admit of its existence in acetylene. We do not profess to say who is right, he or the others, on this point, but when the very small quantities of impurities, phosphoric or sulphuretted hydrogen, appear, it is easy to eliminate them by a suitably organised installation. We have also heard of azote as an impurity and its origin is attributed to coke; coal contains a fairly large proportion of azote, at least 1 per cent. or 10 kilogrammes per ton, and, on distilling, a large quantity remains in the coke. What becomes of it in the electric furnace?

According to a recent work by Messrs. Lunge and Cedercreutz there would be an advantage in making use of it for purifying commercial acetylene from hypochloride of soda or, better still, chloride of lime. Hypochloric acid salts have not, at an ordinary temperature, any action on acetylene gas; they oxidate phosphoric hydrogen easily and completely, which chemists have recognised, in a varying proportion of 93 to 248 cubic centimetres per kilogramme of carbide in the tests of carbide for different productions. With regard to the desiccation of liquid acetylene it can be realised by means of sulphuric acid, sufficiently concentrated, of a density 1·6 to 1·7; the ammonia would be retained as well as the moisture. For applying it as a means of lighting railway carriages a mixture with other gases is at present recommended. Acetylene which, condensed to two atmospheres, could explode at a dark red temperature becomes

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* For the benefit of those of our readers who are interested in storage cells but who are perhaps not familiar with French scientific nomenclature we render this table of data as follows:—

Ampères, per lb.	1·5
Watts, per lb.	2·6
Ampère hours, per lb.	6·6
Units, per lb	10·012
Lbs., per kilowatt	420
Lbs., per unit	82

† No doubt the London Electrical Cab Company could say a good deal about this matter; the information they could supply would certainly be interesting and instructive.—Ed.

* *Vide* The Automotor for October, 1897, for a description of this gear.

more moderate when it is diluted; the explodable temperature increases from 100°C. to each 10 per cent. of other gas, so that very light and practically inexplosive mixtures can be made.

THE RIKER ELECTRIC MOTOR SYSTEM.

ON p. 146 of our current volume we gave a detailed description of the Riker Electric Motor Company's carriage. The accompanying illustration shows their new type of Electric Victoria, and, as introduced on this side by Messrs. Shippey Brothers. The motor is series wound, and has a slotted armature; its output is two kilowatts; it weighs but 142 lbs., and runs at 1,000 revs. per minute; the total weight of the vehicle being but 1,800 lbs., while it will run at 12 miles per hour on a good road for four hours. We understand that the Riker Company are shipping to their agents, Messrs. Shippey Brothers, a complete range of their latest type of vehicles, consisting of the Riker Electric Trap, the Riker Carriage, and the Riker Victoria, all of which will be shortly placed on the English market, and we understand an early opportunity will be given to those interested in automobilism to inspect these latest arrivals.

THE RIKER ELECTRIC VICTORIA.

will be seen, it is distinguished by great elegance in design, there being no unsightly mechanical projections which mar the appearance of so many vehicles. In designing this new type of Riker Victoria the great aim has been to ensure strength and lightness, and at the same time to permit of a good system of suspension. The frame consists of 1¼-inch steel tube, while the wheels are of cycle type with tangent spoke; the driving and rear wheels being respectively 36 and 32 inches in diameter, the wheel base being 6 feet. The battery consists of 40 cells of the new Woodward Multipolar battery, which are now used in the Riker vehicles, and are being

The Trend of Trade.—It is stated that a large quantity of American pig iron has been brought into the Clyde at 10*s*. per ton below the price for which English iron could be obtained in this country, and should it prove equal to specifications, it is said there will be a large importation.

THE Cafromobile is the name given to a small truck drawn by a couple of Caffirs or as we usually spell it—Kaffirs. This motor-vehicle is, we learn, in use in South-East Africa. Where is the Aborigines Protection Society?

ACCIDENTS TO MOTOR AND OTHER VEHICLES.

Defective Brake Gear.—At the Scarborough Town Hall on the 28th ult., the Coroner and a jury resumed their inquiry into the circumstances attending the death of John Vassalli, who was knocked down by a motor-vehicle belonging to the Bradford Motor-Car Company, in Newborough, on Friday, the 22nd ult., and who died at the Scarborough Hospital. William Pickles, engineer, Bradford, the driver of the car, deposed that on the morning of the day of the accident a new driving chain had been fixed on the car by Messrs. Walker and Hutton, of Scarborough; that he was proceeding down Newborough when the iron rod controlling the hand brake broke, and losing control of the car, it quickly gained an alarming impetus, becoming practically uncontrollable, and dashed into the old man just before he gained the footpath, with the result stated. Witness added that, in his opinion, the car was not sufficiently well designed in construction as regards the strength of the driving chain and brake rod and the disposition of the brakes to render it perfectly safe to pass over roads with an incline exceeding one to ten. The jury, after deliberating in private, said that death was due to accident, and they exonerated the driver, stating that he did his best under the circumstances. They found that the connecting rod was not of sufficient strength, that the driving chains were too light for a machine of this weight, and that the drum was also too small. The Coroner said he thought that on the evidence given them the motor-car was quite right, but he could not help thinking that in sending out these motor-cars or arrangements of this description too much care could not be exercised in testing them as to their strength in every particular.

Death of a French Nobleman.—At Périgueux, on the 2nd inst., during a speed competition organised by the Véloce Club, Perigourdin, over a distance of 143 kilometres on the National High Road, and at a spot called the Saut du Chevalier, a car weighing 850 kilogrammes, driven by the Marquess de Montagnac, came into collision with a very light vehicle, weighing only 180 kilogrammes, in charge of M. de Montariol, of Bordeaux. M. de Montariol succeeded in jumping off before his vehicle fell down the embankment, but his servant received severe injuries immediately after the shock, and, while his car was still in motion, the Marquess de Montagnac and his driver looked round to see what had happened. In so doing the stoker released his hold of the steering wheel, with the result that the car suddenly dropped down the embankment in its turn. Both of the occupants were dreadfully injured, and the Marquess de Montagnac expired a few hours afterwards, while his assistant is not expected to recover.

Danger of Horse-drawn Vans.—A young married woman named Gregory, of Stevenson Place, Long Lane, Bermondsey, while standing on the pathway late on the night of the 2nd inst., in Great Dover Street, Borough, was seen to stagger and fall beneath a passing pair-horse van. She was removed to Guy's Hospital, and found to have sustained severe internal injuries, to which she succumbed during the night.

Insufficient Brake Power.—A news agency says that a fatal motor-car accident is reported from Poitiers. A lawyer, named Hay, and his wife were returning from an excursion in an autocar, when the vehicle got out of control while descending a hill and overturned. Mrs. Hay fell under the carriage, and was killed on the spot. Mr. Hay escaped with severe injuries, both arms being broken and his head badly cut. Mrs. Hay was only 28 years of age.

The Stone Wall and the Motor-Vehicles.—A serious accident took place on the 28th ult., between East Kilbride and Bushy. Two motor-cars from Hamilton, going to Ayr Show, collided against a stone wall a little above Braehead. The vehicles were going at a good speed. The occupants were considerably injured. The local doctors were speedily on the spot and had the wounds dressed, some of them being rather serious. One of the vehicles was smashed to pieces.

A Motor-Vehicle on Fire.—In the Bow Road, on 26th ult., a motor-car—one in which apparently petroleum or oil was used for fuel—took fire in the middle of the thoroughfare, and the firemen were hastily summoned to extinguish the blaze. A few buckets of water sufficed, and the car retired for repairs.

The Post Office Mail Van.—The motor-van which conveys the night mails between Reading and Newbury met with a singular accident in the latter town on the 20th ult. The car was returning to Reading, between three and four o'clock, and while proceeding at a good pace along the main street the steering gear went wrong, and the vehicle dashed across the pavement, smashing a large plate-glass window in a stationer's shop and greatly damaging a quantity of stock. The car was detained at Newbury for the necessary repairs, which were quickly effected.

THE AUTOMOBILE CLUB OF GREAT BRITAIN.

At a meeting of this Club held on Wednesday evening, April 27th, a lantern display, which was voted a great success, of cinematograph views taken during the Easter Tour of the Club, showed the progress of the touring cars along the Hog's Back, and at Fareham, Hants. After the display a discussion took place on the arrangements and route for the Whitsuntide Tour. Mr. Roger Wallace, Q.C., presided, and amongst others present were Lord Kingsburgh, C.B., Sir J. R. Somers Vine, C.M.G., Major-General E. L. England, C.B., Messrs. A. W. Armstrong, G. F. Arney, W. Worby Beaumont, F. R. S. Bircham, A. Bird, E. H. G. Brewster, Frank Butler, R. W. Buttemer, Herbert C. Capel, F. T. Carter, T. Clarkson, C. Cordingley, R. E. Crompton, E. Estcourt, Staplee Firth, Cecil Grimshawe, C. Heyermans, W. M. Hodges, Ernest Instone, C. Johnson (Secretary), J. H. Knight, A. Ledger, E. Lefébure, C. Harrington Moore (Hon. Secretary), P. W. Northey, G. Foster Pedley, R. E. Phillips, J. D. Roots, Captain Sampson, J.P., Messrs. Lyons Sampson, E. R. Tebbitt, E. Townsend, &c.

The following Tour was ultimately decided upon:—

Friday, May 27th. London to Cambridge (62¾ miles).—Start from Club at 10.30 a.m., the route being *viâ* Horse Guards' Avenue, Whitehall, Cockspur Street, Waterloo Place, Regent Street, Portland Place, left side of Park Crescent, outer circle of Regent's Park, leave Park by gate opposite Baptist College, Avenue Road, Finchley Road, Child's Hill, Finchley, and by G. N. road to Barnet, Potter's Bar, Hatfield, Cole Green, Hertford; 2 p.m., luncheon at "Dimsdale Arms Hotel," Hertford; 3 p.m., leave Hertford for Cambridge, *viâ* Ware, Buntingford, Royston, and Foxton; 8 p.m., dinner at "Prince of Wales's Hotel," Cambridge.

Saturday, May 28th. Cambridge to Norwich (68½ miles).—9.30 a.m. leave Cambridge for Bury St. Edmunds, *viâ* Newmarket, Kentford, and Saxham; 1 p.m., lunch at Bury St. Edmunds; 2 p.m., leave Bury St. Edmunds for Norwich, *viâ* Ingham, Barnham, Thetford, Attleborough, and Wymondham; 8 p.m., dinner at "Royal Hotel," Norwich.

Whit Sunday, May 29th. Optional Circular Tour to the "Land of the Broads," viz., Cromer, North Walsham, Wroxham, and back to Norwich (62 miles).—10.30 a.m., leave Norwich for Cromer, *viâ* Coltishall, North Walsham, and Thorpe; 1.30 p.m., luncheon at Cromer; 2.30 p.m., leave Cromer for Norwich, *viâ* North Walsham, Stalham, Potter Heigham, and Wroxham Station; 8 p.m., dinner at Norwich.

Whit Monday, May 30th. (Alternative Routes.) Norwich to Ipswich (42¾ miles). A Route.—10.30 a.m., leave Norwich for Scole, *viâ* Long Stratton; 1 p.m., luncheon at Scole; 2 p.m., leave Scole for Ipswich, *viâ* Thwaite and Claydon; 7 p.m., dinner at "Great White Horse Hotel," Ipswich.

Norwich to Ipswich (54¾ miles). B Route.—9.30 a.m., leave Norwich for Saxmundham, *viâ* Brooke, Bungay, Halesworth, and Yoxford; 1 p.m., luncheon at "Bell Hotel," Saxmundham; 2 p.m., leave Saxmundham for Ipswich, *viâ* Wickham Market and Woodbridge; 8 p.m., dinner at Ipswich.

Tuesday, May 31st. Ipswich to Chelmsford (40 miles).—10 a.m., leave Ipswich for Colchester, *viâ* Washbrook and Stratford St. Mary; 1 p.m., luncheon at "Cups Hotel," Colchester; 2 p.m., leave Colchester for Chelmsford, *viâ* Witham; 7 p.m., dinner at "Saracen's Head Hotel," Chelmsford.

Wednesday, June 1st. Chelmsford to London (35¼ miles).—Mr. R. E. Crompton (a member) has kindly invited members to inspect his firm's works, at Chelmsford, on this morning. 1 p.m., luncheon at Chelmsford; 2 p.m., leave Chelmsford for the Club, *viâ* High Ongar, Epping, "Wake Arms," Waltham Cross, Enfield, Whetstone, up the Barnet Road and Finchley Road by the same route as at start. Supper at the Club.

The Liquid Fuel Engineering Company, of East Cowes, Isle of Wight, has kindly placed at the disposal of the Club, a "Lifu" steam van (with driver) as a tour luggage van. The Club steward will accompany this van to take charge of luggage.

Amongst those who have notified that they will probably take part in the Tour are:—Major-General England, C.B. (De Dion tricycle), Messrs. Boverton Redwood, F.R.S.E. (Daimler, 8 H.P.), Estcourt (Daimler wagonette), Wills (Benz Ideal), Frank Butler (Benz $2\frac{8}{10}$ H.P.), Heyermans (Mors), A. Ledger (Benz), Buttemer (Benz), Hewetson (Benz), Cecil Grimshawe (Daimler), Phillips (De Dion tricycle), Ernest Instone (The Daimler Motor Company's wagonette), Herbert Capel (Benz, or with Mr. Thomas Clarkson's steam carriage), E. Townsend (Bollée), Frederick R. Simms (Daimler carriage and De Dion tricycle), F. T. Carter (Bollée), Claude Grahame White (Daimler), Dr. C. E. Shelly (Arnold—from Hertford to Cambridge), A. D. Stopes (Arnold), Sir J. R. Somers Vine, C.M.G., Messrs. Ellis Parr, C. Harrington Moore, Louis d'Egville, Holland Tringham, &c. The Right Hon. Earl of Shrewsbury and Talbot (Phœnix Daimler carriage) will also take part in a portion of the tour.

Those who are not owners of motor-vehicles may book seats, through the Secretary, in the following motor-carriages, which have kindly been placed at the disposal of the Club:—Daimler Motor Company's carriage, 3 seats; Club (Daimler) wagonette, 5 seats; £3 3*s.* per seat for the whole Tour, or 12*s.* per seat per day.

The fullest details can be obtained upon application to the Secretary of the Club, 4, Whitehall Court, S.W.

Mr. R. E. Crompton (a member) has, in his capacity as engineer, kindly arranged that members should see over the Electric Lighting Stations at Westminster and Kensington, and subsequently visit his Laboratory at "Thriplands," Kensington Court, on Friday, 20th inst. The visit to the stations will be made on motor-vehicles, which will start from the Club at 8.30 p.m.

On Saturday last an evening run for dinner on motor-vehicles was arranged to Windsor and back, leaving the Club at 3 p.m., the start home being made at 8 p.m. We learn that the following carriages had been entered for this "run":—

- Club wagonette No. I (lent by the London Wagon and Van Company, Limited).
- Club wagonette No. II (lent by the Daimler Motor Company, Limited).
- Mr. Hugh Campbell's Daimler carriage.
- Mr. Frank Butler's Benz carriage.
- Mr. Harrington Moore's sociable.
- Mr. Northey's electric carriage.

Over 20 members booked seats for the "run" and for dinner.

The Committee of the Automobile Club of Great Britain have placed themselves in correspondence with the Customs authorities of the various European countries with a view to securing for members of the Club, and for owners of motor-vehicles generally, facilities for taking motor-vehicles into those countries free of duty. We have been supplied with copies of the replies which have been received to the present time, and as the matter is one of considerable interest to motor tourists we print them hereunder. It is evident that the Automobile Club of Great Britain is fully alive to the best interests of automobilism:—

Ministère des Finances,
Direction Générale des Douanes,
[*Translation.*] Paris, *le* 26 *Avril*, 1898.

Sir,—You did me the honour to write to me on the 20th inst., with a view to securing that members of your Club should be able to enter France with motor-vehicles intended for their personal use without being required to pay Customs duties.

The law does not permit the free importation of carriages of foreign manufacture, even if they be imported by private persons. But if it is not intended that the carriages should remain in France, the admission will be authorised under the ordinary regulations for the payment of duties subject to re-exportation during a year.

These duties will be refunded to the parties interested when the carriage is taken out of the country again—which, furthermore, may be effected through a Customs house other than that through which it was brought into the country—after a careful verification, and on showing the document given on the introduction of the carriage into the country.

Instructions to this effect have been given to the staff under my orders.

I am, &c.,
LE CONSEILLER D'ETAT,
Directeur Général.

To the Secretary,
Automobile Club of Great Britain.

Ministerie van Financiën, s' Gravenhage,
No. 88. 9 *May*, 1898.
[*Translation.*]

Sir,—With reference to your letter, I have the honour to inform you that motor-carriages and motor-cycles which are introduced into the Netherlands for a temporary stay by members of the Automobile Club of Great Britain are free of duties, or from giving any security for these duties, provided no fraudulent attempt be made, and on production of proof of their membership of the aforesaid Club.

I am, &c.,
for De Minister van Financiën,
(Signed) C. VAN DYCK,
de Secretaris-Generaal.

A SUCCESSFUL TRIP WITH A STEAM MOTOR-VEHICLE.

IN its issue of the 15th ult. the *Hawick News* gives an account of a most interesting run made by Mr. W. Philipson and Messrs. T. and W. Toward in one of the motor-vehicles that this firm, or rather the two firms of Messrs. Atkinson and Philipson and Messrs T. and W. Toward have jointly constructed. We may mention that here we have an excellent illustration of the success that attends an intelligent co-operation of the carriage builder with the engineer. Messrs. Philipson and Atkinson are, as no doubt our readers know, a leading firm in the North of England in carriage building, while Messrs. Toward have established a reputation as traction engineers. By working together and making the experience and knowledge of the one supplement that of the other, they have produced a type of steam motor-vehicle which has given great satisfaction, and several orders are now on hand. Says our contempory:—

"A motor-car being still somewhat of a novelty, the appearance of one in High Street on Saturday evening, the 9th ult., attracted much attention, crowds following it along the streets towards the yard of Mr. Robson, wood merchant, where it was put up for the time being. The car was accompanied by Mr. William Philipson, of the firm of Atkinson and Philipson, carriage and harness manufacturers, Newcastle-on-Tyne, by whom the car was built, and along with him were Messrs. Thomas and William Toward, of the firm of Messrs. Toward, engineers, the makers of the engines by which the car is propelled. The trio were on an experimental trip, having started from Newcastle on Thursday evening, and proceeded to Hexham the same night. On Friday they came on to Carlisle, a distance of some 40 miles, viâ Haltwhistle and Greenbank. At the latter the rubber tyre of one of the wheels slipped off, and they had to proceed without it. On Saturday about mid-day they left the 'merrie city' for Hawick, about 45 miles, reaching their destination shortly after 8 o'clock. At Langholm a halt was made for a couple of hours. The car is not constructed for swift running, but it can easily do 20 miles an hour, though the speed is restricted to 12 by Act of Parliament. Mr. Philipson is of opinion that motor-cars are best adapted for heavy traffic, such as that carried on by omnibuses, cars, lorries, and carts. The firm are busy making a motor-car wagon to carry 3 tons of coal. It is found that steam is the most suitable motive power for such cars; gas or oil may be used for light cars. A car, including the engines, costs from £300 to £500; but the expense of running is very slight, $3\frac{1}{2}d.$ worth of coke being sufficient fuel for 20 miles. Water requires to be taken in every 10 miles or so. Messrs. Atkinson and Philipson, it may be mentioned, do an extensive trade in the construction of ordinary carriages, and are the holders of 25 gold and silver medals for the best designs in carriage building. The motor-car in question is a wagonette with seats for two in front and four behind. The body is mounted by means of three elliptic springs on a steel double-perch under-carriage of original and protected design. This under-carriage frame carries the boiler and engines, and is, in turn, supported on the hind axles by spiral springs, and on the front axle by side springs, which effectively relieve all vibration. The boiler is of the fire tubular type. Steam is generated by a coke fire, the fuel being fed by an ingenious device from the top by one of those sitting in the carriage. The motor itself consists of a pair of light, high-pressure, horizontal reversing engines, capable of propelling the carriage with six passengers up an incline of 1 in 9, at a working pressure of 175 lbs. per square inch. The engines have long connecting rods and ample wearing surfaces, and are geared direct from the crank-shaft to the hind axle and driving wheels with pitched chain and sprocket wheels. The driving axle has a very compact differential gear. The steering gear is worked by a vertical spindle and lever and pivoted axles, and is easily controlled, while the reversing gear, foot and screw brakes are very convenient for the driver. The wheels have solid rubber tyres, which are more suitable for motor-cars than pneumatics. No 4 looks well and workmanlike on the road, and we may safely conclude that it is a success, as the builders are now engaged on No. 7.

"The car, which weighs 18 cwt., left Hawick on Monday morning shortly after 9 o'clock on the return journey to Newcastle, viâ the Carter Fell. Its movements were again watched with great interest by large crowds as it passed along the streets, turning the corners very cleverly, and moving very smoothly and with very little noise."

THE Winton Motor Carriage Company have issued a challenge to any American or European manufacturer of motor-carriages to race them from Chicago to New York, or over any other route of not less than 1,000 miles, in the United States. The terms require that competitors shall use regular single-seated commercial machines, carrying a driver and one passenger. We have not seen this challenge but should like to.

THE ELIESON ELECTRIC CAB AND VAN.

WE have in previous issues described at some length the progress that the Elieson Lamina Accumulator Company, of Camden Town, N.W., has made in perfecting its system of electric traction. It will be remembered that one of the most important features of this system is the absence of any differential gearing; this is effected by using a specially formed chain,* which, while gripping the driving wheels sufficiently to ensure rotation of the latter, is yet, by its peculiar construction, enabled to slip wheuever one or the other of the two wheels is forcibly retarded in its speed, as when it forms the inner wheel in rounding a curve. This method is not only very simple, but effective, as we can testify from personal observation. This gearing is practically noiseless. In other respects, too, considerable ingenuity is displayed in overcoming various practical difficulties, and at length this firm has produced an electric cab, which we illustrate herewith, and which, whether as regards its elegance of design, or its mechanical details, leave little to be desired. This vehicle, as will be seen, is a marked advance upon the ordinary electric cab such as we are accustomed to see in the London streets. The motor is made so as to allow the Field magnet coils to be placed either in series or in parallel. The current is derived from a battery of 40 Lamina cells, and when discharging at 20 ampères the capacity is 160 ampères hours. All the cells are grouped in series, hence they do not suffer from unequal rates of discharge. The total weight of the battery is about 10 cwt., and the weight of the vehicle in working order about 1 ton.

We also give an illustration (Fig. 2) of their latest design in electric delivery vans. It will be seen that while preserving the same general features the motor in this case is placed in front of the

FIG. 1.—THE ELIESON ELECTRIC CAB.

* *Vide* THE AUTOMOTOR, May, 1897.

driving wheels. The weight of the battery is about 12 cwt., and the total weight 22 cwt. Objection might be taken to the prolongation of the tubes and to the manner in which they are curved up. While in the event of a collision this prow would prevent damage to the van in question, it might possibly inflict damage to the colliding body. The arrangement of the cells and switching gear is the same in both vehicles.

We understand that several orders for these cabs and vans have been placed; some prolonged tests having shown that they fulfil every requirement for street traffic.

AUTOMOBILISM AND POLICEMANISM.

MESSRS. W. A. MARTIN AND Co., who were recently summoned for obstruction with a motor-vehicle, writes to a contemporary as follows:—"It may be of interest to the owners of motor-cars to learn our experience on the road, with regard to the police regulation. We have been making a number of experimental runs to test the working appliances, and to give the drivers an opportunity of acquiring experience in steering. On returning through Clapham recently, we had to stop a few minutes in consequence of a screw breaking belonging to the steering gear, and as we were ascending a hill the steam lifted the safety valve. We were instantly surrounded with two or three policemen, ordering us to move on. This we could not do for a few minutes. Our name and address were taken, and in a few days after we received a summons to the South-Western Police Court for allowing a locomotive to be run without sufficient control. Upon the case coming on for hearing, it was found that the policeman had made a mistake, as the car was stopped and under perfect control. The case was adjourned for a fortnight, and another summons issued under another head, for permitting a car to be used that the fittings being in such a condition as to be likely to cause danger to persons on the highway. As no one on the part of the police had examined the car, or knew anything about it, the magistrate dismissed the summons. If cars are to be used on the common roads, the police should have instructions as to the regulations to be observed. Even the court did not possess a copy until the second summons was heard. This, it appears, was the first summons under the Act, therefore some excuse for blundering; but why a motor should not be permitted to stop a few minutes on the road, to correct any trifling defect that may happen, as well as ordinary carriages and vans, is difficult to understand."

Action Against a Motor-Vehicle Company.—On May 10th, at Coventry County Court, Hannah Terry, carrier, Corley Moor, near Fillongley, sued the Daimler Motor Company (Limited) for £19 6*s.* 6*d.*, damages sustained in a collision with a motor-car on January 31st. On the date named, Mr. Seward, in the employ of the Daimler Motor Company, was bringing back some things shown at Bingley Hall Exhibition, and when near Coventry a collision occurred between the motor-car and the carrier's cart. Plaintiff and a Mrs. Fennimore were both upset and injured. After hearing the evidence, the jury found that the driver of the motor-car was not guilty of negligence, and a verdict was entered for the defendants, as also, by consent, in a second action brought by Mrs. Fennimore.

ELECTRIC TRACTION AND ELECTRIC FRICTION IN LIVERPOOL.

THE Tramways Construction Committee decided by seven votes to three to order for use on the experimental electric tramway between St. George's Church and the Dingle, 14 German electric cars—seven of the Altona type and seven of the Ring-Bahn type—with trailers to each. The cars, with their trailers, will accommodate 50 persons each. The Committee resolved to leave Sir Arthur Forwood to order 14 other cars from America, provided the specification of the electrical work was altered so as to fulfil the requirements of Dr. Hopkinson, consulting electrical engineer to the Corporation. About four months must elapse before the cars are ready for use. The Committee are desirous of seeing both the German and American cars at work, with the object of adopting a car of their own pattern which they hope to have made in Liverpool. The City Council refused to agree to the recommendation of the Generating Stations Committee (of which Sir Arthur Forwood is the chairman) to accept tenders for the supply of electrical generating engines of a certain type, whereupon Sir Arthur intimated that he had striven during the last two years to provide the city with a worthy tramway system, but his committee had not received the support and sympathy of the Council. He, therefore, not only would resign from the Committee, but that would be the last occasion upon which he would be present in that chamber. This is not the first time Sir Arthur Forwood has resigned from the Tramway Committee.

FIG. 2.—THE ELIESON ELECTRIC VAN

THE Newton Rubber Works Company are manufacturing a 10-inch pneumatic tyre for heavy motor-vehicles. Four of these gigantic tyres are capable of sustaining a weight, so says the *Horseless Age*, of 8,000 lbs. They claim to be the only manufacturers in the United States able to turn out such tyres.

Z 4

DOINGS OF PUBLIC COMPANIES.

Dick's Asbestos Company, Canning Town, inform us that they have taken offices at Nos. 51 and 52, Fenchurch Street, E.C.

The Right Hon. Lord Rathmore has joined the board of directors of the British Electric Tramway Company (Limited).

The Motor and Cycle Company of Ireland (Limited).—Mr. Robert Gardner, the liquidator of this Company, last month repaid to the ordinary shareholders a final sum of 1*s.* per share. By this payment the ordinary shareholders are refunded all monies paid by them, and as the preference shareholders were repaid in full in September last, the entire amount of the subscribed capital has now been returned. Would that the same could be recorded of all other companies.

New Issue.

The Scottish Motor Hiring Company (Limited).—This Company has been formed for the purpose of acquiring, as a going concern, the business and assets of the Scottish Motor Omnibus and Car Company (Limited), Hamilton, and of carrying on, developing, and extending the same. The capital is £25,000 in £1 shares, of which 15,000 are now issued at par. In addition to continuing and extending regular services of cars on fixed routes, the directors propose to arrange summer motor-car tours in Scotland, England, and Ireland, summer holiday excursions, popular half-day trips, and to give facilities for hiring by the hour, day, week, or month. To meet this extension of business, arrangements have been made for the early delivery of 30 motor-cars, equally serviceable for passenger and goods traffic. The balance sheet for the first quarter, ending January 25th last, under the old Company showed a gross profit on the three months' working at the rate of 35 per cent. per annum on the subscribed capital, and the shareholders have been paid an interim dividend at the rate of 20 per cent. per annum.

Austen's Patent Wheel-Making Machine (Limited).

The first ordinary general meeting of the shareholders of this Company was held on April 29th, at the registered offices of the Company, 10, Drapers' Gardens, E.C. Mr. Charles Lloyd Roberts (the chairman of the Company) presided.

The Secretary (Mr. Charles J. Coombes) having read the notice convening the meeting,

The Chairman during his speech said: Most of you are well acquainted with the machine to the protection of which the patents apply. Briefly it may be described as a small power-driven tool for screwing up the nipples on the spokes of tension wheels, the principle being that the nipple is screwed on to the spoke until the latter comes through the nipple, when it presses back a catch, which throws the machine out of gear and stops it, then another spoke is inserted and the machine started again, and so on until every spoke in the wheel is tightened to the tension required. In action it is so simple that a boy without any special training can true up a wheel inside of two minutes, whereas by the old hand-method a man, highly paid by time—a skilled wheelmaker—seldom made more than, say, 10 wheels for his day's work; the average number was about six, I believe. We are now in a position to supply machines to manufacturers to be worked on a royalty of a fixed sum to be paid on each wheel manufactured, the machines meanwhile remaining our property. Messrs. Humber and Co. have, among others, already completed arrangements to use our machines, and from this one firm alone we should derive a very handsome income, while we hope and confidently expect that in a few months' time every large cycle manufactory will be using our machines on similar terms. In addition to thus letting out the tools on royalty we have a large and convenient workshop, fitted with complete wheel-making plant and enamelling ovens, in Whitechapel, where we make up wheels either from the materials our customers supply us with, or sell the complete wheels. This branch of our trade is, I am glad to tell you, already meeting with most gratifying support, and evidently supplies a need long felt by those smaller cycle makers who hitherto have experienced much difficulty in obtaining wheels made and guaranteed true at anything like short notice, or at relatively small expense. At seven days' notice, I may say, we are now prepared to guarantee delivery of wheels, accurately trued, in any number asked for. So much for cycle wheels. But this is not our only resource for supplies of work or the profits incidental on same. We shall be prepared to supply tension wheels of the highest class of excellence for use on carts, carriages, or motor-cars and vans, and can do so at prices considerably lower than those now ruling for wooden wheels of ordinary quality. We would also lease machines for making this class of wheels in a similar manner to the ones for cycles.

A Shareholder. Are Humber's going to make all their wheels with our machines?

The Chairman. Certainly, except wheels made with direct spokes. They have given us permission to use their name publicly, and they will also be very glad to show any of our machines at work at their place in Coventry.

Mr. Myall. How many machines have they?

The Chairman. Two, and one machine is capable of making 100 wheels per day.

Mr. Myall. Have you any idea of the average output of bicycles per annum?

The Chairman. I should think quite 1,000,000 bicycles are made in a year—that is 2,000,000 wheels. In addition to that there are as many perambulator wheels as bicycle wheels manufactured in the course of 12 months. Then we have other machines for making carriage, motor, and other wheels, as mentioned in my speech.

A vote of thanks to the chairman and directors terminated the proceedings.

New Companies Registered.

[Under this heading we give a full list of new Companies registered which take power to make, deal, or become interested in any manner in automotor vehicles.]

Electric Horse Promotion Syndicate (Limited).—Registered by Chapronière and Co., 11, Charing Cross, W.C.; capital £5,000, in £1 shares. Object, to adopt an agreement made by this Company with J. Lambert, and to acquire and turn to account certain patents.

Electric Light and Power Company (Limited).—Registered by Markby, Stewart, and Co., 57, Coleman Street, E.C.; capital £6,000, in £1 shares (5,003 deferred). To carry on the business of an electric light company and supplier of motive power, and the business of electricians, electrical, mechanical, and general engineers, &c.

Electric Railway and Tramway Carriage Works (Limited).—Registered by Waterlow and Sons (Limited), London Wall; capital £150,000, in £5 shares. Object, to carry on at Preston, Lancashire, and elsewhere, the business of manufacturers of and dealers in tramway-cars for horse, electric, and cable roads, and vehicles for light railways, and any other kinds of cars and rolling stock, whether worked by electricity, steam, gas, oil, horse, or any other mechanical power. The first directors are:—G. Flett, G. F. Fry, J. Kerr, R. H. Prestwich, and G. Richardson. Registered offices, 13, Spring Gardens, Manchester.

Felsche's Patent Tube-Joint Syndicate (Limited).—Registered by Ashurst and Co., 17, Throgmorton Avenue, E.C.; capital £700, in £1 shares. Object, to adopt an agreement with Felsche, Roderwald, and Co., to acquire certain patents, and to manufacture, sell, and deal in bicycles, vehicles, and carriages of all kinds.

Hillsdon and Stones (Limited).—Registered by R. Brooks, 24, Lawrence Lane, E.C.; capital £6,000, in £1 shares. Object, to carry on the business of cycle manufacturers, motor and carriage builders, engineers, &c. Registered office, Alexandra Works, Alexandra Gardens, Folkestone.

Lancaster Light Railways (Limited).—Registered by F. J. Leslie and Co., 15, Union Court, Castle Street, Liverpool; capital £50,000 in £1 shares. Object, to construct and maintain rail and tram roads in Lancashire, to be worked by means of horse, steam, electric, or other power.

Mansfield Motor-Car Company (Limited).—Registered by Jordan and Sons (Limited), 120, Chancery Lane, W.C.; capital £5,000, in £10 shares. Object, to carry on the business of automotor manufacturers, electrical, gas, and mechanical engineers, &c. The first directors are:—W. J. Chadburn, G. A. Fish, F. Hamever, F. A. Robinson, R. F. Vallance, and J. J. Ward. Registered office, 24, Leeming Street, Mansfield.

Scottish Motor Hiring Company (Limited) (Hamilton).—Capital £25,000, in £1 shares. Object, to carry on the business of motor-carriage proprietors and carriers (Scotch Company).

Thomas and William Coldwell Syndicate (Limited).—Registered by Waterlow Brothers and Laytou (Limited), Birchin Lane, E.C.; capital £3,000, in £10 shares. Object, to carry on business as manufacturers of and dealers in outer covers or tyres for wheels of cycles, carriages, and other road vehicles.

Yorkshire County Cycle Company (Limited).—Registered by Lupton and Fawcett, Leeds; capital £100,000, in £1 shares. Object, to manufacture, sell, and deal in cycles, motor or horseless vehicles, carriages, cycle components, &c. N. R. Hepworth is appointed sole governing director.

Strength of Cycle Frames.—A test of the strength of a safety bicycle frame is recorded in a recent issue of the *Iron Age*. The frame of the bicycle was made up of the following sizes of tubing:—

	Diameter.	Thickness.
Head tnbe	1¾ inches.	No. 23 W. G.
Upper resch tnbe ..	1¼ „	No. 22 „
Lower „ ..	1¼ „	No. 22 „
Seat-post tnbe	1¼ „	No. 22 „
Upper rear fork tube ..	¾ inch.	No. 22 „
Lower „ „ ..	¾ „	No. 18 „

The bicyclo was supported at the wheel centres, and loaded over the seat-post. The first permanent set was noted with a load of 1,800 lbs., with which the total deflection was $\frac{1}{10}$ inch, and the permanent set $\frac{1}{30}$ inch. When the load reached 4,200 lbs., the total deflection was 0·28 inch, and the permanent set ·014-inch. With a load of 4,362 lbs. failure occurred, the front fork bending outwards, bnt without breaking.

To Inventors.—Just now inventors are particularly busy with motor-vehicles; but we who have to wade through multitudinous specifications do not often come across very much worth reproducing or which promises to yield practical results. When we say that as regards the water-tube boiler there have been no less than some 2,200 patents taken out it will be seen, taking into consideration the very few really successful water-tube boilers, how useless and impracticable must be many of these inventions. In this connection it is just as well to recall some words of Rankine written a good many years ago. Said this distinguished engineer:—"An evil which arises from the separation of theoretical and practical knowledge is the fact that a large number of persons, possessed of an inventive turn of mind and of considerable skill in the manual operations of practical mechanics, are destitute of that knowledge of scientific principles which is requisite to prevent their being misled by their own ingenuity. Such men, too, often spend their money, waste their lives, and, it may be, lose their reason, in the vain pursuit of visionary inventions, of which a moderate amount of theoretical knowledge would be sufficient to demonstrate the fallacy, and for want of such knowledge many a man, who might have been a useful member of society, becomes a being than whom it would be hard to find anything more miserable."

President	Sir David Salomons, Bart.
Secretary	Andrew W. Barr, Esq.
President of the Liverpool Centre	The Earl of Derby, K.G., G.C.B.
Hon. Local Secretary	E. Shrapnell Smith, Esq.
Semi-Official Journal of the Association	The Automotor and Horseless Vehicle Journal.

SELF-PROPELLED TRAFFIC ASSOCIATION

(INCORPORATED).

LIVERPOOL CENTRE.

Trials of Motor Vehicles for Heavy Traffic.

May 24th to 27th, 1898.

Mr. E. Shrapnell Smith, the Hon. Sec., notifies that a dinner will be held at 7 o'clock, at the Adelphi Hotel, Liverpool (Brownlow Hill Entrance), on Thursday Evening, May 26th, 1898.

The President of the Liverpool Centre, the Right Hon. the Earl of Derby, K.G., is expected to preside, and the President of the Association, Sir David Salomons, Bart., will also be present.

Tickets, including wines, will be one guinea each, and may be obtained from the Hon. Sec. upon receipt of remittance.

No tickets will be issued after Saturday, the 21st May, 1898.

Special cards of invitation have been prepared for those members who may wish to introduce their friends, for which an early application should be addressed to the Hon. Sec.

Depôt—South-west corner of Prince's Dock, close to the Riverside Railway Station.

A limited number of light carriages have been secured, for the purpose of enabling members, their friends, and others interested, to follow the competing vehicles. Seats may be booked at 10s. each per day. Early application is recommended. Tickets (transferable) available for the four days, £2 each.

These carriages will be in charge of experienced motor-men, and will provide a means of observing the behaviour of all the wagons on any one day.

The War Office, the Post Office, the Automobile Clubs of France and Belgium, and other important bodies, have appointed official delegates to the trials.

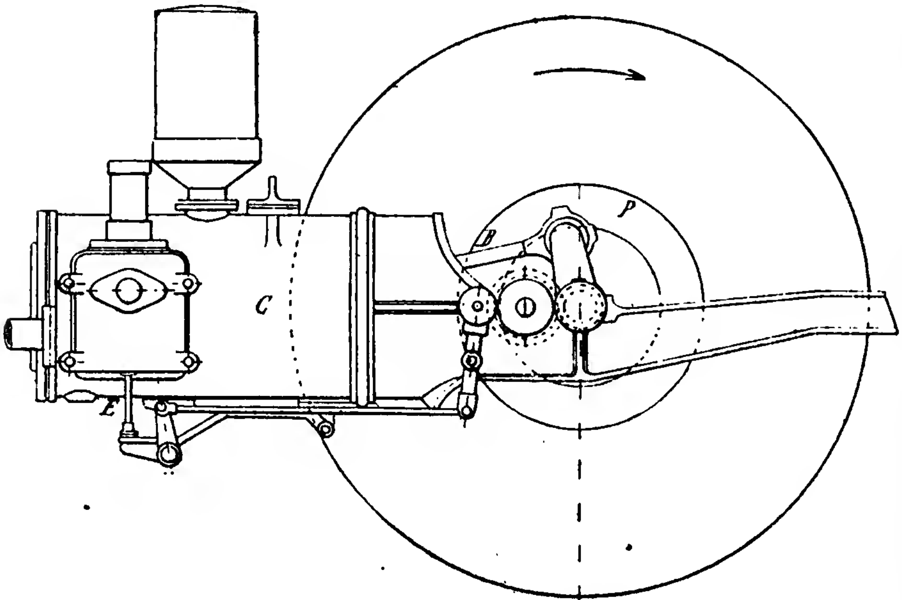
The Council will be pleased to consider any special names submitted to them by members as being eligible for official invitations or notifications.

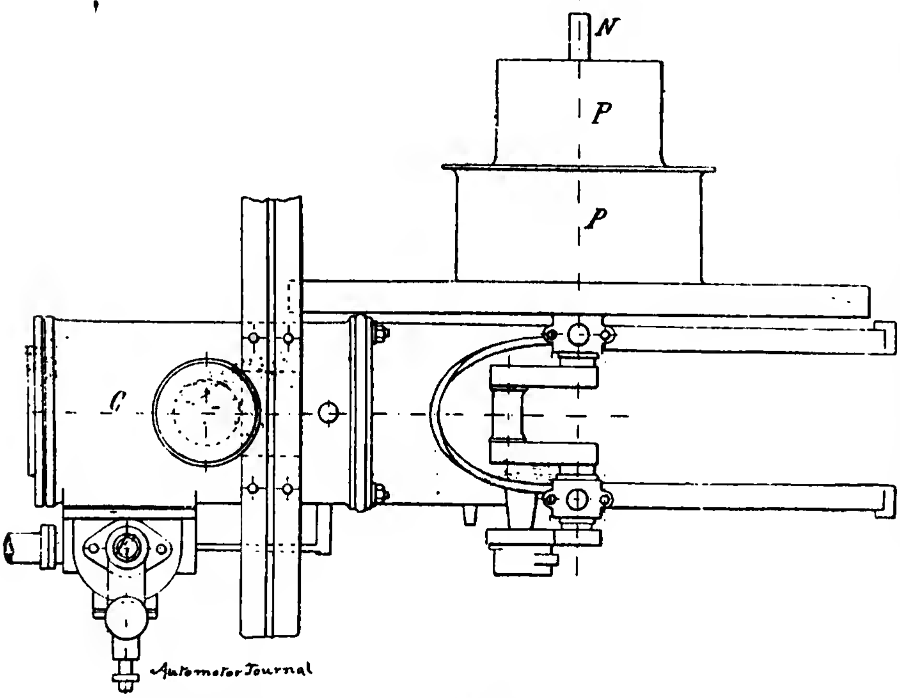
Route maps have been prepared of the whole of the routes which the cars will have to follow. These maps give the profile view throughout the journey, but the rules governing these trials require that they shall not be published till the runs begin. Mr. Shrapnell Smith has personally been round the routes and arranged depôts for re-victualling, &c.

THE BENZ MOTOR.

Among the many forms of light petroleum or spirit motors used for vehicles, the Benz has obtained a deservedly high reputation, especially in Germany and Italy, the majority of the motor-vehicles in these countries using this motor, while in France the firm

Benz Motor.—Fig. 1.





Benz Motor.—Fig. 2.

known as La Maison Parisienne de Voitures Automobile also use it in their well-known vehicles. Mr. Chas. Benz made his first motor in 1878, and it was of ¾ H.P., with electric ignition. It was applied to a tricycle, and a speed of 7 miles per hour was obtained. About 10 years ago the Benz motors and vehicles were introduced inio France by M. Roger. In 1889, in the Paris Universal Exposition, one of these vehicles was shown, and it was the only motor-vehicle there. In 1896 the present arrangements with La Maison Parisienne were made. The Benz motor, as now perfected, is made in three types. The first and oldest is a single horizontal cylinder motor, working on the Beau de Rochas cycle, with electric ignition (*see* Figs. 1 and 2).

The next type is a motor having twin cylinders arranged as in Figs. 3 and 4, while the remaining type is a motor having two opposite cylinders (*see* Figs. 5 and 6). The general arrangements are clearly shown, the valves being actuated by means of cams and levers driven by a secondary shaft, as shown in Fig. 1. The electric ignition consists of an induction coil energised by a couple of small storage ... ›nt is led to the igniter, ... f a porcelain tube and ... The supply of oil is ... ›at and needle valve. In ... the motor is simple and ... ısily learns to run it. Of the three types mentioned the single cylinder motor is applied to small vehicles, as shown in the illustrations in The Automotor for November, 1896, and June, 1897.

In the larger vehicles, such as the delivery vans or omnibuses, two-cylinder motors are employed. In the char-a-banc, No. 15 of Les Poids Lourds Competition, a 9 H.P. motor was used. Of the three types, that illustrated in Figs. 5 and 6 is to be preferred, as a much better balance can be obtained; on the other hand much more room is required. The two-cylinder arrangement shown in Fig. 3 is generally preferred. As will be seen, the cranks are placed at 180°; thus while one cylinder is making its firing stroke the other is exhausting, and while the former is compressing the latter is firing; there is thus an impulse at every revolution. Usually the cranks in many two-cylinder motors lie in the same radial plane, or $\theta = 0°$. In this case while one cylinder is making its firing stroke, the other is pumping or inhausting, and while the former is exhausting the latter is compressing. Some doubt exists with many engineers as to which is the better arrangement, but we prefer the Benz, as a little consideration will show that for the Beau de Rochas cycle this arrangement is better, as producing a more regular turning moment. In practice these motors run, however, extremely well, and seem to be free from many of the troubles which afflict most light oil motors. Of course, even with the Benz there is a quantity of gearing necessary in order to effect speed regulation, reversing, turning, &c., but as far as possible simplicity has been aimed at.

Belts are used to transmit the motion, and we understand that, if properly looked after, these give no trouble; they certainly avoid much gearing and are quieter—a point of considerable value. The Benz is favourite not only with automobilists on the Continent but also on this side, no less than four being at the recent meet of the Automobile Club. A good feature of them is that the motors are horizontal, and hence all the space of the vehicle can be utilised for passengers or goods.

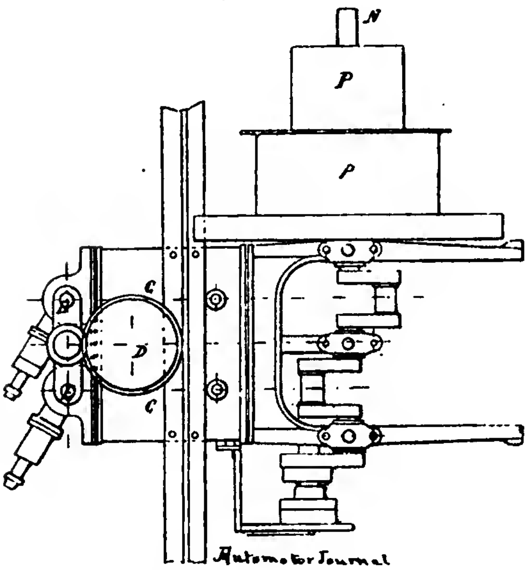
There will be an exhibition of cycles, motor-vehicles, &c., at the Agricultural Hall, London, from November 18th to 26th.

THE BICKFORD BURNERS FOR AUTOMOBILISM.

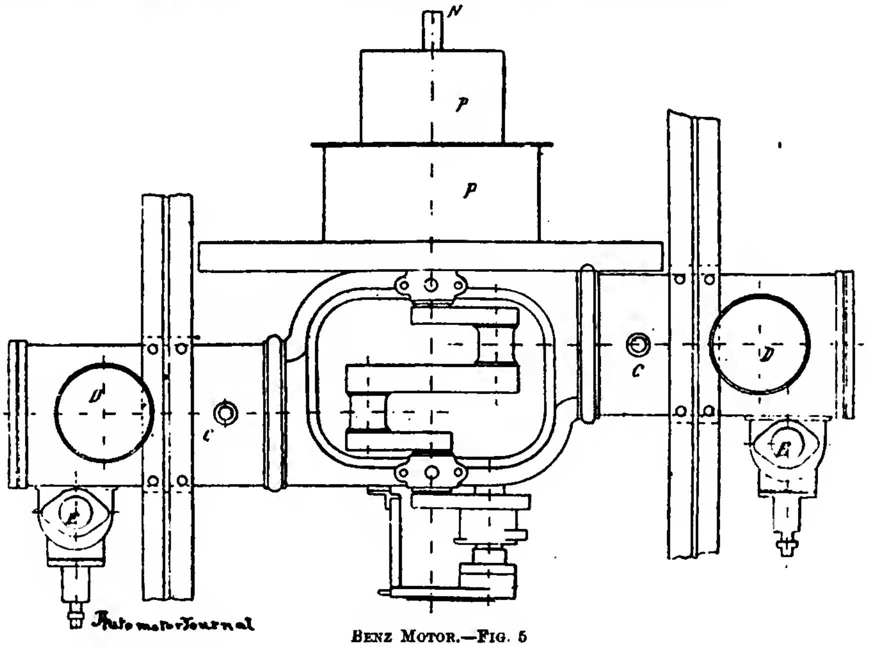
Messrs. Bickford and Co., of Camborne, in the course of a letter to us, write:—We are introducing improvements in the firing of small steem-boilers which, we believe, ere wortby of the careful attention of all owners of steam launches, steem road-cars, &c.

Tbe adventeges of our system of liquid-fuel firing are:—Always plenty of steam; adaptability to existing boilers; no smoke, coal, dust, or dirt; steam up in half the time; fuel obtainable everywhere; utmost simplicity; no trouble. The common objections to liquid fuel are that it is noisy and that the liquid-fuel burner cannot be started till steam is up, end, consequently, that liquid fuel cannot be used for raising steam initially. In our burners these difficulties are overcome; tbe boiler makes little if any more noise than a coel fire of equal power, and is worked without either steam or air blast. Where a boiler is fitted with one of our burners the process of raising steam is unique in its simplicity. A match is applied to a wad of asbestos soaked in oil which is placed in position under the burner, then, after waiting seven minutes and opening two cocks, the furnace is working et full power. Steam is consequently raised in about half the time necessary with coal. Tbe intensity of the fire is controlled with tbe utmost nicety by a cock placed in any convenient position; hence there is no stoking with its dust and dirt, end, the fire being just as powerful as desired, there is no lack of steam.

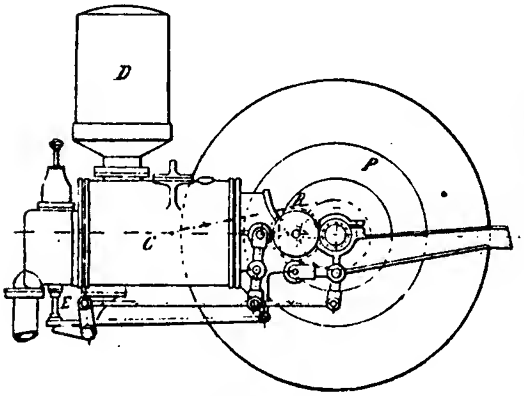
If the engines have been stopping for some time there is no waiting to get fires up when it is desired to start. During short stops the burner is kept hot and ready for immediate work, and steam is kept up in the boiler by a small burner which consumes about one pint of oil per hour. Our burners use common petroleum lamp-oil procurable in any village. They can be fitted to almost any boiler in a few hours without alteration to boiler or furnace. They require no spirit whatever. A steam launch or motor-car fitted with one of these burners can travel twice as far with the same bunker capacity as with coal. Prices, from 25s. for ordinary burners; from 52s. 6d. for bunsens.



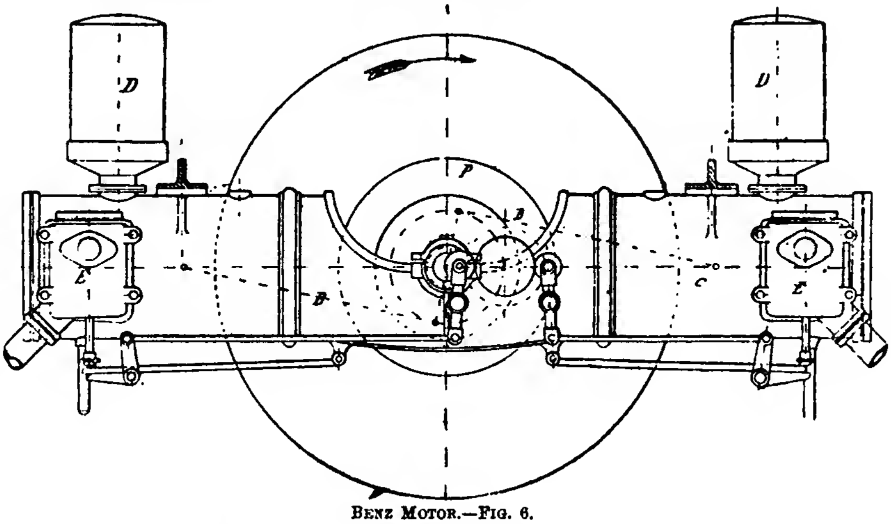
Benz Motor.—Fig. 3.



Benz Motor.—Fig. 5



Benz Motor.—Fig. 4.



Benz Motor.—Fig. 6.

We regret to record the death of M. Hertu, the well-known French automobilist. He was the founder of the firm of MM. Hertu, Henlin, and Deligeon. He was a Chevelier of the Legion of Honour. He was living in retirement for some yeers before his death.

NOTES OF THE MONTH.

IT is worthy of note that the recent Easter trip of the Automobile Club was accomplished without any accident whatever.

AN extension of patent has been granted to the Hon. C. A. Parsons for his now well-known turbine which has been fully described in THE AUTOMOTOR.

THE 22nd annual Stanley Show of cycles, cycle accessories, cycle-making machinery, and motor-carriages will be held at the Royal Agricultural Hall, London, N., on November 18th to 26th, both days inclusive.

ACCORDING to the figures given by the Chancellor of the Exchequer in the recent Budget, the cost of public defence is £175 per 1,000 head of population; in France it is £399 per 1,000; in Germany, £560; and in Russia, £298.

IT is said that Meyer, the celebrated cyclist, has withdrawn from the famous Paris-Bordeaux race. He contends that the adoption of the automobile as a pace-making machine is unfair and unjust.

ACCORDING to Mr. Douglas Young, who doubtless takes his figures from official statistics, 107,421 persons cross London Bridge every day, and 14,367 vehicles; while for Blackfriars Bridge the figures are 69,898 and 8,287 respectively.

MR. SAUNDERSON, of the Kempston Engineering Works, has produced a new motor-vehicle which he claims to be in advance of any other. The car is intended for exhibition at the Royal Show in June next, and a trial to test its powers and capabilities was recently made.

AN official estimate states that of the total internal goods traffic of France, 69 per cent. passes over the railways, 22 per cent. over the navigable ways, and 9 per cent. over the main roads. The railways have an aggregate length of 21,300 miles; the various navigations, 7,600 miles; and the main roads, 24,600 miles.

THE Blackpool Motor-Car Company are inaugurating a system of letting out motor-vehicles to hotels, and Mr. W. H. Blackhurst, of the Crown Hotel, Fleetwood, has lately obtained a license from the local magistrates to use it in connection with trips from his house. No doubt visitors will appreciate this new departure.

MESSRS. PHILLIPS, ORMONDE, AND CO., the well-known patent agents of Melbourne, and local agents for THE AUTOMOTOR, recently brought to the notice of the Postmaster-General for Victoria the advantages of the motor-vehicle for postal purposes, as exemplified by the experience of the British and French postal authorities. The Postmaster of Victoria, however, does not think that the time has yet arrived for their use in that colony.

A STRONG and lasting cement for rubber, either on metal or wood, is said to be made as follows:—Put one part of shellac, broken into small pieces, into 10 parts of ammonia water—strongest—and set aside for three or four weeks, or until the mass becomes entirely fluid. In use the liquid is applied to the india-rubber surface, and the latter is applied to the metal or wood, and firmly wired or corded thereto. On the evaporation of the ammonia a most complete joint is formed between the two surfaces.

WE regret to record the death of Colonel Sir Vivian D. Majendie, K.C.B., the distinguished expert on explosives and petroleum, which occurred on the 24th ult. Quite recently he gave valuable evidence before the Select Committee of the House of Commons on the petroleum question, and declared against raising the flash point of ordinary burning oil. He was an authority on this and kindred matters of the highest order, and was constantly consulted by our own and foreign Governments on questions relating to the higher explosives.

THE London Motor Van and Wagon Company recently sent down to Clacton-on-Sea one of their pleasure motor-cars, which they propose to run there during the season, and at the invitation of the manager, several residents, including a few members of the Council, had "free rides" on the machine to test its qualities. The Company have decided to commence running at Whitsuntide, and stated that as their only object is to advertise the machines they do not wish to compete against the jobmasters in the place, and their fares will be higher than those charged by the brakes.

A MOTOR-CAR Company has been formed at Falkirk, and at a recent meeting of the magistrates of the burgh it was agreed to grant a licence to them to run three cars, to hold eight persons each, and to ply between Falkirk and Stenhousemuir. The cars, which are already in use in the town, have been largely patronised, and are creating a considerable amount of interest. The distance between Falkirk and Stenhousemuir is three miles, and the journey is performed in twenty minutes. Other cars are shortly to be run between Falkirk, Camelon, Laurieston, and Bonnybridge.

AMONG the subjects for which the Academie des Sciences of Paris lately invited papers and contributions, for which it offered various prizes, was this:—"Give the theory of the motions, and a special discussion of the conditions of stability of apparatus of the velocipede class, bicycles, &c., both for rectilinear and curvilinear paths, either on a horizontal or inclined plane." Ten memoirs were received in response to this announcement, only one being of a theoretical nature, the others being based upon practice; and, although several of the papers appeared worthy of serious examination, the committee deemed it advisable to prolong this competition for another year, and admit additional competitors.

THE Cowal District Committee of the County Council of Argyll have decided that, owing to the narrowness of the majority of the roads in the southern section, and to the fact that the use of these by light locomotives or motor-cars will be positively dangerous to the general traffic, no light locomotives or motor-cars will be allowed to run on roads of less breadth than 20 feet over all, and in no case will they be allowed to travel at a greater speed than eight miles an hour. These restrictions apply to the southern section only, the reports of the sub-committees on the other sections of roads not being yet submitted to the Council. What does the Local Government Board say to this?

SAYS the *Birmingham Argus*:—"The motor-cars careering along Birmingham thoroughfares promise to be a serious addition to the dangers of the street. The riders apparently enjoy the consternation and perplexity of pedestrians when they find the noisy machine almost upon them. The rule appears to be to whirl round corners without the slightest reduction of speed. It is quite time the police restrained the ardour of riders who manifest the most reckless disregard for the public safety." It probably does not occur to our contemporary that so-called reckless driving is very much more risky to the driver than to anyone else, and that drivers of motor-vehicles are, as a rule, responsible people not likely to run unnecessary risk.

SAYS the *Financial News* in a recent issue :—"Everything points at the present time to a successful season for the motor-car industry, and not only is there considerable movement amongst the dry bones of the horseless carriage world, but many cycle traders and dealers report that they are receiving inquiries, and in some cases firm orders, for motor-cars, which there is very little reason to doubt will sooner or later be taken up as a sort of alternative or auxiliary branch by many of those who now deal largely, or have in times past dealt largely, in bicycles. A number of serviceable competitions are to be tried this month at Liverpool, and in the meantime great public interest is being displayed in the undertaking, and the motor-car industry should in itself receive a considerable fillip from these arrangements."

MUCH indignation has been created in Richmond by the proposal of the London United Tramways Company to construct a tram line for electric cars right over Richmond Hill, past the Star and Garter, in connection with the scheme to lay down a line from Kew to Hampton Court. It is felt that a string of overhead wires and tall poles on Richmond Hill, as well as the constant passing and repassing of tramcars, must necessarily detract from the natural beauties of the spot. The Richmond and Kingston Corporation will oppose the application to the Light Railway Commissioners for powers, and opposition is threatened from many other quarters. But the scheme is nevertheless receiving a good deal of support elsewhere, principally among the working classes, who will be enabled to travel cheaply and expeditiously to Hampton Court, and memorials in favour of it, which are being taken from house to house by agents of the Company, are being signed very extensively.

SPEAKING of the Easter tour of the Automobile Club, the *Globe* says :—"The tour has proved certain things beyond doubt; for instance, that the motor-vehicle is admirably adapted for pleasure purposes. All the tourists, on the completion of each day's journey, were enthusiastic in their expression of delight with their experiences. The tour has proved, too, that the motor-vehicles are capable of carrying their freight of from two to six passengers over steep gradients, as the route included such well-known hills as the Hog's Back (the first three miles of which were covered in 22 minutes), the Alton Hill, Crowborough Head, and Sevenoaks. It is a new experience to ride over such gradients without the sensation of concern and pity for the unfortunate horses, who usually can only conquer such hills by suffering and distress. But the engine of the motor-carriage, with its tireless and regular pulsation, carries one over these hills without causing any sensation except anticipation of the glorious rush through the air at 14 miles an hour down the other side of the hill, a pace which is in no way diminished when the flat is reached."

MANSFIELD is a flourishing town, but the outlying districts are not readily accessible by railway, and so the principal inhabitants have sensibly resolved to establish a service of motor-vehicles, and a Company has been formed for this purpose. The first automotor vehicle is expected to be in Mansfield in a few weeks' time, and on its arrival it will commence running between the borough and Sutton-in-Ashfield, Pleasley, Mansfield Woodhouse, and Warsop. It will be constructed to carry 22 persons, and in addition there will be a trailing car capable of accommodating a similar number of passengers, making in all a total number of 44. This last-mentioned car will be hitched on to the other as occasion requires. The motor-car will be 17 feet long; the body 5 feet 7 inches in width, and 6 feet 6 inches over all. It will be driven by steam generated by liquid fuel. In construction it will be of the char-à-banc design, two seats across the car providing accommodation for 16 passengers, with room for four on the back seat and two in front. The idea of forming the present Company originated with Mr. F. A. Robinson, The Park, Mansfield, engineer, who has spared neither time nor expense in inspecting the best types of machines at present built.

SOME CONTINENTAL TRIALS OF PETROLEUM*. AND STEAM MOTORS.

COMPARATIVE trials have recently been made at the Brussels Exhibition and at Tervueren as to the working and cost of fuel of light weight petroleum and steam motors. *La Nature* gives an account of this, according to the data furnished by Mr. Max Ringelmann, in *Le Journal d'Agriculture Pratique.* The competition included petroleum motors, semi-portable, of 4 to 6 H.P., and automotors of 8 to 10 H.P.

The Nagel and Hermann motors, of Brussels; the Capitaine motor, of Frankfort; and the Société Française de Materiel Agricole, were amongst the first class of motors.

The Nagel and Hermann motor, set in motion in 9 minutes, furnishes a force of 4 H.P. at 288 revs. per minute and consumes 4·66 lbs. petroleum per hour, of which ·386 lb. are for the lamp, or 1·139 lbs. per H.P. per hour.

The Capitaine takes 7 minutes to be set in motion, and furnishes a force of 4 H.P. at 334 revs. per minute, with a total consumption of 4·7828 lbs. petroleum, or 1·194 lbs. per H.P. per hour.

The Société Française de Materiel Agricole motor takes 12½ minutes, and two men, to be set in motion; at 354 revs. per minute it furnishes a force of 4 H.P. and a total consumption per hour of 4·448 lbs. petroleum, or 1·44 lbs. per H.P. per hour.

The weights of these three motors are respectively 2,310, 1,386, and 1,760 lbs., and their price varies from 2,500 to 2,275 francs.

The locomotives of 8 to 10 H.P. belonged to Messrs. Swiderski, Hille, and La Société Française de Materiel Agricole.

The Swiderski motor, at 274 revs. per minute, furnishes a force of 8 H.P. with a total consumption of 8·518 lbs. of petroleum per hour, or 1·0648 lbs. per H.P. per hour, and was set in motion in 10½ minutes by two men. Its weight is 5,390 lbs., and price 5,000 francs.

The Société Française motor was set in motion in 5 minutes by one man; at 219 revs. per minute it developed 8 H.P. and consumed 7·559 lbs. of petroleum, or ·945 lb. per H.P. hour. Its price is 5,400 francs, and weight 9,600 lbs.

The Hille motor can be set in motion by one man in 11½ minutes. At 240 revs. per minute it develops 8 H.P. and consumes 10·1398 lbs. per hour, or 1·2675 lbs. per H.P. hour. Its weight is 9,350 lbs., and cost 7,000 francs.

The steam automotor section comprises motors of 4 to 6 H.P., made by MM. Lefebre-Albaret, Laursedat, et Cie., and M. A. Raze, and also motors of 8 to 10 H.P. by the former firm.

As regards the former, these give off 5 H.P. at 140 revs. per minute, and consume 24·64 lbs. of coal and 303·6 lbs. of water per hour, or 4·93 lbs. of coal and 60·7 lbs. of water per H.P. hour. The weights vary from 7,040 lbs. to 7,480 lbs., and the cost is about 5,000 francs.

The Raze motor gives off 5 H.P. effective (brake) at 154 revs. per minute, and consumes 28·6 lbs. of coal and 131 lbs. water, or 5·7 lbs. of coal and 26 lbs. water per H.P. hour. The weight is about 7,480 lbs., and cost 5,000 francs.

Motors of 8 to 10 H.P. give an effective power of 8 H.P., and consume per hour 44 lbs. coal and 442 lbs. water, or 5·5 lbs. coal and 55·2 lbs. of water per H.P. hour. They weigh about 9,790 lbs., and cost 6,650 francs.

These trials are interesting, as they show the practical value of the two systems—petroleum and steam—side by side. It may be concluded that petroleum motors of 4 to 6 H.P. consume from 1·1 to 1·3 lbs. of petroleum per H.P. hour, while those of 8 to 10 H.P. consume from ·88 to 1·1 lbs. of oil per H.P. hour. Steam motors of 4 to 10 H.P. consume from 4·4 to 5·5 lbs. coal, and from 55 to 66 lbs. of water.

It is also to be noted that, whereas petroleum motors only require a few minutes to set in motion, steam motors require often an hour.

THE principal event during the past month has undoubtedly been the outbreak of war between the United States and Spain. Should extensive military operations be undertaken, a good opportunity will be afforded of testing the practical value of motor-vehicles as commissariat, baggage, and ambulance wagons, or as tractors hauling these.

* Ordinary burning petroleum, sp. g. about ·8, and flashing at about 100° F.

THE SIMPSON AND BODMAN STEAM VAN.

IN our March issue we published and commented upon the paper read by these gentlemen before the S.P.T.A., giving the results of their experiences with motor-vehicles. The methods of framing, gearing, &c., advocated by them will be gathered from the following description of their van. Their object in designing the vehicle has been to obtain a sufficiently rigid construction and freedom from vibration for the body.

The brackets, b^1, are connected together by the cross bar, b^3. Depending from the bars, a^2, are bearing brackets, a^3, and similar bearing brackets, b^4, depend from the bars, b^2. These bearing brackets, a^3, b^4, are connected to the depending brackets, b^1, by the bars, a^6, and the bars, b^7. The bearing brackets, a^3 and b^4, carry the bearings of the crank-shaft, c; they are also connected together by the tie rod or bar, b^6. Struts or stays, b^5, connect the end bar, a^1, with the lower parts of the bearing brackets. There is a stay, a^4, between the end bar, a^5, and the cross bar, b^3, which is formed of a single steel tube. Upon this stay is fixed a journal, and there is fitted an oscillating bearing, d, which carries the steering wheels axle-tree, d^1. The axle-

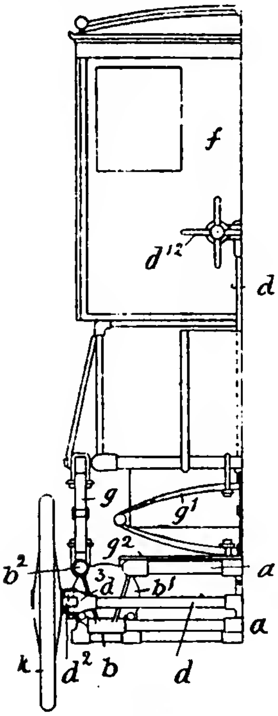


FIG. 2.

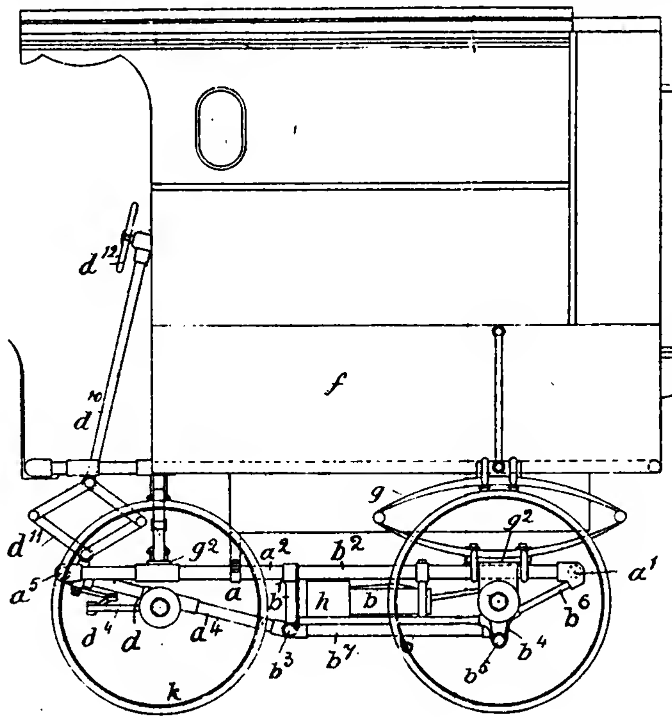


FIG. 1.

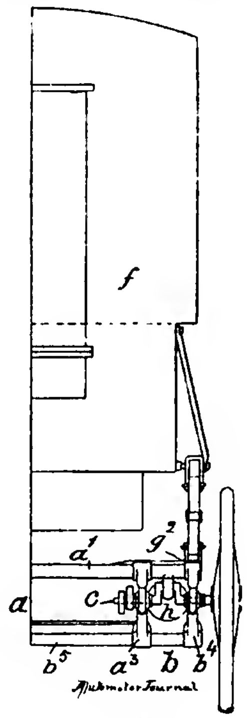


FIG. 3.

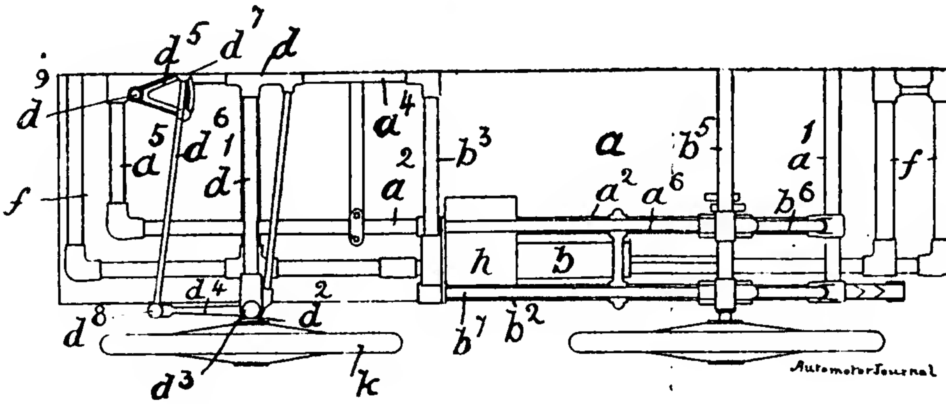


FIG. 4.

Referring to the accompanying drawings, Fig. 1 is a side elevation of the motor-vehicle, Fig. 2 is a half-front elevation, and Fig. 3 a half-back elevation. Fig. 4 is a half-plan of the vehicle looking from the underside. The framework or perch, a, consists of a rectangular trussed frame of steel tubing formed with a wing, b, on each side and extends over the axial line through the wheel centres. The tubing is formed into straight bars and joined together by connecting pieces and brackets made of steel or malleable iron. Each wing, b, is formed by continuing the end bar, a^1, past the side bar, a^2, carrying a bracket, b^1, projecting from the bar, a^2, and connecting each end of the end bar, a^1, with the bracket, b^1, by means of the bar, b^2, in each case.

tree, d^1, carrying the steering wheels, k, is formed of steel tubing, to the ends of which are fitted short axles, d^2, by means of a knuckle joint, d^3. To each axle, d^2, is fixed an arm, d^4, which is coupled with a sector, d^5, by means of a coupling rod, d^6, with knuckle-jointed ends, d^7, d^8. The ends, d^7, of the coupling rods, d^6, cross one another when jointed to the sector, d^5, as shown in Fig. 4. The sector is mounted in a bearing, d^9, and is connected to the steering rod in the steering post, d^{10}, fixed to the body framework of the vehicle by means of the flexible coupling, d^{11}, which steering rod is operated by the hand-wheel, d^{12}, acting through suitable worm or bevil gearing. The body, f, is shown mounted upon springs, g and g^1; the springs,

g, are seated upon the bearing brackets, b^6, and the spring, g^1, is seated upon a transverse bar, g^2, fixed to the side bars, a^2, of the framing The axle-tree, d^1, is trussed by the stays, d^{13}. To the depending brackets, a', are bolted the cylinders, h, which act upon the driving wheels directly the crank-shafts, c, forming also the driving wheels axles.

A RECENT DESIGN IN AUTOMOBILE PHAETONS.

A good deal of what biologists would call "selective process" is observable in the design of mechanically-propelled vehicles. Whether it be that long association with the horse has blunted or perverted our perceptions of what is fitting is questionable; but the fact remains, or rather the impression obtains, that it is exceedingly difficult to satisfy our ideas of elegance in designing horseless vehicles. So conscious are many of our automobilists of this fact that they recognise that this absence of what artists mean by "completeness" constitutes a serious hindrance to the advancement of the industry. And with a view to effecting an improvement, the distinguished automobilist, Sir David Salomons, President of the Self-Propelled Traffic Association, has generously offered a handsome sum for competition in the forthcoming Brussels Races for the best-designed vehicle. Even our French neighbours, who are unsurpassed for elegance in ordinary carriage building, seem to lose their artistic touch when it comes to motor-vehicles. An improvement is, however, noticeable in later designs, and we feel sure that eventually motor-vehicles will be designed that will not as at present remind one of a street omnibus without horses or of a cab being pushed from behind, but will satisfy one's æsthetic and mechanical sense. The vehicle we illustrate herewith seems to us to approach nearer to our conception than many we have seen. It looks natural, and not as though it had lost its horses. Indeed, horses would be in every sense out of place if attached to it. As it is, it does not convey any idea of association with animal traction, but, like a railway locomotive, it is unmistakably an automotor-vehicle. Its appearance is, perhaps, somewhat heavy, but this is due to the thick rubber tyres. In other respects the model is good, the machinery is not too apparent, and there is no reason why it should ever be, but most makers will obtrude chains and pinions to an unnecessary degree. This vehicle is a six-seated phaeton, and has been designed and built by La Société Continentale d'Automobiles, which now carries on the business founded by MM. Gautier et Wehrlé. As will be seen, the motor is placed in front, and consists of two horizontal opposite cylinders using light petroleum, and having a simple carburator, incandescent ignition, and valve gear, the latter being worked by cams in the usual manner. Instead of transmitting the motion of the main shaft by chain gearing, a longitudinal shaft is fitted which, by a most ingenious system of universal joints, transmits the motion to the rear wheels. We shall hope to illustrate this gear, as it seems to present several advantages. The transmission gearing runs in oil, and is very accessible. We understand that no difficulty is experienced in working this gearing under the most trying conditions. The vehicle in the illustration is entered for the Paris-Amsterdam Race, and will no doubt give a good account of itself.

A Recent Design in Automobile Phaetons.

HOW THE ROMANS BUILT THEIR ROADS:

A Lesson to our Municipal Surveyors.

The Romans constructed their main roads to last for ever. They are true monuments, made of siliceous and calcareous materials far superior to the highest type of modern work. The superstructure was a roadway, generally very strongly convex, and two side paths or footways. Near Rome the full width was often 20 metres, but not usually. From 3 to $3\frac{1}{2}$ metres for the smaller roads and from 4 to $4\frac{1}{2}$ metres for the larger are dimensions that have been generally noted. In mountain regions the road was narrowed to a single carriageway, $1\frac{1}{2}$ metres. The sidewalks were large near the cities, but reduced to $\frac{6}{10}$ metre in the outer districts. These were built of cut stone, at least on the border. At every 12 paces (18 metres), mounting stones were placed. At every 1,000 paces (1,481 metres), mile stones were erected. In one instance, the roadway was divided by a low wall down the middle as if to surely establish two streams of traffic.

Some of the best roads were paved with marble. The minor or secondary roads were not so carefully made.

In the construction of the wagon road a ditch was dug to the solid earth, which was stamped or rolled, or even stakes driven if necessary, then, on a floor of sand, 10 or 15 centimetres thick, a layer of mortar was placed, after which they placed successively four layers, as follows:—

Statumen.—The support or foundation. A course of several layers of flat stones, bound by a hard cement, or, failing in that, clay. This layer was usually 30 centimetres thick, and twice that in bad lands.

Rudus.—A concrete of pebbles, stones, or broken bricks strongly stamped together with iron-sheathed stampers. This layer, when finished, was usually 25 centimetres thick. When mortar was lacking, loam was used.

Nucleus.—A layer of 30 to 50 centimetres of gravel or coarse sand, finer than the third layer, and rolled successively in small layers.

Summum dorsum (*summa crusta*).—A convex layer, 20 to 30 centimetres thick or more, made somewhat differently according to the materials at hand. It was either paved with cut stone or laid with pebble and granite or metaled.—*Carriage Monthly.*

The examination of candidates for licenses to ply as automobolists is held in the Rue de Magdebourg, Paris, near the Trocadero. This street has a very steep gradient, worse than the Savoy Hill in London.

NOTICES.

Contributions and articles likely to prove of interest to our readers will receive due attention, but in all cases the name and address of the writer must be given, not necessarily for publication.

All matter intended for publication should reach us not later than the 10th of each month, and be addressed to THE EDITOR OF "THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL," 62, *St. Martin's Lane, London, W.C. Stamped envelope must be sent if the manuscript is required to be returned. The Journal is published the middle of each month.*

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The Automotor and Horseless Vehicle Journal.

A RECORD AND REVIEW OF APPLIED AUTOMATIC LOCOMOTION.

MAY 16TH, 1898.

DIARY OF FORTHCOMING EVENTS.

Notices to be included under this heading should reach the Office not later than the 12th of each month.

1898.	
May 16. 23 ..	Society of Arts Cantor Lectures—"Electric Traction," by Prof. Carus Wilson.
May 20 ..	Automobile Club of Great Britain. Visit on motor-carriages to electric lighting stations of Westminster and Kensington.
May 24-27 ..	Self-Propelled Traffic Association (Liverpool Centre) Heavy Vehicle Trials.
May 25 ..	"Concours de Fiacres," Paris. Organised by the Automobile Club of France.
May 27 to June 1	Whitsuntide Tour of the Automobile Club of Great Britain (for details see p. 288).
June	International Italian Exhibition of Motor-Vehicles (Turin).
June 10 to 25..	Motor-Vehicle Exhibition, Paris. Automobile Club of France. Sections—(*a*) Automotor vehicles which have given proof of their practical efficiency; (*b*) Industries connected with automobilism; (*c*) Motors adapted for automotors; (*d*) Vehicles adapted for automotors.
June 15 to July 15	International Concours of Automobile Tricycles and Bicycles in connection with the Turin (Italy) Exhibition.
June 25 and 26	Brussels to Spa Race. Organised by the Automobile Club of Belgium.
July 3 to 11 ..	Race from Paris to Amsterdam, under the auspices of the Automobile Club of France.
July 17 to Aug. 1	Lille (France) Motor-Vehicle Exhibition.
July 30 and 31	Automobile Race, Lille to Boulogne.
August 22 to Sept. 3	Engineering, Machinery, and Motor-Car Exhibition. Royal Agricultural Hall, Islington.
Nov. 18 to 26..	Stanley Show of Cycles, Motor-Carriages, &c. Royal Agricultural Hall, Islington.
1899	Race from Paris to St. Petersburg, under the auspices of the Automobile Club of France.
1900	Paris International Exhibition — Great Display of Automotor-Vehicles and Allied Trades.

ANSWERS TO CORRESPONDENTS.

J. HILLICK (Coventry).—The Duryea steering gear is practically the same as Ackermann's.

F. ANDREWS (Liverpool).—The steepest grade in Liverpool is, we believe, 1 in 9, but if you apply to the local municipal engineer's office you might obtain more definite information.

W. W. (Cheltenham).—You will see a description of Houldsworth's speed-gear in Goodeve's "Elements of Mechanism," which is, or ought to be, in every public library.

JAS. CORY (Cardiff).—No. Any formula you see in THE AUTOMOTOR given editorially may be accepted as correct.

JAS. KING (Blackpool).—Ramsbottom's rings are undoubtedly the best for pistons of gas and oil engines.

L. R. C. S.—The firm you name make a good motor, but you would require to have some instruction in handling any one.

WISEMAN.—You are quite right; there is no patent in the Eickemeyer winding, so far as we know. *See* AUTOMOTOR for June, 1897.

OMNIBUS (Gloster Road).—(*a*) We could not possibly be responsible for a thing like this. (*b*) There are some points, including the tyres, which do not conform to the Act, but these are small matters, easily rectified provided the principle of the vehicle is all right.

M. CURRAN (Paddick).—A description of Parsons's steam turbine appeared in No. 9, Vol. I. For a catalogue you had better write direct to Mr. Parsons.

THE VIBRATION OF MOTORS.

PERHAPS the greatest hindrance to the more general employment of light oil motors for the mechanical propulsion of vehicles is the very pronounced vibration that they are subject to. A case came under our notice quite recently, where a colonial buyer declined to place a large order for oil motor-vehicles for no other reason than that his principals would not be able to guarantee their clients against this nuisance. As, under the circumstances, steam and electricity were out of the question, the order for motors fell through. A correspondent writing from Marseilles makes a similar complaint, only in this case it appears that the objection comes from the sex which, it is needless to say, has to be considered if motor-vehicles are to be a success. So far, little has been done to improve the oil motor as generally understood. Numberless patents are, however, taken out for improvements, or for what are called such, in the details of the mechanism, but whether running light or fully loaded the light oil motor is at once noisy and vibratory. It is, therefore, a very long way from being a good piece of mechanism. Noise and vibration mean the useless expenditure of energy in producing them. They also signify considerable outlay on repairs. To the question what causes this vibration we would reply; consider a dynamo, or, better still, a turbine. It is practically, or should be, noiseless; there is no knock and no vibration, yet there is a large mass of material revolving at a very rapid rate. The reason why this rotating mass does not make any noise and does not vibrate or set up vibrations is simply that it rotates around its centre of gravity. So long as this condition obtains the mechanism will not vibrate. In the case in question everything favours the maintenance of this condition; the turning moment is constant, and at every instant the moving weights are symmetrically disposed about the axis of rotation, in which lies the centre of gravity.

Conversely, the condition for vibration is that we shall have a revolving mass whose centre of gravity does not lie always in the centre of its axis of rotation, and this condition obtains in all oil motors and nearly all steam motors in which we have cranks and reciprocating parts. It is especially pronounced in oil motors, inasmuch as in these we find the reciprocating parts, such as the piston and connecting rod, and the rotating parts, such as the crank web, made much heavier than is the case in similar powered steam engines. The reason for this extra weight is apparent, when we remember that in the ordinary oil motor working on the Beau de Rochas cycle there is, as is well known, an impulse at every second revolution. The cylinder, in fact, resembles a gun and the piston the projectile; there is a sudden and violent explosion—that is, the whole energy is transmitted practically instantaneously. It is a question of impact rather than of a gradually applied load, hence the parts have to be made very strong, and we see that large gas-engines resemble, not a little, guns in the thickness of the cylinder parts. The effect of this rapid discharge is to set up an oscillation in the direction of the axis of the cylinder, in fact, the cylinder will vibrate just as does the barrel of a Maxim rapid fire gun when it is being discharged. It is very difficult to suggest any remedy for this kind of vibration of a practical nature. This vibration must not be confounded with that due to the vibration of the reciprocating parts, such as the piston and connecting rod. It is often attempted to correct this latter by masses placed inside the rim of the fly-wheel, but in fast running engines this method is, at any rate, fallacious, and the vibration due to the reciprocating parts is not thereby eliminated. In fact, this vibration can only be corrected by introducing other reciprocating parts suitably designed and placed. We then have to consider the vibration due to the absence of coincidence between the axis of the centre of gravity of the rotating shaft and its crank and the axis of rotation. To correct this masses may be applied to the fly-wheel or to the crank itself. The correction is, however, often rendered difficult by the presence of cams, clutches, &c., on the shaft.

So far as regards the motor, there is no reason why vibration should not be, if not altogether eliminated, at any rate reduced to a very small amount. To do so would, however, entail a considerable modification in existing designs; but it is worth while to trouble over the matter, as it is this unpleasant vibration that hinders the development of the industry. Lastly, there is the vibration communicated to the vehicle by the motor. Very often one can see a vehicle actually trembling. So far as we know, the scientific examination of vehicles of any sort has never yet been undertaken, at any rate not in this country, but should any leisured and wealthy automobilist ever feel a desire to undertake a study of what we may term the physiology of a motor-vehicle, he will find that every motor has some critical speed at which the vibration is a maximum. He will also find that every vehicle has some vibratory "period" at which *its* oscillations are a maximum. If the periods of the motor and the vehicle happen to synchronise, there will be a most pronounced vibration communicated to the latter. Just, however, as it is possible to produce torpedo-boat engines that do not vibrate, so it is possible to produce motors for vehicles that will also not vibrate. At sea, vibration is evidence of imperfect design, either in hull or machinery; it is also evidence of the same thing in motor-vehicles.

THE LIVERPOOL HEAVY MOTOR-VEHICLE TRIALS.

At the time of going to press we understand that all the arrangements have been made, not only for the successful carrying out of the trials, but also for the accommodation and comfort of the various delegates and guests who will attend. Although, as will be seen from the particulars that we published in the last month's issue of The Automotor, the number of vehicles entered is not in itself large, yet this is not by any means a disadvantage, as it will enable the judges to concentrate their attention upon the few rather than to perfunctorily examine the many. Having witnessed the French trials last year, we know that the work involved in observing and tabulating results, if these are to have any scientific value, is by no means light, and we are sure that the judges in the forthcoming trials will have an arduous task, but we are equally sure that it will be efficiently performed. These trials of motor-vehicles will probably be the first ever made in this country of a scientific and practical nature, and they will be watched with great interest from all parts of the world; as in the solution of the problem of carrying fairly heavy loads on ordinary roads, the great difficulty of the economical transport of goods will be overcome, and British manufacturers will not be, as at present, placed at a disadvantage as compared with their foreign rivals.

Coming to the actual details of the competition, we reproduce herewith from our last issue the particulars of the entries:—

ENTRIES.

Class I.—*Minimum load, 2 tons; minimum average speed, 6 miles an hour; minimum platform area, 60 square feet.*

Official No.
7 T. Coulthard and Co., Cooper Road, Preston.
9 Robert Cooke Sayer, 11, Clyde Road, Redland, Bristol.
1 The Liquid Fuel Engineering Company, 20, Abchurch Lane, London, E.C.
2 The Steam Carriage and Wagon Company (Limited), Homefield, Chiswick, London.

Class II.—*Minimum load, 5 tons; minimum average speed, 4 miles an hour; minimum platform area, 110 square feet; floor of platform to be not less than 3 feet 9 inches, or more than 4 feet 3 inches, from ground.*

Official No.
3 The Steam Carriage and Wagon Company (Limited), Chiswick.

Class III.—*Minimum load, 2 tons.*

8 T. Coulthard and Co., Preston.
10* Robert Cooke Sayer, Bristol.
5 The Lancashire Steam Motor Company, Leyland.
6 The L. R. Syndicate (Limited) (Serpollet System), 22, Chancery Lane, London, W.C.
4 The Steam Carriage and Wagon Company (Limited), Chiswick.

The following are the judges appointed:—

From London Council: Sir David Salomons, Bart., President S.P.T.A.; Professor Boverton Redwood, F.I.C., F.R.S.E.

From Liverpool Council: Professor H. S. Hele-Shaw, M.I.C.E., &c.; John Alexander Brodie, Esq., M.I.C.E.; Everard R. Calthrop, Esq.

As reserves the following gentlemen will hold themselves in readiness to act if occasion requires:—S. B. Cottrell, Esq., M.I.C.E.; H. B. West, Esq., M.I.M.E., M.I.N.A.

We understand that the following gentlemen representing the French Automobile Club have signified their attention of being present:—Comte de Dion, Vice-President; Comte de la Valette; M. Pierre Giffard; M. G. Forestier; Baron Rogniat; M. Leon Francq Jeune; M. Louis Lemoine; M. Amédée Vernes; M. André Michelin.

The Comte L. Van den Steen de Jehay has been appointed to represent officially the Belgian Automobile Club.

The War Office has selected the following officers to officially attend and report upon the trials:—Major R. L. Hippisley, R.E.; Captain J. A. L. E. Johnstone, R.E.; and Captain H. F. Gaynor, R.E.

Appointed by the Duke of Norfolk, Postmaster-General—Mr. Francis Salisbury, Postmaster of Liverpool.

Deputations are expected to attend from the Corporations of Hull and Wolverhampton.

In Liverpool, the following Associations have appointed as delegates:—Corn Trade Association—Mr. John Blyth; Cotton Association—Mr. Danson Cunningham (Vice-President), Mr. R. W. Brown; Cart-Owners' Association—Mr. R. Proctor (Chairman), with a committee of 12 members; Timber Trade Association—Mr. R. R. Lloyd (President); Chamber of Commerce—Deputation of Light Railway Commissioners; Salt Chamber of Commerce—Mr. H. John Falk (President).

The general arrangements are:—

1. During the trials all communications to be addressed to the Adelphi Hotel, where the headquarters of the Association will be.

2. The depôt for heavy vehicles, from which the starts will be made, is the Dockyard, at the south-west corner of the Prince's Dock, adjoining the Riverside Station.

3. Light carriages will be provided to enable those desirous of witnessing the trials through to follow the runs. Seats may be booked at 10s. each per day. Tickets (transferable) for the four days £2 each. Early application is recommended. All seats will be numbered, and the carriages will be in the charge of experienced motor men.

* We understand that this is an electrical vehicle.

4. A dinner will be held at the Adelphi Hotel on the evening of Thursday, May 26th, 1898. It is expected that the Right Hon. the Earl of Derby, K.G., will preside.

5. All persons attending the trials must wear the official rosettes to secure admission to the depôt, &c.

6. Further particulars may be had from Mr. E. Shrapnell Smith, Hon. Local Secretary, and organiser of trials.

Address—To May 21st, Royal Institution, Liverpool.
During trials, Adelphi Hotel, Liverpool.

Maps of the routes to be traversed, giving gradients and other topographical information, together with halting places, depôts of fuel and water, will be supplied to competitors and visitors.

We may add that the honorary organising secretary of the Liverpool Centre, Mr. E. Shrapnell Smith, will gladly supply information of every kind to intending visitors, and both he and Mr. Andrew W. Barr have arranged to attend during the whole period of the trials, and in every way ensure their success.

THE BRITISH MOTOR SYNDICATE.

We understand that the actions brought by a number of shareholders in this Company have finally been compromised by those interested. No doubt our readers will recollect the series of articles which we have published from time to time upon this subject, and the views which we have enunciated thereon, none of which we have changed in the smallest degree. We regret that this compromise should entirely destroy all prospect of the methods in connection with this Syndicate being made public, because, not being in possession of the details of the settlement, which appear to have been kept particularly secret, it is difficult to judge whether the shareholders have been well advised in closing the pages of what promised to be a very interesting book on the art of company work. If the shareholders have determined to let bygones be bygones and have received a fairly satisfactory quittance, we have no further right or wish to battle on their behalf. Although desperate cases require desperate remedies, at the same time we quite agree that it is often a mistake to throw good money after bad, and so long as the individual shareholders are satisfied we are personally glad to know that this ugly sore, which has, with others, been one of the chief hindrances to the progress of automobilism, has been healed. In this matter we have avoided as far as possible any personal reference, always endeavouring to deal with the schemes in the abstract, and whilst recognising that Mr. H. J. Lawson, outside the financial question, has been instrumental in introducing automobilism to the British public, it is to be regretted that this in itself good object should have been associated with financial methods of a distinctly questionable character. The majority of the investing, or perhaps it would be better to say speculating, public rarely investigate; they follow a leader like sheep, and hence they nobly subscribed for projects in automobilism which can never be realised, and which those of us whose business it is to know these things foresaw were doomed to failure. Thus not a few investors thought that light oil or spirit motors would be used for heavy traffic, and hence subscribed for the purchase of this class of patent. It is now recognised that not only is the use of oil motors restricted practically to purposes of light traffic, but that should some of the suggested legislation relating to petroleum ensue, the value of motors, or the patents relating thereto, will depreciate enormously. However, if the members of the British Motor Syndicate are satisfied with their assets and with their undeniably able chairman, we can only congratulate them on their gracefully modest reticence and prudence which has led them to wash their financial linen in the seclusion of their own offices rather than in public. From what we know, we should not be surprised to hear that the Great Horseless Carriage Company's dissenting shareholders are also quietly "compensated."

WIND PRESSURE.

To say that the wind exercises an influence upon the motion of nearly all moving bodies is to state a truism familiar to everyone, and after every heavy gale we have ample evidence of the fact in the chimney-pots, tiles, telegraph-wires, &c. that get displaced, and in the wreckage that strews the sea-beach. Of the actual pressure of the wind, or rather of the action of the wind, little that is accurate is known, and two similar instruments properly tested will often give dissimilar results when but a little distance apart. Neither are we agreed as to the exact relation existing between velocity and pressure. It is, indeed, very difficult to measure either the velocity or the pressure; thus in the tests made of the wind force during the construction of the Forth Bridge it was found that large instruments would give readings different from small ones, although both were apparently exposed under the same conditions. The question of wind pressure is of rather more interest and importance to the architect and civil engineer than to the automobilist; but inasmuch as aeronautics is but a form of automobilism, and inasmuch, also, as under certain conditions the wind pressure adversely affects automotor vehicles, we give the following information:—

The pressure of the wind is, it is generally agreed, expressed with tolerable accuracy, sufficient for all practical purposes, by Hawksley's formula—

Let v = velocity in feet per second;
h = height through which a body must fall in order to generate a velocity, v;
w = weight of a cubic foot of air = ·0765 lb.;
g = acceleration of gravity.

Then—

$$h = \frac{v^2}{2g}.$$

And since p, the pressure of a fluid striking a plane perpendicularly, and then escaping at right angles to its original path, is that due to the height, h, we have—

$$p = \frac{wv^2}{g}.$$
$$= \frac{\cdot 0765\, v^2}{32}.$$
$$= \left(\frac{v}{20}\right)^2 \text{ (nearly).}$$

From this formula is constructed the following table:—

Velocity in feet per second, v.	Velocity in miles per hour.	Pressure in lbs. per square foot.
10	6·8	0·25
40	27·2	4·00
70	47·6	12·25
100	68·0	25·00

If the pressure is applied to an inclined surface, then the effective pressure, p_e, will be—

$$p_e = \left(\frac{v \sin \theta}{20}\right)^3$$

where θ is the internal angle made between the direction of the wind and the plane surface.

A somewhat similar table will be found on p. 21 of THE AUTOMOTOR POCKET-BOOK.

THE SCARBOROUGH ACCIDENT.

We give the salient facts of this deplorable affair elsewhere. If, however, automobilists take the lessons it conveys to heart much good will be done. The moral of the thing seems to be that in motor-vehicles two things are absolutely indispensable if automobilists wish to avoid unpleasant and distressing occurrences such as the one in question. The first is the driver must be possessed of plenty of nerve, and not afraid to incur personal injury if by so doing he can avoid injuring others; secondly, the brake power must be more than ample—it must be capable of absorbing the whole kinetic energy of the vehicle. As regards the first this is a matter of employment, but having regard to the legal obligations that may be incurred we think too great care can hardly be displayed in selecting a good driver, and we should prefer a man who had not been a fitter or engineer but who was accustomed to street traffic and who had nerve and intelligence. Working day after day at an engineer's bench does not give one the knowledge or experience of handling a vehicle in a crowded street. We do not say that the Scarborough accident was due to any incompetence on the part of the driver, but it would seem that either he did not do all that was possible as regards manipulating the machinery or else the vehicle was in a very defective state.

From the published account of the accident it would seem that one of the driving chains parted, and hence until the engine was stopped there would be a tendency for the vehicle to run round and round; this might be partially but not wholly checked by the steering gear. In the absence of any accurate data relating to the vehicle we, however, hesitate to express any opinion upon this head. Of course there was but one thing to do, and that was to instantly stop the motor and brake the wheels. As, however, the former was not apparently done and the gear of the latter was broken, and the second brake does not appear to have been used, the vehicle pursued an erratic course and in going down a gradient developed, as a local scribe picturesquely but unscientifically says, a tremendous impetus—whatever that may be. It does not seem to have occurred to the driver that there was still another expedient and that was to throw on the reversing gear even at the risk of stripping his wheels. However, after fatally injuring a pedestrian the vehicle was stopped. As regards the second point, we doubt whether the brake gear of motor-vehicles is as powerful as it might or should be. By Article II, Section 4, of the Local Government Board Regulations, the light locomotive is to have two independent brakes of such efficiency that the application of either shall cause two of the wheels on the same axle to be held so that the wheels shall be prevented from revolving. Whether this means from revolving under all circumstances or whether it means after the motive power is cut out we do not know. We, however, think that a good brake for motor-vehicles should be capable of preventing the wheels from revolving under all circumstances such as when on a descending gradient under full power. We were consulted on this head some time ago and advised that this should be specified—the manufacturer would not, however, have it, as he said it could not be done. Every one has, however, observed that on railway trains it is the commonest occurrence to see the wheels so effectually braked that they are prevented from revolving although the train is in motion. On railways the adhesion is never very great, being but one-fifth to one-seventh of the weight on drivers of the motor-vehicle (the locomotive). On road motor-vehicles with iron tyres and on macadam roads the adhesion is at least one-half the weight on drivers, and hence, by effectually braking the wheels, the vehicle could be stopped in a very short distance. Let us consider the case of a vehicle weighing, in working order, $W = 2$ tons; let the weight on drivers be two-thirds of this, or $w = 3{,}000$ lbs.; taking the co-efficient of adhesion, $\mu = \frac{1}{2}$, then the greatest pull, P, the motor can possibly exert will be $\mu w = 1{,}500$ lbs.; let R be the resistance in pounds per ton due to the road; v the velocity in feet per second while the vehicle is traversing a space s feet; let $l - s$ be the distance in which it is required to stop the vehicle by calling up a brake resistance of R^1 lbs., while the vehicle is in motion it will develop a kinetic energy of $\frac{1}{2} W v^2 / g$; suppose it is going at the rate of 15 miles per hour = 22 feet per second, then the kinetic energy will be 34,500 foot lbs., and the equation of motion will be—

$$\tfrac{1}{2} W v^2 / g = (P - R)\, s = (R + R^1)\,(l - s).$$

Confining ourselves to the right hand expression, and making $l - s = 50$ feet, say, and putting $R = 120$ lbs., we easily find that $R^1 = 570$ lbs. Similarly, if we wish to stop in a distance of 20 feet we must have a brake resistance of 1,600 lbs., in order to dissipate the kinetic energy. From these figures it will be seen, that in order to call up a resistance of half a ton something more substantial than thin iron rods and light bell crank levers are necessary. In short, to obtain full control over a motor-vehicle powerful screw hand gear, modelled after railway practice, is, we think, essential. This, however, implies that the axles must be carried between horn plates. Brake tests and the actual distances a vehicle will run under various conditions have never yet been made, so far as we know. In fact, though vehicles have been used for so many centuries yet little is known of the science of road automobilism. We hope brake tests will form part of the programme at the forthcoming trials in Liverpool, as the heavier the vehicle the more necessary it is to have good braking power, and it is also to be hoped that the Scarborough accident will lead automobilists to pay some attention to the matter, as our own observation convinces us that the majority of motor-vehicles are deficient in this respect.

REVIEWS OF BOOKS.

The Engineering Magazine.—The April number of this magazine is interesting to automobilists for at least two articles, although neither deal with that branch of the subject with which the majority of our readers are more particularly concerned with. At the same time automobilism covers such a wide field and the same appliances for locomotion are used under such different circumstances that even those who simply wish to eliminate the horse will find many useful "wrinkles" in studying what is being done in other directions in this what we term the noble art of automobilism. Dredgers are examples of automotors which are in a humble and prosaic way improving old harbours and ports, and Mr. Corthell discusses them as an expert and his contribution is a most useful and interesting one. In the gearing used on board these craft there is much in principle that is worth study by those who design motor-vehicles. Both kinds of automotors use chain gearing, for example, under bad conditions as regards the life of the chain.

"Notable Speed Trials of British Locomotives," by that distinguished authority, Mr. Rous-Martin, is an attempt to set at rest the much-debated question of the speed of locomotives, and we find that even in 1848 speeds of 1 mile in 46 seconds had been reached. On many of our newer locomotives speeds of 1 mile in 42·3 seconds are easily attained, while 1 mile in 41·8 seconds has been reached in other special express engines, while in the Jubilee Year on a Midland express engine Mr. Rous-Martin did 90 miles per hour. He concludes by declining to believe that, contrary to what many engineers think, a maximum has yet been reached. The article is well illustrated and is good reading. Another article of interest to makers and users of small high-speed motors is entitled the "Steam-Engine and the Dynamo," by Mr. Charles T. Child. In "The Gas-Engine in American Practice," we find a good account of what is being done on the other side in developing a rather neglected form of motor. There is a good description of the Diesel engine, but the Kane-Pennington motor, of which so much has been said, does not appear to commend itself to Mr. Child.

In the May number of this magazine there is again much matter of considerable importance to automobilists. We have frequently insisted that for heavy vehicles automobilists cannot do better than follow, within, of course, limitations, torpedo-boat practice. We are limited as to weight and so are torpedo-boats. Mr. John Platt describes the development of the torpedo-boat destroyer, and rightly describes these vessels as being a marvellous concentration of power and speed. Naturally the firms of Thornycroft and Yarrow come in for much mention. As is well known, the former firm are actively developing their motor-vehicle business and are embodying in their mechanism many of the features that they so successfully have employed in torpedo-boat practice. "Railroad Fares and Passenger Travel," by Mr. H. G. Prout, is an instructive attempt to solve a very intricate problem. Those of our readers interested in light railways and in establishing lines of other motor-vehicles will find here some points worthy of consideration. Mr. Corthell continues his account of sea dredgers, to which we have before alluded. Perhaps the most useful article is one by Mr. J. B. Starwood on the "Economical Use of Steam in Non-Condensing Engines." As steam motor-vehicles use small non-condensing motors, and as these are extremely extravagant in their consumption of coal or other fuel and water, every information which will enable makers and users to improve them is to be welcomed. As we intend to reproduce this article we need say nothing further at present.

Other articles are:—"American and English Architectural Steel Construction," by Mr. C. V. Childs; "An Effective System of Finding and Keeping Shop Costs," by Mr. Henry Roland; "The Purification of River Water-Supplies," by Mr. Allen Hazen; "Applications of Electricity on a Modern Warship," by Mr. George H. Shepard; and "Tank Irrigation in Central India," by Mr. George Palmer.

"SCIENCE and Engineering, 1837-1897."—This is an interesting little *brochure*, written by Mr. Chas. Bright, the son of the late distinguished submarine cable engineer, Sir Chas. Bright. It gives in a popular and condensed form a *resumé* of the scientific inventions that have been made in the Victorian era. As a cable engineer, Mr. Bright naturally deals with telegraphy more fully, but his remarks on other subjects are not less readable. Curiously enough nothing is, however, said of road automobilism. Surely there have been some useful inventions in this branch of applied science? The work is published, without any preface or introduction to explain its *raison d'être*, by Messrs. A. Constable and Co.

La Revue de Méchanique.—The April number of this is to hand, and as usual it contains a number of high-class articles. There is an excellent report of the Commission appointed by the Municipality of Paris to examine into the smoke nuisance and the means for its suppression. An exhaustive analysis on the vibration of engines and ships is made by M. Haas, of the French Navy; this we can certainly recommend to the notice of makers of motor vehicles, especially those who manufacture oil motors. Another good article is on pumps by M. L. Masse, in which the principal and most used pumps are described and illustrated.

"ACETYLENE GAS: its Nature, Properties, and Uses; also Calcium Carbide," by Mr. G. Thompson, consulting engineer, Liverpool. This is the title of a forthcoming work on a subject of growing importance and of great industrial possibilities. It is by a distinguished and well known engineer, and hence should be authoritative. We hope to review it in our next number.

WE have also received:—*The Journal of the Society of Arts, The Indian Engineer, Industries and Iron, The Practical Engineer, Coach-Builders' and Wheelwrights' Art Journal, The Journal of Acetylene Gas Lighting, Knowledge, Machinery Market Review, The London Chamber of Commerce Journal, Indiarubber World, Cyclist, Scottish Wheel, Irish Field, The Yachting World, The Engineering Magazine, La Revue de Méchanique, La Locomotion Automobile, La France Automobile, L'Industrie Velocipédique et Automobile, L'Automobile Illustré, La Moniteur Automobile, La Revue des Transports Parisiens, Les Sports, L'Energie Électrique, Der Motorwagen, Samokat, Horseless Age, American Wheelman, The Motocycle, Australasian Coach-Builder and Saddler*, &c., &c.

CATALOGUES.

THE United Ordnance and Engineering Company (Limited), until lately known as Messrs. Easton, Anderson, and Goolden, send us their catalogue of continuous current dynamos and motors. While for lighting and power these machines have a deservedly high reputation, we do not observe any mention made of motors suitable for electric traction. Indeed, it is rather a matter for regret that hardly any British firms seem to manufacture such. Most of the motors we have seen in vehicles are either of United States or Continental make, yet there is a good opening for a British-made article. In addition to the purely commercial information as to prices, &c., a good deal of technical information as to the calculation of horse-power, &c., is given. This will greatly facilitate the task of selecting a machine by a customer.

THE latest catalogue of the Daimler Motor Company contains illustrations, descriptions, and prices of their now well known vehicles. We observe that they make no less than 11 distinct types of vehicles, all having 4 H.P. motors and four speeds, the lowest of the latter being 2·2 and the highest 16·6 miles per hour. As these vehicles are very carefully built their price is naturally high, but it is undoubtedly cheaper in the long run to pay a good price for a good article than to take out the balance in frequent repairs. So far as our experience goes, these vehicles give great satisfaction if used intelligently.

GOOD clutch gear is an essential for motor-vehicle mechanism, and among the many forms of friction clutch, that by Messrs. Heywood and Bridge, of Salford, is well suited for this and kindred purposes, or indeed wherever a machine has to be started and stopped many times. This firm have forwarded us a descriptive pamphlet of their patent friction clutch, and we gather it is successfully applied to such diverse motors as rolling mills and electric-lighting engines. If a clutch will stand the former it will stand anything.

MESSRS. J. BAGSHAW AND SONS (Limited), of Batley, Yorks, have sent us a copy of their new catalogue, which contains particulars of the shafting, pulleys, plummer blocks, &c., manufactured by them. Among other specialities we notice clutches and wheel gearing suitable for motor-vehicles. There is also a good practical chapter on power transmission.

MESSRS. HOLDEN AND BROOKE (Limited), of Manchester, make an exceedingly effective automatic injector which we think would prove invaluable in steam automobilism, as it would obviate the necessity for a feed pump. In their catalogue this is fully described, and also the method of fixing and using it. They also make a simple reducing valve which would also be applicable to motor-boilers using high steam.

MESSRS. SMITH, PARFREY, AND CO. send us their price list of wheels and fittings for vehicles of all sorts. This old-established firm is laying itself out to meet the wishes of automobilists, and make a special line of wheels, &c., for motor-vehicles. As their experience with vans and omnibuses is so large, they should be well able to advise on the most suitable kind of wheel to adopt.

THE Ardwick Engineering and Machine Company, of Manchester, make, in addition to other specialities, small motors eminently suitable for motor-vehicles, and also lay themselves out to develop the ideas of inventors. In their latest catalogue we observe illustrations and price lists of some neatly designed steam-motors, and they also include a useful chapter on the management of them. Another chapter on useful data will be of service to amateurs in fixing general dimensions, &c. Altogether a most useful catalogue.

WE have received a sheet giving drawings and particulars of Weatherill's anti-vibrating springs and connections for motor-vehicles. Vibration in these vehicles is such a common and unpleasant feature that any means that will lessen it is to be welcomed, and no doubt if these fittings were better known they would be more generally used.

AMONG the really scientific firms of manufacturing machinists few hold a higher position than that of Mr. Jas. White, of Glasgow, who manufacture the very scientific instruments invented by Lord Kelvin. A catalogue of these instruments of precision is interesting and instructive in itself. Although most of the instruments are connected with electrical work, yet many, such as tachometers, indicators, counters, are of use to the automobilist. Needless to say that the goods turned out by this firm are of the very highest excellence.

THE Kelham Rolling Mills Company, of Sheffield, send us a description of their specialities in tyres for motor-vehicles. These tyres are made to any section and fitted with rubber by a new and ingenious process.

THE HEILMANN LOCOMOTIVE.

IT is very generally admitted that the present type of locomotive cannot be much, if at all, improved. On the other hand, the tendency is in the direction of hauling heavier trains at higher speeds, requiring, of course, much more powerful engines. It is a defect with the ordinary locomotive that at high speeds, owing to the method of imparting motion to the driving wheels, very serious oscillations are set up; while at still higher speeds the increase of back pressure in the cylinders causes the power to fall rapidly. Again, in order to haul heavy loads great tractive power is necessary, but while for low speeds this is easily attained by coupling the wheels, for high speeds it is not practically possible to couple more than two, and as the revolutions cannot be high these coupled wheels have to be of large size. For these reasons the problem of hauling heavy loads at high speeds cannot be solved by ordinary locomotives.

It is the distinguishing feature of electric traction that the turning moment on the driving axle is constant, while the speed of revolution can be as high as we want, and any desired tractive effort can be obtained by increasing the number of axles and attaching a motor to each. The power imparted to the motors can be derived either from a central rail, an overhead wire, storage batteries, or, lastly, it may be generated on the locomotive itself. Inasmuch as weight is necessary in order to obtain the proper adhesion of the wheels, and for other reasons, the latter system is preferable. Such, in brief, is the principle of electric railway traction most likely to be adopted on existing railways, and to M. Heilmann belongs the credit of having been the first to apply this principle in a practical manner. About four years ago he designed and built an electric locomotive, called the "Fusée Electrique"; this was tried on the Chemin de Fer de l'Ouest, and it easily hauled trains of 200 tons at a speed of 66 miles per hour. So satisfied were the directors with this performance that arrangements were made for the construction of a still larger and more powerful locomotive on this system. This we illustrate in the accompanying drawings. Fig. 1 is a general view of the locomotive with a van attached. As will be seen, the funnel is in the rear, while the front part of the locomotive is plated into a shape something like a warship's bows. The locomotive consists of two distinct portions; the front part forms the engine room, in this are placed the engines and dynamos which generate the current; the rear part comprises the boiler, tanks, bunkers, &c. The whole is carried on deep web girders, which, in their turn, are carried by two eight-wheeled bogies. In the front part are placed six compound Willan's engines, all on one bed plate, and all driving on to one main shaft, the total I.H.P. being 1,350. Six cylinders were employed, so as to obtain an exactly perfect balance of the reciprocating parts. To each end of the main-shaft is coupled direct a six-pole series wound dynamo, the field magnets of which are excited by a smaller dynamo. When running at the normal speed of 400 revs. per minute the armatures of the large dynamos give off 900 ampères at 400 to 450 volts. The current is distributed to eight motors, one on each axle, thus each wheel is used for adhesion, and slipping is impossible while the full tractive effort is obtained.

Fig. 1.—Heilmann Locomotive (General View).

Fig. 2.—Heilmann Locomotive (Elevation).

Fig. 3.—Heilmann Locomotive (Plan).

The boiler is of the Lentz type, and has 351 tubes and 1,990 square feet of heating surface, and will easily evaporate 29,700 lbs. of water per hour.

The total length of the locomotive over all is 52 feet; the wheel base being 37 feet. In working order it weighs 115 tons. It can haul loads of 200 tons at speeds varying from 90–120 miles per hour, and we believe that it is owing to considerations regarding the permanent way that the full power of this locomotive has not yet been utilised. So far the trials have been highly satisfactory, and M. Heilmann has abundantly demonstrated the correctness of his electrical system of traction.

KINGDON'S STEAM VALVES.

EVERY improvement in small steam-motors suitable for automobilism is to be welcomed, as in vehicles especially is it very necessary to combine as high an efficiency as possible with small size, weight, and cost. Messrs. Simpson, Strickland, and Co., of Dartmouth, who have for many years maintained a very high reputation as builders of Admiralty steam launches, have brought out a compound steam-motor, which embodies several improvements—the inventions of Mr. G. Kingdon.

These improvements consist in the arrangements of the valves and piston-rods, and, as will be seen, one slide valve regulates the steam admission to both engines, so that exhaust steam from the high-pressure cylinder passes through the valve to the low-pressure cylinder at each stroke, and is then used before going to the condenser or atmosphere. Another improvement is that whereby a gland between the two cylinders is dispensed with. Referring to the accompanying drawings (Figs. 1 and 2), *A* is a valve formed with a large port or aperture, *B*, of sufficient width to serve for both the ports, *H*, *D*, in the high-pressure cylinder, and communicates with a passage, *C*, and ports, *B'*, *B''*, which correspond during the movements of the valve with the low-pressure cylinder ports, *F*, *F'*. Steam from the boiler enters the steam chest at *R*, and is thus distributed; with the pistons at the extreme top ends of their stroke, the valve, *A*, is just moving down to uncover the port, *H*, to the steam chest and admits live steam to the top side of the high-pressure piston, *I*, and opens communication between the under side

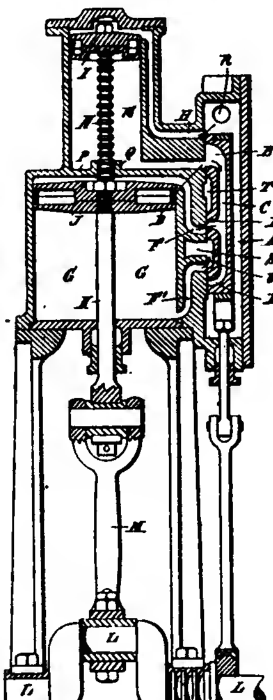


FIG. 1.

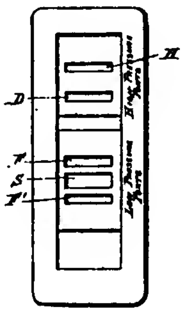


FIG. 2.

of the piston and the top of the low-pressure piston, *J*, by means of the wide port, *B*, passage, *C*, ports, *B'*, and *F* respectively to exhaust the steam from the cylinder, *E*, for further work upon the piston, *J*, the port, *B''*, being closed upon the face of the cylinder. The valve, *A*, is at the same time commencing to uncover the exhaust port, *S*, for exhausting the steam from the under side of low-pressure cylinder to the condenser, or atmosphere, as the case may be, through the cylinder port, *F*, and valve port, *U*. When the pistons, *I*, *J*, have arrived at their extreme lower position, the valve, *A*, will begin to uncover the port, *D*, to the steam chest for admission of live steam, the recess, *T*, being formed for this purpose, and the port, *B*, will open communication between the top side of the high-pressure cylinder, *E*, and underside of the low-pressure cylinder, *G*, through the ports, *H*, *B*, *C*, *B''*, and *F'* respectively, *B'* being closed upon the cylinder face. The top side of the cylinder, *G*, will also communicate with the condenser or atmosphere through the cylinder port, *F*, valve port, *U*, and exhaust, *S*, and so on consecutively. Both pistons are connected to the same rod, *K*, to actuate the crank-shaft, *L*, through the connecting rod, *M*, in the ordinary manner.

Fig. 3 is a sectional elevation of an equilibrium tubular valve arranged as described for the friction valve shown in Fig. 1, the

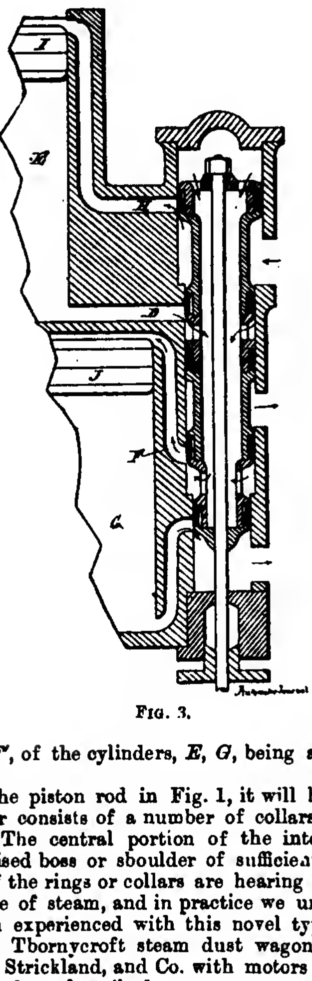


FIG. 3.

ports, *H*, *D*, *F*, *F'*, of the cylinders, *E*, *G*, being also arranged in a similar manner.

Referring to the piston rod in Fig. 1, it will be seen that it is grooved, or rather consists of a number of collars turned out on a single rod, *K*. The central portion of the internal cover, *P*, is formed with a raised boss or shoulder of sufficient depth that never less than three of the rings or collars are bearing against it. There is thus no leakage of steam, and in practice we understand that no trouble has been experienced with this novel type of gland. We believe that the Thornycroft steam dust wagons are supplied by Messrs. Simpson, Strickland, and Co. with motors fitted with valves and piston rods as here described.

Company Promotion in Germany.—In Germany there are two forms of limited liability companies, one the "Aotiengesellschaft," with shares to bearer, and the other, "Gesellschaft mit beschränkter Haftung," with registered shares in capital, which latter is now taking the place of the "Commandit" or of the "Geworkschaft," a very common system of conducting mining operations, one which has no fixed amount of capital, but where it is called in as required by the board. Formerly such companies had unlimited liability, that is, each member of the partnership was liable for every penny he possessed, whereas now the liability is limited to the amount of money called up or paid; should the partner fail to pay, be may have to sacrifice his share, or at least the difference of what it may fetch at public sale on the open market, and the actual cost price or amount already paid up. The first-mentioned class of company is generally floated by bankers of high standing, men of mark, who place the shares amongst their clients. The professional promoter, underwriter, as known in England, is conspicuous by his absence in Germany; hence, says a Foreign Office report on German trade, the dead weight of promotion capital does not exist in that country.

THE KRIÉGER ELECTRIC CAB.

IN THE AUTOMOTOR for March, 1897, we described the Kriéger system of electric propulsion for vehicles, chiefly cabs, carriages, &c. Commencing some years ago with an ordinary horse-drawn cab, M. Kriéger has gradually developed a system of electric propulsion which not only differs materially from other systems in use, but which also possesses some points of marked superiority to them. Briefly, in M. Kriéger's system the driving power is applied to the fore-carriage by means of an electric motor geared to each wheel.

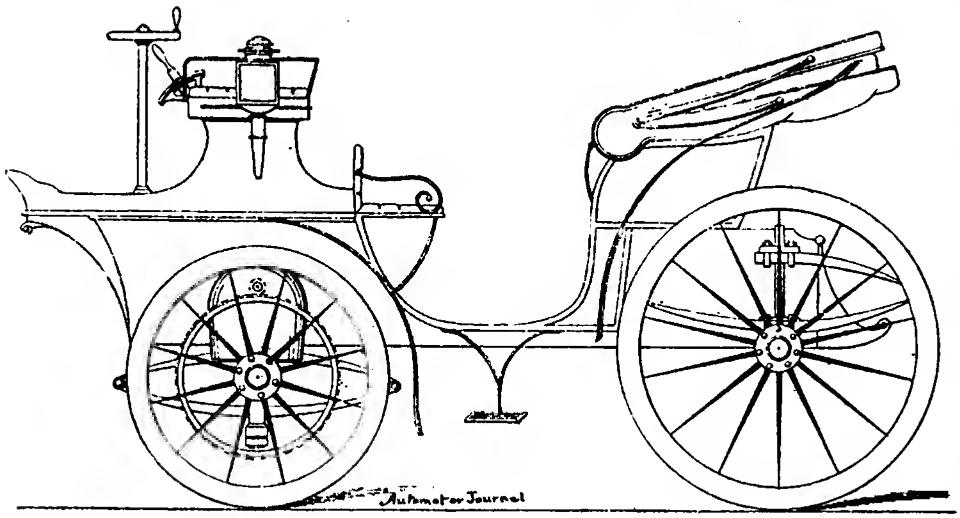


FIG. 1.

To the armature shaft of each motor is attached a pinion with helical teeth engaging with a similar wheel rigidly attached to the corresponding driving-wheel. The ratio of gearing is as 1 to 10. The field magnets of the two motors are coupled in series, and the two armatures in parallel. The use of an independent motor to each driving-wheel enables the steering to be effected electrically. For instance, if the armature of the motor on the inside of the curve it is desired to traverse be short circuited, the fore-carriage will turn to that side. The short circuiting is brought about by means of a special commutator arranged for this purpose. The fore-carriage turns to an angle equal to that made by the steering handle. Hand-steering gear of the usual type is also fitted to the carriage, the whole electrical apparatus constituting an electric servo-motor of a most ingenious kind.

Not content with the success which attended the vehicles built up to last year, M. Kriéger has continually improved upon them, and his latest model, the "Milord" coupé of 1898, which we illustrate herewith (*see* Fig. 1), contains several improvements worth describing. It will be noticed by those familiar with the Kriéger carriages that the driver's seat has been lowered, and the electric gearing of the fore-carriage motor sufficiently reduced to give all the necessary elegance to the vehicle. The mechanical and electrical arrangements are on the same principle as those described by us in THE AUTOMOTOR of 1897, the proportions only having been changed in accordance with long experience.

The weight of the new carriage "Milord" is 2,530 lbs. when empty, and with four passengers and the conductor it weighs about 3,300 lbs. The average speed is 11 miles per hour (a speed really guaranteed), the maximum speed being 15 miles per hour. One can cover about 50 miles of average road without recharging the accumulators; the carriage can thus run the whole day around any given town, and even traverse a very long road before it would be necessary to return to the place where it has to be recharged.

The new battery of accumulators is composed of 44 Fulmen elements weighing 1,012 lbs., and storing up a useful energy of 12 kilowatts, corresponding to the average length of road just mentioned of 50 miles. The weight of the motors is 286 lbs., the efficiency of the motors and transmission being 82 per cent. Six different speeds, of 3, 5, 6·6, 9·6, 12, and 15 miles per hour, are obtained by the manipulation of a single commutator or controller placed within the reach of the conductor's hand. The motors and the gearing are completely sheltered from dust in a box made of sheet iron, as shown in the drawing, above the steering axle in front. The ratio of motor gear to the wheel is 17 to 1 (helical gear).

The frame is made of wood, and carries the tray of the battery. The box is completely separated from the frame, from which it is supported by strong springs. The conductor has two brakes, one (electric) acting on the motors in front, and the other (a rolling brake) fixed on the rear axle. The wheels are fitted with Michelin's pneumatic tyres. The motors, specially constructed by MM. Postel and Vinay, yield 3 H.P., at 2,500 revs. per minute.

The Electric Cab Society Club (Kriéger's system) are at present building a number of cabs which are going to be tried by the Compagnie Générale des Petites Voitures; this type we illustrate in Fig. 2. They will be designed to run an average distance of 40 miles per day in Paris. The accumulators will be recharged during the night. It is said that a saving of more than 40 per cent. will be effected over cabs drawn by horses.

Exhibition of Acetylene Apparatus.—The Executive Council of the Imperial Institute has on foot a scheme for holding an exhibition of acetylene gas generators and illumination by acetylene gas. The generators admissible are divided into three groups, viz., (1) those in which the gas is generated by water being allowed to drip, or flow in a small stream, on to the top of the carbide; (2) those in which water rises round the carbide; (3) those in which the carbide falls into the water; these being again subdivided into automatic and non-automatic. Forms were sent out for applications for space, the Council of the Institute not undertaking to hold the exhibition unless there was a sufficient number of applicants to cover the actual outlay which will be involved.

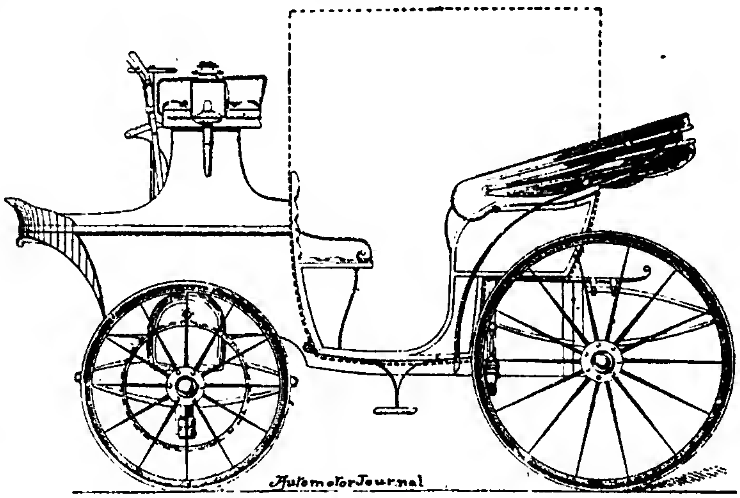


FIG. 2.

MOTOR FIRE-ENGINE.

MESSRS. MERRYWEATHER AND SONS, the well-known manufacturers of fire-engines, have naturally turned their attention to the subject of the self-propulsion of these vehicles, and have produced the accompanying design. As will be seen, the vehicle is carried on four wheels, the two front wheels being carried on a divided axle with pivoted arms, while the rear wheels are the driving wheels. The boiler is carried at the rear end of the frame, and the engine placed vertically in front of the boiler between the frames. The steam cylinders are placed above the frames and actuate the pumps, placed below the frames and directly below the cylinders, by means of rods which may be disconnected when steam is used for propulsion of the machine.

The propelling machinery consists of a crank-shaft driven by the steam cylinders operating a counter-shaft by means of gear wheels and differential gearing. The ends of the counter-shaft are provided with sprocket-wheels which drive similar wheels attached to the bearing-wheels of the machine by means of chains, one on each side of the machine. At the rear of the engine a platform for the stoker is provided and bunkers for fuel. The feed cocks and water and pressure gauges are so arranged as to be easily accessible to the stoker on the rear platform. A platform or seat is provided on the front part of the machine for the accommodation of the driver, and the steering mechanism, steam valve, and reversing gear are placed within convenient reach. The usual hose and implement box may be fitted on the top of the frames between the engine and the front seat or platform, and foot-boards for the firemen on each side. A water tank is also carried between the frames.

In the accompanying drawing A is the boiler, carried on rear end of frames, B; C are the steam cylinders actuating the pumps, D, by means of rods, E; F is the crank-shaft operating the counter-shaft, G; H is a sprocket-wheel fixed to counter-shaft; J is a sprocket-wheel fixed to the bearing-wheels, K, which are driven by the chain, L; M is the platform for the stoker; N is the platform for the driver; O is the steering mechanism; P is the handle for actuating the steam valve; Q is the reversing lever; R is the hose box; S is the water tank.

It will be observed that the design is certainly simple, but we should not like to say that it embodies the latest of our ideas in self-propelled fire-engines. Exception, for example, may well be taken to the use of chain-gearing for transmitting the necessarily rather large power necessary to run the vehicle at a good speed. Such gearing, too, would also be noisy. We doubt, too, whether the boiler and motor, presuming they are of the same type and size as are usually fitted to fire-engines built for the London County Council, could produce the necessary power for rapid movement of the vehicle.

A MOTOR FIRE-ENGINE.

The Universal Cyclometre.—Some weeks ago we received from M. Marcel Fonreau, of 54, Rue de Chabrol, Paris, a cyclometre with a request that we would test it. We have since done so, and are glad to report that within the limits to which such an instrument is applicable it is remarkably accurate. Of course, much depends upon the road and the method of driving. In the City upon asphalte the readings were correct, but on rough country roads the error was about 5 per cent. in excess. For speed testing on good roads we can recommend this instrument, but it requires to be carefully used as it is somewhat delicate and is more applicable to motor-bicycles and light vehicles than to heavy ones. It is beautifully made and very light. It can easily be attached to the handle-bar, but care has to be exercised in adjusting the endless cord which transmits the motion from the driving wheel to the counting mechanism. We would suggest a more substantial construction and attachment for ordinary motor-vehicles, while the recording tape might be dispensed with as it adds to the expense and complication, with great liability to getting out of adjustment. A clock forms part of the machine.

AN automobile race from Lille to Boulogne and back will be run on July 30th and 31st next, under the auspices of La Société Industrielle de Nord. There will also be an exhibition of motor-vehicles in Lille from July 17th to August 1st.

FOREIGN NOTES.

THE only motor-carriage in Rio de Janeiro, Brazil—a Panhard—is at present laid up for repairs, which nobody can be found to make.

THE Prefect of the Maritime Alps has issued a regulation restricting the speed of motor-vehicles to 6 miles per hour in thickly-populated districts, and to 18 miles per hour in the open country.

IN a few days' time horses will no longer be used on the Place de la République-Aubervilliers line of tramways. Five electric cars are already running. The accumulators with which the cars are supplied are, says the *Temps*, sufficiently powerful to allow of the steepest slopes being mounted at a speed of 14 or 15 kilometres an hour.

As will be seen from a letter we publish elsewhere, the Netherlands Government has consented to admit vehicles owned by members of the Automobile Club, London, free of duty, and also without any other restraint, provided satisfactory evidence of membership is forthcoming. We think the thanks of all automobilists are due to his Excellency the Minister of Finances, M. C. Van Dyck, for his liberal consideration in this matter.

IN the recent Course de Périgueux nine voitures competed in one class, six motor-tricycles in another, and three voiturettes Bollée. The total distance was 87 miles. The first arrival was M. G. Leys, on a 6 H.P. Panhard, in 3 hours 54 minutes; the next was the cyclist Osmond on a tricycle, his time was 4 hours 9 minutes. Among the Bollées the first arrival was M. Wilfred, on a 4 H.P. motor, the time being 6 hours 27 minutes. The fastest speed was thus 22·3 miles per hour.

M. PIERRE GIFFARD, a well-known French cycling journalist, is warmly advocating the use of petroleum motor-cars in Madagascar. He points out that new railways are in contemplation for early construction, and that these railways will need "feeders"; that goods will not be conveyed by horse traction for the simple reason that horses do not thrive in the beautiful but unhealthy island: and that here is the chance of the motor-car, on the roads which will have to be constructed to lead to the railways. At first he thinks that steam motor-cars, burning wood fuel, will be used, but later the more convenient oil-motors will become universal.

THE sad accidents that have lately occurred in France, at Poitiers and at Périgueux, whereby in the former case a lady was killed on the spot, and in the latter a French nobleman lost his life, not to mention the severe injuries that others received, will have the effect, it is to be hoped, of checking the rather preposterous craze for automotor racing that possesses our French neighbours. These races are no doubt invested with a certain amount of interest to those concerned, but they serve no really practical end—on the contrary they make people believe that automotors are employed more for sporting purposes than for convenience, and hence the public will come to regard motor-vehicles with prejudice and dislike. Of course accidents are possible with all machines, and as regards the one at Poitiers the occurrence was due primarily to a defective axle, but descending a gradient at fast speed was a contributing cause.

As regards the very serious accident at Périgueux, this was due to a collision between two motor-vehicles while both were going at a high speed on a raised embankment or viaduct. One vehicle was pitched over, and the other getting out of control ran down the embankment and turned over. To say that such occurrences are "accidents" is a euphemism. We rather think they are due to a lack of intelligent appreciation of the risks incurred. In other words, the drivers displayed an inexcusable foolhardiness, because it is neither safe nor necessary to drive such vehicles at these excessive speeds.

La France Automobile publishes some excellent photographs of the vehicles and of the scene of the above disaster. Both vehicles are apparently very badly damaged.

THE French Touring Club has arranged to standardise the patterns and dimensions of chains used in motor-vehicles. Both in France and Great Britain a sort of Automobile "Lloyd's" is necessary, not only in the interests of makers and users, but also in the interests of the general public. As the recent accidents show, many important fittings, such as brakes, are often very defective and inefficient.

THE Western Railway of France, which is perhaps one of the most progressive railway companies in Europe, as witness its adoption of the Heilmann locomotive (which is described in our present issue), has decided to use motor-vehicles for parcels and passengers, and has invited tenders from manufacturers.

THE Northern Railway of France is likewise progressive, and is fully alive to the advantages of motor-vehicles for certain purposes. Just as this railway was perhaps the first to employ four-cylinder compound engines long before they were known in England, so is it among the first to employ a perfect system of motor-vehicle. It has now in course of construction two separate and distinct types—the first is a single second-class compartment, with seats for 12 persons. Of this type there are two models: the one on the Serpollet system, and the other propelled by electricity (storage cells). The second type is a carriage having several compartments and a seating capacity for 50 people; it is propelled exclusively by electricity in storage cells. Both types constitute in fact a system of light railways used as feeders to the main lines. This kind of thing is apparently possible in France, but not so in Great Britain. Whether it arises from different economical conditions or from a want of enterprise on the part of our railway directors it would be hard to say.

Disfiguring the Thames Embankment.—In the March issue of THE AUTOMOTOR we discussed a proposal made by the London County Council to run a line of tramways on the Thames Embankment. We joined in efforts of others to prevent such an æsthetic outrage, and we are glad to say that on the second reading of the Bill in the House of Commons it was thrown out by a large majority. The House of Commons does not, as a general rule, impress one with a sense of profound wisdom, but in this matter it exhibited profound common sense.

Pneumatic Tyres.—Messrs. Souther have recently made a number of experiments on the friction of pneumatic tyres when inflated to different pressures. The least pressure tried was 30 lbs. per square inch, which in the medium-weight tyre tested was just sufficient to keep the felloes off the road with a weight of 180 lbs. on the saddle. Under these circumstances the efficiency of the machine was about 61 per cent. Increasing the pressure to 40 lbs. brought up the efficiency to 74 per cent., and from this onwards the efficiency augmented but slowly with increasing pressure. The highest pressure used was 70 lbs. per square inch, and the efficiency was then about 81 per cent.

Testing Feed Water.—A writer in a contemporary says:—"Treatment of feed water by an engineer has not, as a rule, met with any great success, as a number of experiences in this line that have been shown up will testify, but there are a few tests that everyone having charge of boilers should be familiar with. The presence of hard or soft water is easily detected by dropping a few drops of alcohol that has dissolved all that it can possibly hold of good soft soap. The water will turn milky white if it is hard, and remain clear if soft. Add to the water from five to ten drops of oxalate of ammonia in a test tube. If carbonate of lime be present, the water will in a short time present a clouded or milky appearance, and in a few hours a precipitate will be found at the bottom of the tube. Take some of the feed water and add a few drops of nitrate of baryta or barium chloride. If sulphate of lime or sulphuric acid is present, it will be shown by a milky appearace, and by the formation of a white precipitate. If decomposed animal matter is the cause of all the trouble, it will be shown by adding a drop of permanganate of potash, which will colour the water a bright violet rose when first added. If decomposed organic matter is present, the colour changes to a dull yellow; if present in large quantities, however, the colour will in time disappear. If, upon adding a few drops of solution of prussiate of potash a blue colour is produced directly or after some time, it shows that iron is held in solution."

CORRESPONDENCE.

**** We do not hold ourselves responsible for opinions expressed by our Correspondents.*

**** The name and address of the writer (not necessarily for publication) MUST in all cases accompany letters intended for insertion or containing queries.*

**** Correspondents are particularly requested to write on one side of the paper ONLY, to place the subject of their letters as a headline at the top of the sheet, and their names and addresses at the foot. Attention to these matters saves much time and ensures the insertion of the letter.*

THE SPORTSMAN'S EXHIBITION.

To the Editor of THE AUTOMOTOR.

SIR,—The attention of my directors having been drawn to your statement in the April number of your journal that "Under the auspices of the London Exhibitions (Limited) what was ironically termed a Sportsman's Exhibition was held for a few days recently at Earl's Court," I am desired to ask you to kindly point out in your next issue that this Company had nothing to do with the Sportsman's Exhibition beyond letting a portion of the buildings to the promoter of it. It certainly was not held "under the auspices of the London Exhibitions (Limited)," and as your statement, coupled with your following remarks, is calculated to do harm to this Company, I am sure that you only need to be acquainted with the facts in order to rectify the error into which you have unwittingly fallen.—Yours faithfully,

AUSTIN BRERETON
(Manager of the Press Department).

Earl's Court, London, *April 22nd*, 1898.

[We regret having attributed the exploitation of the Sportsman's Exhibition to the London Exhibitions Company. The error arose in consequence of a communication to us enclosing a card of invitation having the heading upon it, "The London Exhibitions (Limited)," otherwise we were guiltless of any intentional offence.—ED.]

THE VIBRATION OF MOTORS.

To the Editor of THE AUTOMOTOR.

SIR,—Can anything be done to prevent the vibration of the motor in a car? I find that ladies particularly object to this, which seems to me to be due to the lightness of the parts. I have tried springs and rubber washers placed under the holding-down bolts, but with no improvement. Makers suggest all kinds of expedients, but this means expense with no guarantee of cure. May I ask what you suggest in order to cure this objectionable feature of the motor-car?—I am, Sir, yours sincerely,

JULES LE DOUX.

Marseilles, *April 28th*, 1898.

[We refer to this elsewhere.—ED.]

THE CROWDUS STORAGE BATTERY.

To the Editor of THE AUTOMOTOR.

SIR,—Being much interested in storage cells, I shall be glad to learn the result of your criticism on the Crowdus cell which appeared in last month's AUTOMOTOR. It seemed to me that you have completely demolished the pretensions put forth by those interested in exploiting this latest American "notion." If Mr. Bowden really has a cell which is only, say, 50 per cent. lighter than British cells of the same capacity, and if his claims are substantiated by independent tests made as you suggest at the Board of Trade testing laboratory, he will be simply unable to meet the demand for such cells, and could safely order a cargo of them from Chicago. Those of us who have spent time and money in the study of the storage cell know that it is not difficult to obtain a high rate of discharge from certain chemical reactions, but other factors are cost and weight, and, perhaps more important still, life or durability, especially in traction work.—I am, Sir, yours, &c.,

PbO^2.

London, S.E.

[We have had no further communication from Mr. Bowden. In our present number we publish a most exhaustive analysis by M. Hospitalier on a Fulmen cell, which is worth serious reading to all interested in storage cells.—ED.]

PRESSURE OF AIR ON VEHICLES.

To the Editor of THE AUTOMOTOR.

SIR,—During the strong winds of last week it seemed to me that my car was sensibly retarded. With the wind in front I noticed a considerable diminution of speed, and with the wind blowing on the side I had to steer so as to counteract this tendency to go sideways. I have had a large experience in driving horse-drawn vehicles, but have never noticed that the wind made any sensible difference. Will you kindly explain why the wind should affect a motor-car and not a horse-drawn carriage, and how can I determine the pressure of the wind for any given case?—Yours faithfully,

May 3rd, 1898. A COVENTRY DRIVER.

[The wind affects a horse-drawn vehicle as well as a mechanically-propelled one; only the horse accommodates his pull to the extra resistance *automatically*, whereas the automotor, paradoxical as it may appear, does not, unless fitted with governing mechanism, which is never the case so far as our observation goes. We answer the question on wind pressure elsewhere.—ED.]

THE CONCOURS DE SPA.

Monsieur le Rédacteur de L'AUTOMOTOR.

MONSIEUR,—Nous vous prions d'insérer dans votre estimable journal l'information suivante :—

La liste des prix spéciaux pour la fameuse course des automobiles Bruxelles-Spa, qu'organise les 25 et 26 juin prochains, l'Automobile Club de Belgique s'accroît tous les jours; aux prix offerts par Sir David Salomons, le Touring Club Belge, il faut en effet ajouter le prix du Comte de Hemricourt de Grunne, membre du Comité, qui tient à récompenser non pas la voiture la plus rapide, mais celle qui présentera le plus de qualités au point de vue *pratique*.

Une cinquantaine de membres nouveaux ont éte admis dans le courant de ce mois aux ballotages de l'Automobile Club, parmi eux MM. Lucien Vorlet, à Verviers; Henry De Clercq, à Bruxelles; Ernest Preudhomme, à Bruxelles; Philippe de Burlet, à Bruxelles; Raoul Gcelhand de la Bistrate, à Anvers; Camille Jenatzy, à Bruxelles; Comte Jules de Monceau, à Bruxelles; Baron de Dieudonné de Corbeekooer Loo, à Louvain; Fernand Hérard, à Paris; Baron Lundeu; Gérard Nothomb, Albert Mans, Albert Liérart, Albert Tesch, à Bruxelles; MM. Armand Dresse, Edmond Dresse, Dawaut Preudhomme, Dawaut Adrien, Dawaut, Georges fils, Maurice Leloux, Georges Béar, Auguste Aerts, Charles Rocour, G. Rocour, Jules Lamarche, Alfred Lamarche, Max Hauzeur, Adolphe Hauzeur, Dieudonné Sklin, Fernand Pisard, Georges Deprez, Auguste Gillard, Auguste Dumoulin, Chevalier Octave de Mélotte, P. Van Hougaerden, Gustave Terwaugne-Dalloge, Mathieu Douvoiseri, de l'Automobile Club Liégeois.

Max Coget, Joë May, Léon Génart, Felix Pardon, Paul Gecscher, de Timary; Lucien Niguet, de Bruxelles.

L'Automobile Club Liégeois vient d'être reconnu par l'Automobile Club de Belgique comme "Cercle Adhésif" et a par conséquent le droit de désigner un de ses membres pour le représenter au Conseil d'administration de l'Automobile Club.

Veuillez agréer, Monsieur le Rédacteur, avec mes remerciements l'expression de mes sentiments distinguées.

Comte FERNAND DE VILLEGAS DE ST. PIERRE,
Le Secrétaire Général.

Automobile Club de Belgique,
14, Place Royale, Bruxelles.

WHEEL GUARDS.

To the Editor of THE AUTOMOTOR.

SIR,—I hope you will allow me space in your journal to suggest a plan for minimising street accidents from motor-cars or other vehicles. I say motor-cars particularly because this is a modern vehicle, and one that will, I believe, be very much used in another 10 years or less. My plan is to box the lower half of the wheels in to within, say, a couple of inches of the ground, so that if they struck an object on the ground it must push it away and not run over it. I enclose rough sketch for your perusal.—Yours obediently,

"PROTECTOR."

[We do not reproduce our correspondent's sketch as his meaning is sufficiently plain, and we see no practical difficulty in adopting such a plan, or a modification thereof. Something similar is already in use in the Paris tramcars.—ED.]

PETROL STORES.

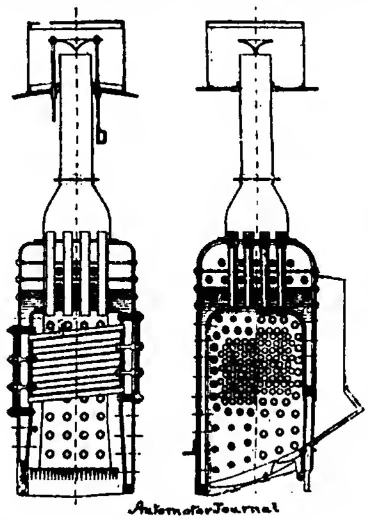
To the Editor of THE AUTOMOTOR.

SIR,—Under heading as above I see you give my name and address. Permit me to say I do not keep a store for sale of petrol; but as I generally have a few gallons by me, I shall be happy to help any brother automobilist who may not have sufficient to reach either Farnham or Guildford.—Yours, &c.,

Barfield, Farnham, *April 18th*, 1898. JOHN HENRY KNIGHT.

THE WEIDKNECHT BOILER.

AMONG the many types of boiler now being used for steam motor purposes it is interesting to note that in France the vertical boiler in one or the other of its modifications finds special favour. With us there is a strong leaning to water-tubers, but so far our French friends have not followed us in this respect. De Dion et Bouton have been very successful with their pot boiler, while Le Blant has been no less successful with his modified "Field." M. Wiedknecht employs a type of vertical boiler which we herewith illustrate. As will be seen, it contains some features which we are not accustomed to see associated in these boilers, and which many authorities will hardly



call good practice. However, M. Wiedknecht has to satisfy the very rigorous French authorities, and so far, we understand, he has found this boiler very well adapted to his steam vehicle. This boiler has a grate area of 3 square feet. There are 87 tubes 1·18 inches diameter external; the total heating surface being 64 square feet. The boiler will evaporate 572 lbs. of water per hour. It supplies steam to a motor which has two cylinders, 4·92 inches diameter by 4·92 inches stroke. Steam is cut off at from 10 per cent. to 83 per cent. of the stroke by a variable valve gear of the Soling type. At 350 R.P.M. the H.P. is 20. The consumpt is 10·7 lbs. of coke per mile on good roads, and about 7 gallons of water; the weight of the vehicle fully loaded with 16 passengers and about half a ton of baggage being nearly 7 tons, and the maximum speed on a good level road being 9 miles per hour.

THE Peugeot Motor Company has just increased its capital from 800,000 francs to 2,400,000 francs. The subscriptions were raised among the shareholders without any difficulty.

SAYS an American Exchange, James N. Wood, of Wood, Meagher, and Company, Richmond, Va., has nearly completed a single cycle gasolene engine which develops 1 H.P. and weighs only 50 lbs. He is also engaged on an Otto cycle marine-motor which will be reversible like a steam-engine. He expects to be able to build single cycle vehicle motors as light as 20 lbs. to the H.P. One often hears of these much needed inventions, but somehow they do not eventuate.

NEW INVENTIONS.

Claiming particularly to apply directly or indirectly to Motor Vehicles, &c.

Compiled for "THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL" by HERBERT HADDAN and Co., Registered Patent Agents, of 18, Buckingham Street, Strand, W.C., London.

Patents Applied For.

Abbreviations: Impts., Improvements in; Relg., Relating to.

1898.			
April	1.	7,785.	J. WALKER. Differential mechanism.
,,	2.	7,955.	V. E. PRETOT. Motors for automobile vehicles.
,,	4.	7,985.	A. A. LEGRAND. Automotor.
,,	4.	8,028.	Viscount H. J. M. P. C. DE RIANCEY. Automotor road-vehicles.
,,	5.	8,076.	F. W. LANCHESTER. Power-propelled vehicles.
,,	6.	8,233.	J. T. HIMMEGER and J. CROWLEY. Electric tramcars, &c.
,,	6.	8,262.	G. H. RAYNER. Controlling device for electric motor-vehicles.
,,	7.	8,271.	J. HEYS. Impts. fork crowns, &c.
,,	7.	8,367.	P. TEICHMANN. Improved acetylene vehicle.
,,	9.	8,456.	H. COURTEEN and W. H. BROWN. Impts. self-propelled vehicles.
,,	12.	8,496.	A. G. NEW. Impts. motor-cars.
,,	13.	8,644.	J. REA, J. REA, JUN., S. REA, and H. M. DINSDALE. Impts. variable speed gear.
,,	14.	8,752.	J. REA, J. REA, JUN., S. REA, and H. M. DINSDALE. Impts. hydrocarbon motors.
,,	16.	8,848.	W. G. HEYS (J. J. Heilmann). Electric propulsion of vehicles.
,,	18.	8,959.	W. PECK. Improved motor-propelled road-vehicle.
,,	20.	9,179.	L. F. S. COLOMBIER. Engines for automotor vehicles.
,,	21.	9,258.	J. MILLOT and B. MILLOT. Impts. driving gear.
,,	22.	9,275.	H. MOORE. Impts. hydraulic driving gear.
,,	22.	9,321.	R. HADDAN (Heinle and Wegelin). Impts. reltg. motor-vehicles.
,,	22.	9,350.	G. C. MARKS (Trepeau and Lagarade). Impts. speed gear.
,,	23.	9,382.	A. G. NEW. Impts. motor-vehicles.
,,	23.	9,423.	G. DOMINY and J. J. H. STURMEY. Impts. variable speed gear.
,,	25.	9,470.	A. S. BOWER. Impts. driving gear.
,,	25.	9,512.	A. HERSCHMANN. Impts. speed gear.
,,	27.	9,645.	W. H. IRELAND. Handles for motor-cars, cycles, &c.

Specifications Published.

THE following is a List of Specifications recently published, and obtainable at the Patent Office, 25, Southampton Buildings, London, W.C., at the uniform charge of 8*d.* per copy. Owing to the enormous pressure upon our columns it has been found impossible to deal in any other form with the accumulation of patents now being taken out in connection with automobilism. As far as possible, a selection for special mention is made by the Editor from the more prominent inventions:—

Applied for during 1896.

29,610. W. J. H. JONES, 21, New King Street, Deptford, London. Motors adapted to petroleum vapour or gas.

25,221. V. E. PRETOT, 21, Boulevard Poissonniere, Paris. Motor road vehicles.

1897.

659. L. RUB, 93, Schille Street, Augsburg, Germany. Igniting devices.

878. L. PHILIPPOT, 34, Rue du Parc, Ivry (Seine), France. Atomising device.

1,073. L. SHERRIN and F. SHERRIN, Gate House, Ingatestone, Essex. Hydraulic motor.

1,475. H. PORON, Troyes, Aube, France. Engines and gear.

1,694. A. WINTON, 37, Bolton Place, Cleveland, Ohio, U.S.A. Explosion engines.

1,695. A. WINTON, 37, Bolton Place, Cleveland, Ohio, U.S.A. Explosion engines.

1,707. F. PARKER, 2, Wyndham Street, Brighton. Motor-cars.

2,924. C. T. CROWDEN and W. L. P. WEBB, Vernon Lodge, Leamington. Variable speed gear.

4,785. H. W. METCALFE, 36, Balls Road, Claughton, Birkenhead. Friction clutches.

4,963. C. A. HAMILTON, 12, Artillery Street, Londonderry. Steam, gas, and air engines.

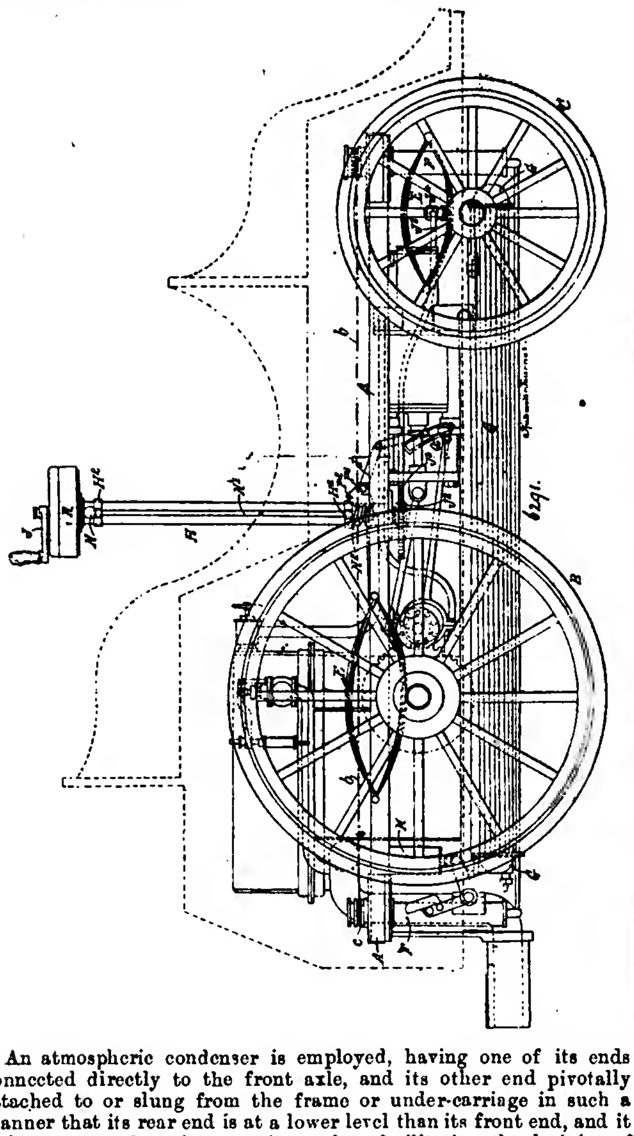
21,459. R. P. PICTET, 37, Rue Jean Goujon, Paris. Air and steam motors.

22,578. R. F. MOORE, 78, Bensham Manor Road, Thornton Heath, Surrey. Speed alarm.

28,493. C. DIETRICH, 245, Bauhofstrasse, Elsterwerda, Germany. Means for lubricating bearings.

6,291. Self-Propelled Vehicles. Edward Smith Higgins, 127, Brixton Hill, Brixton; Herbert Alfred Bessemer, 42, Therapia Road, Honor Oak; and William Bourchier Nicholson, Acacia Cottage, Acre Lane, Brixton, all in the County of Surrey. March 10th, 1897.

Relates to a motor-car or self propelled vehicle, in which the motor machinery is supported by a framework or under-carriage resting upon the axles independently of the body of the vehicle, which is supported through the medium of suitable springs upon the said framework or under-carriage, or upon the axles, and adapted to be raised to permit access to the said machinery for cleaning or repairs. The upper and lower parts of the springs can be readily disconnected or disengaged, and screw jacks, hydraulic jacks, or the like are used for raising the carriage-body relatively to the said machinery.

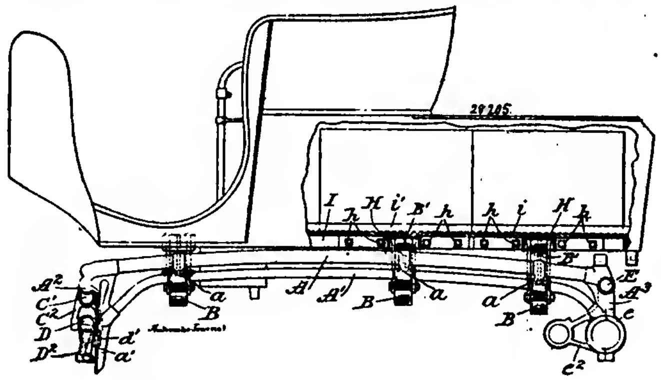


An atmospheric condenser is employed, having one of its ends connected directly to the front axle, and its other end pivotally attached to or slung from the frame or under-carriage in such a manner that its rear end is at a lower level than its front end, and it is free to turn about its rear pivots, thus facilitating the draining of the said condenser, and providing for an increased circulation of air around the condenser-tubes.

The mounting of the various steering, controlling, and other operating or indicating devices is within or upon an upright or standard supported upon the axles independently of the carriage-body. The propelling machinery is contained in a space enclosed by the said carriage-body and the condenser.

28,205. Running Gear and Frames of Motor Road-Vehicles, &c. Hiram Percy Maxim, 1, Columbia Street, Hartford, Connecticut. Date claimed, May 3rd, 1897. Date of application, November 30th, 1897.

The invention chiefly relates to the running gear. The side members of the running gear frame are composed of two rods or bars, A and A^1, one above the other, firmly united at or near their ends to the front and rear end members, and to each other, by suitable union pieces, A^2 and A^3. The two rods or bars may also be united at intervals between their ends by clips, *a a*, which also serve



as means of attachment for the springs, B B. These two rods or bars form a girder which gives the required strength without excessive weight. Both rods or bars, A and A^1, may be curved or arched upwardly, the lower rod or bar, A^1, having considerable curvature near its ends to bring it into substantial parallelism with the upper rod or bar, A, for the greater portion of its length. The end portions thus act as braces to most rigidly support the front crab-jaw and rear-driving shaft bearing respectively against horizontal strain. The front end member of the running gear is also composed preferably of two rods or bars, C^1, one above the other, firmly connected to the side members and to each other at or near their ends by means of the union pieces, A^2, referred to. The front member is preferably arched or curved downwardly, inasmuch as it is supported by the front axle at its middle, and therefore is better calculated to withstand the strain upon it, while the side members, which are supported at their ends and in turn support the weight of the body between their ends, are better calculated to stand the strain upon them by being arched or curved upwardly. The double construction of each side member and front end member imparts greater rigidity and strength to the frame. The front end member is provided at its middle portion with a bracket or fork, C^2, to which is pivoted, on a horizontal pivot, the front axle. The latter is preferably composed of a tubular rod or bar, D, which is curved or arched upwardly, and a tie-rod, D^1, the said rods, D and D^1, being united at their ends by suitable union pieces, D^2, which also form the forks for the support of the front wheels. The union pieces, A^2, are provided with crab-jaws or extensions, a^1, which stand in rear of the front axle and afford vertical bearing surfaces for the same. Each union piece, D^2, or each end of the front axle is provided with a clip, d^1, secured thereto, which is extended around and behind the edge of the adjacent crab-jaw to prevent the front axle from being torn away from its bearing against the crab-jaw when backing up, &c.

The rear member of the running gear frame may be a substantially straight bar, E, preferably tubular, which is rigidly secured to the union pieces, A^3, and is provided with depending brackets, *e e*, for the support of the rear shaft or axle, F, and the motor and intermediate mechanism.

The springs, B B, which may be of usual or suitable character, and are preferably disposed transversely, having their ends secured to the side members of the running gear frame, support the body of the vehicle.

The invention also relates to the construction and suspension of the motor, and the driving connections thence to the driving shaft of the vehicle, and to novel means for securing the driving wheels to the driving shaft.

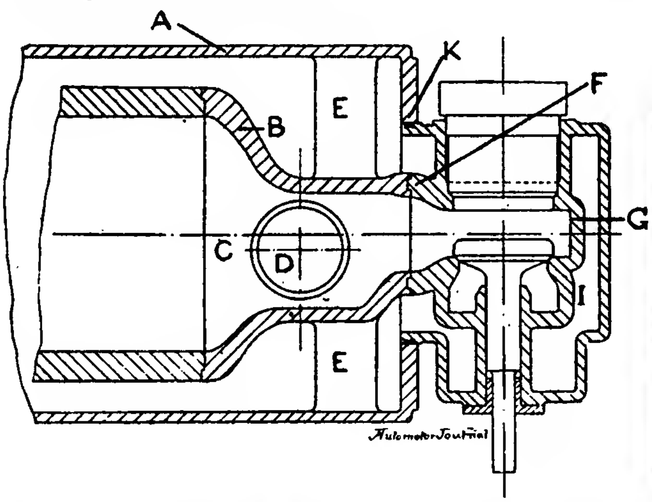
8,318. Oil-Engines. Charles William Pinkney, 77, Raglan Road, Smethwick, Stafford. March 31st, 1897.

The combustion chamber is provided with a surrounding water-jacket, which may be a continuation of a water-jacket surrounding the cylinder in which the piston works. The oil and air inlets are arranged so that the oil and air enter the combustion chamber before they enter the vaporiser, which may be in communication with the rear end of the combustion chamber, the igniting arrangement being in communication with the vaporiser.

When the piston makes its charging, or forward, stroke, the oil and air are drawn into the combustion chamber and cylinder, and, at or about the end of the charging stroke, all the valves are closed, and, at the back, or compression, stroke of the piston, the oil and air are forced into the combustion chamber and compressed therein, a portion entering the vaporiser, which is highly heated by a petroleum lamp, or any other suitable heating device. The portion thus entering the vaporiser becomes thoroughly gasified, whilst the portion in the combustion chamber, being cooler, is in a less gasified condition. When the piston has reached about the end of its compression stroke the portion of the charge of oil and air which is in the vaporiser is ignited, which ignition may be effected by any suitable means, such as an ignition tube, or an electric spark. The portion so ignited fires back into the portion of the charge in the combustion chamber and completes the gasification of the charge, and it explodes, or ignites, at a lesser rate than it would do if the charge in the combustion chamber had in the first instance been more highly heated and more perfectly gasified, and thus injurious shocks are prevented, whilst heavy oils may be employed without the use of the large vaporisers which would be necessary if the whole charge were thoroughly gasified at once.

3,370. Internal Combustion Motors. Francis William Crossley, of Crossley Brothers (Limited), Openshaw, Manchester. February 9th, 1897.

This invention relates more particularly to internal combustion motors of considerable size, and has mainly for its object the construction of the breech or closed end of the cylinder, so as to allow of greater freedom for unequal expansions, thus reducing strains which might otherwise be excessive.



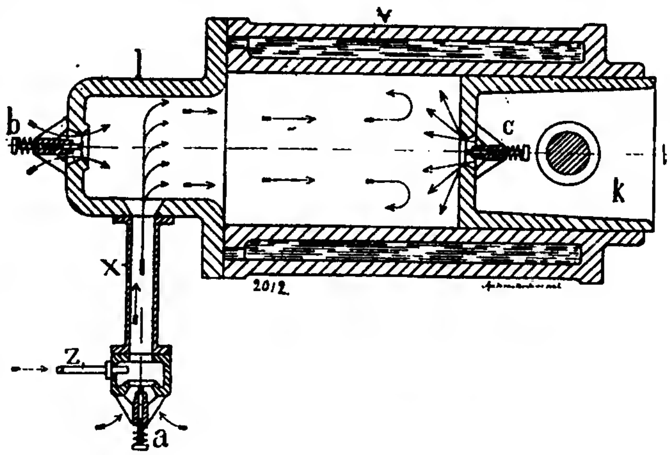
The figure shows a sectional elevation of the end of an "Otto" type gas-engine cylinder. The breech end of the cylinder mainly consists of an outer shell, A, and an inner shell, B, the space between these two shells forming a portion of the water jacket. The space, C, inside the inner shell is the major portion of the "compression" space. The inner shell, B, is attached to the outer shell, A, by a branch connection, D, through which the charges of air and gas enter, by means of any other desired connections, and by means of ribs, E, suitably disposed. These connections and ribs are placed as close to the cylinder end as may be convenient.

The outer end of the inner shell, B, is coned or otherwise reduced to a smaller facing, F, to which the exhaust valve casing, G, is bolted by means of bolts, which pass from the inner shell, B, close to the latter joint, F, to the outside of the exhaust valve casing, G.

The exhaust valve casing, G, is made with a water space, I, which is placed in free communication with the water space of the breech piece all round the joint, F, of the exhaust valve casing, G, the outer metal of the valve casing, G, terminating at the cylinder side in a circular path, K, which fits sidewise in a bored hole in the internal flange of the outer shell, A, of the breech piece, a water joint being made there by means of a ring of indiarubber in a recess in the circular path, K, or by any other well known means.

2,012. Production of the Explosive Mixture in Oil-Engines. Emil Capitaine, Frankfurt on the Main, Germany. January 25th, 1898.

In the drawing, *v* is the cylinder, *k* the piston, *l* the explosion chamber, *x* the vaporiser for the oil, which tube is heated outside by a flame and inside by the heat generated by the explosions; *a*, *b*, and *c* are the three air-admitting valves, *z* is the pipe which supplies the oil.



During the suction period the oil admitted or drawn through pipe, *z*, is driven into vaporiser, *x*, by the action of the air which enters through valve *a*. From the vaporiser, *x*, it passes into the explosion chamber, *l*, and thence into cylinder, *v*. The oil is vaporised in the vaporiser, *x*, and this oil vapour is forced into the combustion chamber by the air which enters at *a*. As at the same time air is admitted through valve *b*, the mixture of air and vapour issuing from vaporiser, *x*, will be driven with increased velocity into the cylinder space.

As the mixture of oil vapour which issues from the vaporiser mixes little or not at all with the air which is admitted through valve *b*, the said mixture is surrounded by the air passing or drawn in through the latter valve, whereby the oil vapour is prevented from coming into intimate contact with the walls of the explosion chamber and cylinder and thus condensing thereon.

Valve *c* in the piston allows air to flow through the still incomplete mixture of oil vapour and air, so as to render the mixture more perfect. It is thus possible to effect a more or less intimate mixture just before the end of the suction period or during the whole or a part of its duration. This valve can be actuated by known devices in such a manner that it is in operation during the full time of the suction period or more or less towards the end thereof. Furthermore, the air that is admitted through valve *c* may be allowed to flow into the cylinder in an annular-shaped spray or stream, or in a greater or less number of fine streams.

7,972. Instantaneous Steam Generators. Ells Dagnall, 30, Maude Grove, Fulham, S.W., and Alfred William Southey, 16, Elm Street, Gray's Inn Road, W.C. March 27th, 1897.

The generator consists of a set of straight steel tubes of circular section, each comprising an outer tube, *a*, and inner tube, *b*, of such diameter as to leave an intervening annular space, c. The tube, *b*, communicates at one end with the space, c, and the tubes are so connected in series that the water, or water and steam, shall circulate through them in succession, entering each through the inner tube, and returning through the annular space, and so on through the whole of the tubes connected in series. The connections are formed at the one end by a casting or header, d, into which the tubes are screwed, so that at this end there is no communication between them but a passage, e, through the casting or header, by which the annular space, c, of the one tube connects with the inner tube, b, of the next in the row, the superposed rows of tubes being also connected in series by the annular space of the last of the lowermost row being similarly connected to the inner tube of the first of the row above, and so on, the last of the upper row being connected to a steam drum, f. At the opposite end the inner tube is merely made shorter than the outer tube, and its end left open, the end of the outer tube being closed by a plug, g. The inner tube, b, is fitted with a sleeve, h, corrugated helically so as to fit between the two tubes, and acting as a baffle to cause the steam and water to follow a helical course through the annular space, and so cause a scouring action on the

FIG. 1. FIG. 4.

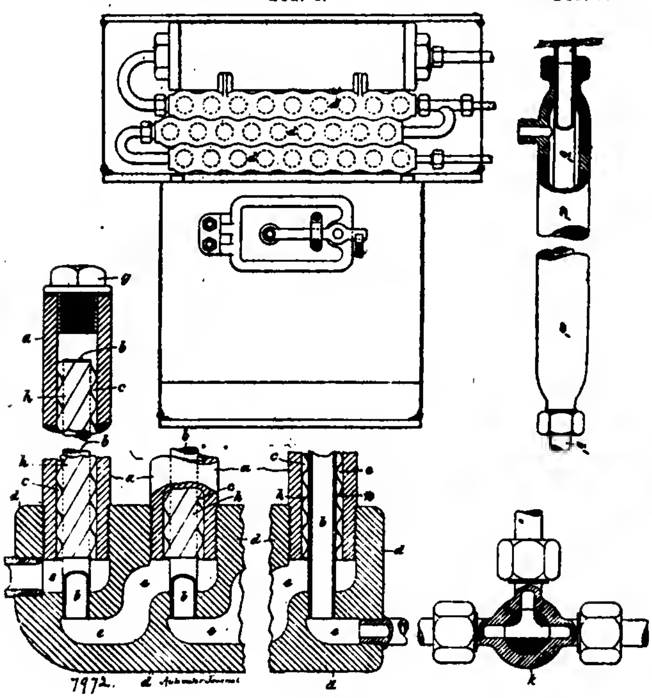


FIG. 3.

sides of the outer tube, whereby saline deposits in the outer tube will be prevented. Or the water and steam may be allowed to circulate through the inner tube only, as shown in Fig. 4, especially in the case of the tubes nearest the fire; the water hermetically held between the inner tube, b^1, and the outer tube, a^1, preventing the outer tube being burnt either by the action of a badly-regulated fire or during stoppages. The heat applied to the outer tubes will be rapidly transmitted through them to the water contained in the inner tubes through the agency of the water contained in the outer tubes.

The water is supplied by a feed-pump worked by the engine, and capable of being also worked by hand at starting, and is fed to the inner tube of the first of the lowermost row, and also to, say, the first tube of the uppermost or any intermediate row, the feed being under the control of a three-way cock, k, by which the proportional quantities of water entering at the two points, and consequently the proportional quantities of the two classes of steam, may be regulated, the water supplied at the second point escaping the action of the hottest portion of the generator, and consequently generating saturated steam, which mixes with the superheated steam coming from the lower rows of tubes, the result being a mixture of saturated and superheated steam, which may be used without injury to the engine. The regulation of the water feed may be automatically effected by means of a device controlled by a pyrometer.

PETROL STORES, REPAIRERS, AND STORAGE OF MOTOR-VEHICLES.

THE following list comprises the information already given in our last issue and in THE AUTOMOTOR POCKET-BOOK, with additional particulars in the compilation of which we have been greatly assisted by the Secretary of the Automobile Club of Great Britain.

It must be understood that we do not vouch for the complete accuracy of the information or the competency of the repairing firms mentioned, but it is hoped that our readers will assist in the composition of a complete and reliable list by sending us, from time to time, corrections in and additions to the matter following:—

References. — (*a*) Petrol. (*b*) Repairs. (*c*) Accommodation for storing motor-vehicles. (*i*) Ironmonger. (*o*) Oil merchant. (*) Authorised agents of Messrs. Carless, Capel, and Leonard.

ENGLAND.

ABBEY WOOD (Kent) (*a*)—J. Smart and Co.
ALRESFORD (*o*)—Crown Hotel.
ALTON (*a*, *i*, *)—Hetherington and Son.
(*c*)—Swan Hotel.
ANDOVER (*a*, *i*, *)—T. Lynn.
ASHFORD (Kent) (*a*, *)—J. Broad, 24, Park Street.
BASINGSTOKE (*a*, *i*, *)—Julian and Sons.
BATH (*a*)—J. Colmer (Ltd.), Union Street.
BEDFORD (*a*, *b*, *c*)—E. Pears Caporn, 48, Prebend Street.
BEESTON (Notts) (*a*)—J. H. Ball.
BIGGLESWADE (*a*)—Dan Albone, Ivel Works.
BIRCHINGTON-ON-SEA (*a*)—G. Cousins, cycle agent.
BIRMINGHAM (*a*)—Francis Williams, 281, Broad Street.
(*a*)—E. Shufflebotham and Co., Rotten Park Street, Ichnield Port.
(*a*)—Accles (Ltd.).
(*c*)—The Char-a-banc.
BLACKPOOL (*a*, *b*)—Blackpool Motor Car Co. (Ltd.) The Kiosk, Talbot Square.
BRADFORD (*a*, *b*)—Yorkshire Motor-Car Co. (Ltd.), Albert Buildings.
(*a*)—A. W. Goodall, 56, Gorton Road.
BRIDGEWATER (*a*)—H. Curver, cycle agent.
BRIGHTON (*a*, *b*, *c*)—Brighton Cycle and Motor Co. (Ltd.), 9, Marine Parade.
BRISTOL (*a*)—Colthurst and Harding.
BURSLEM (*a*)—G. T. Heath, 200, Moorland Road.
BURY ST. EDMUND'S (*a*)—S. C. Smith and Co., 21, Cornhill.
CAMBRIDGE (*a*)—Fredk. Swann, Quay Side, Bridge Street.
CANTERBURY (*a*, *i*, *)—Court Bros.
CHICHESTER (*a*, *i*, *)—A. Ballard, 7, East Street.
(*c*)—The Dolphin Hotel.
CHIEVELEY (Berks.) (*c*)—J. W. Pocock, The Mount.
COLCHESTER (*a*, *)—Kent, Blaxill, and Co., 104, High Street.
COVENTRY (*a*)—Beeston Motor Co. (Ltd.), Little Park Street.
(*a*)—Coventry Motor Co. (Ltd.), Fleet Street.
(*a*)—Endurance Motor Co., Gosford Street.
(*a*, *b*)—Daimler Motor Co. (Ltd.), Motor Mills.
(*a*)—Motor Manufacturing Co. (Ltd.), Motor Mills.
COWES, East (I.W.)—Liquid Fuel Engineering Co.
COWES, West (I.W.) (*a*)—White and Sons, Vectis Works.
CROYDON (*a*, *b*)—C. A. Miles, Onward Cycle Works, 423, Brighton Road.
(*a*)—Greengrass and Docking, 62, Dingwall Road.
DERBY (*a*)—G. WALLIS, Alaska Works, Monk Street.
DORKING (*a*, *)—C. J. Pierson and Co., 22, High Street.
(*a*)—Stone and Turner, 98, High Street (benzoline).
(*a*)—White Horse Hotel.
DOVER (*a*, *i*)—Matthew Pepper, High Street.
DUNCHURCH (*c*)—The Dun Cow Hotel.
DUNSTABLE (*a*, *i*, *)—W. H. Brown.
(*a*, *c*)—Saracen's Head Hotel.
(*a*)—The Sugar Loaf Hotel.
EASTBOURNE (*a*)—A. J. Feur, Pevensey Road.
EAST GRINSTEAD (*a*)—Bridgland Bros., London Road.
(*b*, *c*)—Rice Bros., 29, London Road.
EDGWARE (*a*)—Lee's Stores, High Street.
EPPING (*a*, *)—Wm. Cottis and Sons' Ironworks.
EPSOM—Greengrass and Co.
EXETER (*a*)—Knspman and Co, 206 and 207, High Street.
FAREHAM (*a*, *i*, *)—H. Clark.

FARNHAM (Surrey) (a, *)—M. and J. Tily, Castle Street.
(b)—G. Elliot, West Street.
(c)—The Station Hotel.
FENNY STRATFORD (c)—The Swan Hotel.
FOLKESTONE (a, *)—Wm. Francis, 66, High Street.
GAINSBOROUGH (a)—Heinle and Co., 50 and 168, Trinity Street.
GLOUCESTER (a)—S. J. Moreland and Sons.
GREAT YARMOUTH (a)—J. Leach, Market Place.
GUILDFORD (a, *)—R. Shillingford and Co., 135, High Street.
(b)—Dickenson and Burne, Churchacre Works, Leapale Lane.
(c)—White Lion Hotel; White Hart Hotel.
(a, b)—Lawes and Co., Bridge Street.
HANLEY (a)—W. Baker (Ltd.), New Street.
(a)—A. Chew and Co.
HERTFORD (a, *)—J. Coopor and Sons, 13, Maidenhead Street.
(b)—Hale's Cycle Depôt, London Road.
(b)—Wackett's Cycle Depôt, St. Andrew Street.
(c)—Dunsdale Arms; Salisbury Arms; Plough Inn.
HUNTINGDON (a, *)—R. W. Cater and Sons, 95, High Street.
KINGSTON-ON-THAMES (a)—Daimler Co., c/o A. Burgoine, boatbuilder.
(a)—Lewis and Co., London Road.
LANDPORT (a, *)—Wm. Smith, 316, Commercial Road.
(b)—J. E. Whittle, 41, Kingston Road.
LEAMINGTON (a, b)—A. Valentine, Croxton House.
(a, *)—Sleath's (Ltd.), Clement Street.
LEEDS (a)—J. Askham and Sons.
(a)—Lenchters, Mill Hill.
LEIGHTON BUZZARD (a, i)—S. Cooper.
LEWES (o, a, *)—J. Broad and Sons.
LINCOLN (a)—Clarke's Crank and Forge Co.
LITTLEHAMPTON (a, i)—Ockenden Bros., High Street.
LIVERPOOL (b, c)—Francis Mulliner, 61, Great Charlotte Street.
J. Hope and Co.
(a)—Simpson, Maclardy, & Co., 29, South Castle Street.
LONDON (a)—Carless, Capel, and Leonard, Hope Chemical Works, Hackney Wick.
(a, *)—King Motor-Car Co., 23, Oakhurst Grove, E. Dulwich.
(a)—H. E. Hughes, 28, Sherwood Street, Piccadilly, W.
(a)—S. Bowley & Son, Wellington Works, Battersea Bridge.
(a)—Motor-Car Company, 93, Long Acre.
(a)—Southern Motor-Car Co., 59, Brixton Road, S.W.
(b)—Daimler Motor Co. (Ltd.), Shaftesbury Avenue.
(b, c)—Mulliner and Co., 28, Brook Street, Bond Street, W.
(b)—Motor Development Corporation (Ltd.), St. George's Square, Regent's Park,
(c)—F. H. Collins, 263, Duke Street, St. James', S.W.
(c)—Wm. Ashton, 235, Pavilion Road, Sloane Square.
(c)—Smith and Co., Mason's Yard, Duke Street, St. James'.
(c)—J. Rorke, Holland Park Road, Kensington.
LYNDHURST (a, *)—J. Haynes, New Forest Cycle Depôt.
(c)—Crown Hotel.
MAIDENHEAD (a, *)—Thompson and Walton, chemists.
MAIDSTONE (a, *)—E. Allcorn, 30, Stone Street.
MALVERN (a)—Coventry Cycle Motor Co.
MANCHESTER (a)—M. Wells and Co., Hardman Street Oil Works.
(a)—Geddes Bros., 79, Piccadilly.
(a)—J. Heywood and Co., Turner Street, Cornbrook.
(c)—The Denmark Hotel, Chorlton.
MARKET HARBOROUGH (a, i)—S. Kitchon.
NEWCASTLE-ON-TYNE (a)—Rowland Barnett & Co , 41, Dean Street.
NORTHAMPTON (a, i, *)—Johnson and Wright, Gold Street.
(a, b, c, *)—A. F. Mulliner, 79, Bridge Street.
NORWICH (c)—Maid's Head.
OXFORD (a, b, i, *)—Ralph Foort, 19, Queen's Street.
(a)—Oxford Cycle Co., 68, St. Giles'.
PETERBOROUGH (a, *)—Sturton and Sons, chemists.
PETERSFIELD (a, *)—B. Jones, The Square.
(a)—Coulthard and Co., Cooper Road.
PLYMOUTH (a)—Spooner and Co., Bedford Street.
PRESTON (c)—Walmsley and Co., Guildhall Street.
READING (a, *)—J. H. Fuller, 22, Minister Street.
REDBOURNE (a)—Saracen's Head.
REDDITCH (a)—Enfield Cycle Co.
REDHILL (a, i)—Marriage and Co.
REEPHAM (a)—W. Wright, plumber (benzine).
(a)—Franklin, tinman (benzine).
(a, i)—Gibbs and Son (petroleum).
(c)—Page's Inn; Black Lion Hotel.
REIGATE (a, i)—Marriage and Co.
RICHMOND HILL (a)—Beard's Cycle Stores.
RINGWOOD (c)—White Hart Hotel.
RYDE (I.W.) (a, *)—G. Turner, 134, High Street.
SAFFRON WALDEN (a, *)—Robson and Sons, Freshwell Street.
SALFORD (a)—Kitchen Cycle Accessories Co.
SCARBOROUGH (a)—Walker and Hutton.
SEVENOAKS (a)—G. Humphrey, 166, High Street.
(c)—The Station Hotel.
SHOREHAM (c)—The Railway Hotel.
SITTINGBOURNE (a, i, *)—A. Panteney.
SOUTHAMPTON (a)—Summers and Payne, Belvedere.
(a)—Hendy aud Co., East Street.
(a)—Fay and Co., 80, High Street.
(a, o)—Dibdon (benzoline).
(c)—Royal Hotel, High Street.
SOUTHPORT (a, c)—Motor Touring Co. (after 1st June, 1898).
SOUTHSEA (a, b, c, *)—S. Rose and Co., Castle Road.
(b)—Penning, King's Road.
ST. ALBANS (a, *)—R. Norman, Victoria Road.
ST. IVES (a, *)—Turner and Sons, chemists, Market Hill.
ST. MARGARET'S-ON-THAMES (c)—St. Margaret's Hotel.
STANMORE (Middlesex) (c)—Crown Inn.
TEDDINGTON (c)—The Horse and Groom Hotel.
TONBRIDGE (a, o, *)—Wightwick and Sons.
TORQUAY (a)—Wm. Radcliff, St. Heliers.
TOWCESTER (a, *)—Victor Ashby, Park Road.
TUNBRIDGE WELLS (a)—J. Willmot, 16, High Street.
(c)—Royal Kentish Hotel; Castle Hotel.
TWICKENHAM (c)—The King's Head Hotel.
UCKFIELD (a)—W. Flint.
UXBRIDGE (c)—J. Caswell, Chequer's Yard.
WAKEFIELD (a, b)—Whitehead's Autocycle Co. (Ltd.), Cross Square.
WARRINGTON (a)—Caldwell's (Ltd.)
WATFORD (a)—W. Featherley, 43, High Street.
WESTON-SUPER-MARE (a)—W. Appleton, cycle agent.
(a)—Day and Co.
WEYMOUTH (a)—Whitehead Torpedo Works.
WIGTON (a)—T. J. Hayton, 87, High Street.
WINCHESTER (a)—H. W. Frampton, 1, Jewry Street.
(b)—Dean and Smith, Upper Brook Street.
(c)—Gaudy and Sons, coachbuilders, Parchment Street; Royal Hotel; George Hotel.
WINDSOR (a, *)—W. H. Brooks and Sons, 28, Peascod Street.
WOKING (c)—Station Hotel.
WOODBRIDGE (a)—R. H. Rowland, The Thoroughfare.
WORTHING (a)—Thos. Page, 3, South Street.

WALES.

LLANDUDNO (a, c)—Motor Touring Co. (after June 1st, 1898), Bodafon Hall and Back Jubilee Street.
NEWPORT (Mon.) (a)—C. D. Phillips, Emlyn Works.
PONTYPRIDD (a)—Morris Bros., cycle works.
RHYL—Motor Touring Co. (after June 1st, 1898), c/o Connah and Co., cycle manufacturers.

SCOTLAND.

BRIDGE OF ALLAN (c)—Royal Hotel.
GREENOCK (a)—Greenock Foundry Co.
(a)—Macalester and Type.
(a)—Thos. Orr, East Blackhall Street.
(a)—J. and H. M. Paterson, 32, Eldon Street.
(a)—Paul Jones and Sons, East Bay, Greenock Road.
HAMILTON (a)—J. and C. Stirling.
(b)—Stirling's Motor Carriages (Ltd.).
KELSO (a, b)—Hogarth and Sons, Shodden Park Works.
(c)—Hall's Livery Stables.
SANDBACH (a)—Alex. Robertson.
STIRLING (a, i)—Graham and Morton.
(a, i)—Virtue and Fergusson.
(b)—G. Thomson, coachbuilder.
(c)—Golden Lion Hotel; Station Hotel.

IRELAND.

BELFAST (a)—J. and J. Haslett, North Street.
WEXFORD (a)—Wm. Armstrong.
(b)—Philip Pierce and Co., Mill Road Ironworks.
(b)—Wm. Doyle, Selskar Ironworks.

THE AUTOMOTOR

AND

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CONTENTS.

THE LIVERPOOL TRIALS OF HEAVY MOTOR-VEHICLES.

THESE trials, which have been looked forward to with such anticipation by traders, engineers, and others interested in locomotion in all parts of the country, were duly commenced in Liverpool on May 24th and were terminated on the morning of May 28th. The preparations for their conduct had been made on a most elaborate and extensive scale, and all the arrangements were carried through without a hitch. The trials were, in fact, from almost every point of view a distinct success, and they mark a new era in automobilism because they have demonstrated the practicability of moving weights up to 5 tons at good commercial speeds on vehicles which weigh less than 3 tons. Although many, including ourselves, never had any doubt about the feasibility of doing this, yet generally speaking, and especially as regards Liverpool, the impression largely prevailed, even among shipowners and engineers, that it could not be done.

As every one interested is aware, these trials were inaugurated by the Self-Propelled Traffic Association, and were carried out under the auspices of the Liverpool branch, because it is in Liverpool and the surrounding district that the problem of the cheap transport of heavy goods is of such vital importance. The special object of the trials was to arrive at a type of vehicle which could not only replace horse-drawn vehicles but also compete with the railways as regards cost of transport, &c. In pursuance of this object the following conditions were laid down by the Association :—

I.—The vehicles shall be self-propelled. The part carrying the generator, or motor, or both, may be articulated and detachable, but the propulsion shall be effected by utilising the load for adhesion.

II.—The vehicle shall be propelled by mechanical power alone, but (with the reservation that the judges may disqualify and prohibit from competition any vehicle or motor which, in their opinion, is faultily constructed or dangerous from any cause whatever) there shall be no restriction on the source of such power or the nature of the agents used.

III.—The vehicle shall be capable of going anywhere that a horse-drawn vehicle carrying the same load can go, and of being placed in the same positions, and withdrawn therefrom, without external assistance.

IV.—The vehicle shall be capable of working into and out of an embayment of one and a half times its own length.

V.—The vehicle shall conform in all respects to the requirements of the Locomotives on Highways Act, 1896, and, in the case of its being oil-propelled, of the "Regulations as to Petroleum" issued by the Home Secretary under Section 5 of this Act.

VI.—All working parts shall be properly encased.

VII.—The tare of the vehicle shall be recorded both inclusive and exclusive of any water, fuel, or accumulators used for the purpose of propulsion.

Competing vehicles were to be classified as follows :—

Class I.—Vehicles capable of carrying a minimum load of 2 tons of goods. Vehicles entered in this class may be open or covered.

Class II.—Vehicles capable of carrying a minimum load of 5 tons of goods. Vehicles entered in this class shall have level platforms only without any covers.

To these classes the following regulations applied :—

I.—The average speed during the trial runs, inclusive of stoppages, shall reach : (*a*) in Class I, six miles per hour; (*b*) in Class II, four miles per hour.

II.—The vehicle shall have a level platform area of not less than : (*a*) in Class I, 60 square feet; (*b*) in Class II, 110 square feet.

III.—In Class II the height of the floor line from the ground shall be not less than 3 feet 9 inches, and shall not exceed 4 feet 3 inches.

Objection was taken to this classification as the limit of 2 tons as a minimum would effectually prevent the makers of oil-propelled vehicles from competing, while the higher minimum weight of 5 tons in Class II, coupled with the minimum speed of four miles per hour, was felt as being too onerous. In order to meet this latter objection the Association decided to have a third class to which the only regulation applying was "that the vehicle should carry a minimum load of 2 tons."

In arriving at a judgment of the merits of any vehicle to fulfil these conditions the judges were to more particularly regard the following points:—

(*a*) *Cost.*—Economy of working, including attendants.

(*b*) *Control.*—Stopping, starting, changing speed, steering, and reversing, particularly under adverse conditions, such as on inclines, or in confined spaces.

(*c*) *Working.*—Noise, smell, visible vapour, dust, or other nuisance when travelling. Number of mechanical operations requiring attention from the driver. Efficiency of brakes. Time occupied in preparing the vehicle for service on the road. Ability to start from rest on an incline of 1 in 16. Speed—within legal limits. Distance run without taking or receiving supplies of fuel, oil, gas, electrical or chemical materials, or electrical current, water, or of any agent employed for actuating the motor or assisting its working. Ability to complete the course without stopping to effect repairs, adjust parts, apply lubricants, or for any other purpose or cause not provided for in the itinerary. Freedom from a breakdown of any nature.

(*d*) *Construction.*—Strength of frame and working parts. Quality of workmanship. Efficiency of springs. Freedom from complicated or over-refined parts. Facility with which repairs can be effected. Capacity of bunkers, oil and water tanks. Ratio of available to total platform area—preference will be given, as regards vehicles entered in Class II, to a system that gives the entire platform, from end to end, free for goods. Ratio of tare to power of motor. Ratio of tare to weight of freight carried during the trials.

For steam-propelled vehicles attention was to be given to:—Action of feed-pumps or injector; ample supply of steam; consumption of fuel and water per mile; leakage of steam or water; and arrangements for stoking.

Regulations were also made for oil-propelled vehicles, but inasmuch as none of these were entered it is unnecessary to specify them. Intending competitors engaged to abide by the following rules:—

I.—The vehicle shall carry at least the minimum weight of goods, or any weight in excess declared by the competitor, throughout the continuance of the trials. Suitable ballast will be provided by the Association.

II.—Each competitor shall himself make all arrangements for the necessary staff and appliances to work his vehicle or vehicles. Accommodation for the vehicles, in Liverpool, will be provided by the Association. Vehicles intended for trial shall be registered as "arrived," at this depôt, not later than 3 p.m. on Monday, May 23rd, 1898.

III.—An official observer will accompany each vehicle during the trial runs, to take notes of behaviour, fuel, and water consumption, &c., and no repairs will be permitted without his knowledge and consent.

IV.—Any vehicle withdrawn from competition during the trials, except under the written authority of the judges, shall not be eligible for a prize, or for commendation.

V.—Six photographs of each vehicle, together with one perfect negative, shall be furnished by the competitor, not later than May 16th, 1893. These must be delivered in good order at the Liverpool Royal Institution, addressed to the Hon. Sec., Self-Propelled Traffic Association.

VI.—Full drawings of any vehicle shall be submitted to the judges in confidence, if required by them, prior to the final adjudication.

VII.—Entries shall be made on printed forms (to be obtained from the hon. sec.) at any time prior to 12 noon on the last day of March, 1898, and shall be accompanied by an entrance fee as under:—

	£	s.	d.
For one vehicle	£5	5	0
For each additional vehicle by the same competitor	1	1	0

Entries shall be addressed, under cover of a registered letter, to the Hon. Sec., Self-Propelled Traffic Association, The Royal Institution, Colquitt Street, Liverpool.

VIII.—A complete list of particulars shall be lodged with the hon. sec. not later than May 16th, 1898. The description must be type-written, or printed, and six copies must be furnished. The tare weight of the vehicle, both exclusive of any water or fuel, and in complete running order, must be given, also, as briefly as possible, any peculiarities of construction or of working to which the competitor desires to draw the attention of the judges.

IX.—Each competitor shall arrange to have his vehicle or vehicles ready for inspection by the judges at 9 a.m. on the morning of Tuesday, May 24th, 1898, in the depôt that shall be used as headquarters during the trials.

X.—All vehicles shall be stored over-night at the depôt or depôts provided by the Association.

XI.—Lots will be drawn to determine the order of starting. It is intended to begin the runs shortly after 9 a.m. on each of the four days, the vehicles following one another at intervals of about ten minutes.

XII.—At the conclusion of the trials, any vehicle, or motor, or part thereof, shall be opened up, in confidence, for inspection by the judges, if required.

The judges reserve to themselves the right of absolutely disqualifying any competitor for any infraction of these rules.

While obeying in all respects the instructions of the judges, and the conditions of the competition generally, it is to be fully understood and agreed by every competitor that no responsibility, legal or otherwise, is to attach either to the judges or to the Self-Propelled Traffic Association, in respect of anything, or for any damage or injury caused to any person or thing, but that all responsibility of every sort and kind, whether pecuniary or otherwise, is to attach to the competitor, and is to be borne by him.

The following were the instructions issued to the official observers:—

Duties of Official Observers in Charge of Vehicles during the Runs.

(*a*) To be in attendance at the Prince's Dock depôt on the four mornings, May 24th to 27th inclusive, at or before the times named below.

(*b*) To "take charge" of the vehicles in the following rotation:—

	a.m.	a.m.			Declared working pressure.
May 24th.	Attend ;	Start ;	No.	on Route A.	lbs.
25th.	,, ;	,, ;	,,	on ,, A.	,,
26th.	,, ;	,, ;	,,	on ,, B.	,,
27th.	,, ;	,, ;	,,	on ,, B.	,,

To "take charge" means to receive custody from the official observers in charge of the depôt before the heating of the boiler is allowed to be started.

(*c*) To observe and to record the time occupied in raising steam from "all cold" to the declared working pressure. To note the consumption of fuel for this purpose. Small weighing machines are provided.

(*d*) Where the boiler is fired with coke or coal, to allow no stoking to be done from the weighed supply on the vehicle until after the start.

(*e*) Fifteen minutes before the official starting time, to have the vehicle loaded with its full complement of fuel, water, and passengers. To record the number of bags of ballast, which must be examined before each run. Each person carried must show the ticket giving his exact weight. A weighing machine with attendant is provided. Passengers must be informed that they will be required to complete the entire journey.

(*f*) Five minutes before the official starting time, to have the vehicle brought to the starting point. At the moment of starting, *i.e.*, when at the starting point and waiting for the starting signal, steam must be raised, and all firing up to departure done, by the use of another lot of fuel.

(1) To see that the attendants completely fill the tanks (oil and water).
(2) To measure the position of the water level in the boiler.
(3) Where the boiler is fired with coke or coal, to note and to call the attention of the judges to the state of the fire.
(4) To have the two measuring cans on board.

(*g*) At the word of the judges to "start," to note the time and the boiler pressure.

(*h*) To keep the "log" of the run and to observe the general behaviour of the vehicle upon the road. The items included under "General Behaviour" are enumerated on the second page of the log-sheet. Particular attention is to be given to the stopping and starting on the hills, *i.e.*, to note how promptly the vehicle is brought to rest after the word "stop" (to be given opposite the placard), and whether it is necessary to back before starting again. Each "stop" is to be for 15 seconds, at the expiration of which the word "start" shall be given. The control of the feed-water is also an important point; when ascending hills, observe fluctuations of water in the gauge-glass as an indication of possible priming. Note whether the frame shows signs of stress, also degree of lurching and vibration.

(*i*) Intermediate depôts, to regulate the stoppages, where possible, to occupy 15 minutes precisely. Every vehicle must stop for not less than 15 minutes, whether supplies are required or not. To check the supplies of water and fuel. All water and oil must be measured in the stamped cans. To despatch telegrams to headquarters on the forms supplied.

(*k*) To record the arrival at the Prince's Dock depôt so soon as at the entrance gate. To note the boiler pressure at this moment and the level of the water in the boiler. Where the boiler is fired with coke or coal, to note and to call the attention of the judges to the state of the fire.

(*l*) To check the weighing of the coke or coal unused. To check the measuring of the water and oil required to fill the tanks.

(*m*) To transfer the vehicle to the custody of the official observers in charge of the depôt, who will sign the "log" in the spaces provided.

(*n*) To hand the completed "log" to the honorary organising secretary (Mr. E. Shrapnell Smith), or to his acting representative in the office at the Prince's Dock depôt.

By order of the judges,
E. Shrapnell Smith, *Hon. Sec.*

In addition to these travelling observers, another set of official observers were placed in the charge of the depôt at the docks, whose duties are set forth below :—

Duties of the Official Observers in Charge of the Depôt.

To enforce the following regulations :—

(*a*) All repairs shall be made in the presence of, or with the full cognisance of, the official observers in charge.

(*b*) No vehicle shall be repaired or otherwise handled by any person, except between the hours of 8 a.m. and the time of departure, or during a period of two hours after returning, unless by the written permission of the judges.

To perform the following duties :—

(*a*) To attend the depôt at 8 a.m.

(*b*) To record the nature and extent of any repairs effected in the depôt.

(*c*) To deliver vehicles into the custody of the official observers appointed for the runs.

(*d*) In the absence of both the official observers appointed to any vehicle, to record—

(1) The time at which the heating of the boiler is started and the time at which the declared working pressure is obtained.
(2) The consumption of fuel for this purpose.

Meantime to secure substitutes.

(*e*) To "post" the telegrams received from the various depôts *en route*.

(*f*) To accept the custody of each vehicle, when the official observers in charge have completed the fuel and water measurements.

(*g*) To record the time of delivery by the road observers, and the time at which the attendants finally leave the vehicle.

A form having the necessary spaces is attached.

By order of the judges,
E. Shrapnell Smith, *Hon. Sec.*

The observers attached to the various vehicles had to fill up a log sheet, a specimen copy of which we append :—

Log Sheet.

May...............1898.
Vehicle No................
Route A.
Official Observers ....
Arrived at Depôt ....a.m.
Vehicle "taken charge" of ....a.m.
Vehicle "transferred" to O.O. at P.D. Depôt .... p.m.
Began to heat boiler ....a.m.
Pressure ....(lbs.) .... a.m.
Consumed for this purpose ....
Oil in tank and connections ....gals.
Water in tank and connections ....gals.
Coke on board ....cwt.
Coal on board ....cwt.

At Start—
Total persons on the vehicle.................... = ...lbs.
Tanks full ....
Position of water-level in boiler ....
Condition of Fire ....

At Finish—
Position of water-level in boiler ....
re ....
to fill tank ....gals.
fill tank ....gals.
coal unused ....cwt.

Passengers carried —
....
....
....
....
....
....

General behaviour. (Section (*h*) of Instructions.)
Stopping, starting, changing speed, steering.
Noise, smell, visible vapour, dust, or other nuisance.
Efficiency of springs.
Action of feed pump or injector.
Control of feed water.
Leakage of steam, water, or oil.

Special observations—

.... } Official Observers.
....

Custody accepted at Prince's Dock Depôt ....p.m.

.... } Official Observers in charge of Depôt.
....

Originally 10 vehicles were entered for the competition: four in Class I, one in Class II, and five in Class III. Ultimately these numbers were reduced, and at the trials the competing vehicles were :—

Class I.—*Minimum load,* 2 *tons; minimum average speed,* 6 *miles per hour; minimum platform area,* 60 *square feet.*

No. 1. "Lifu" lorry; Liquid Fuel Engineering Company, 20, Abchurch Lane, London.

No. 4. Lorry; the Steam Carriage and Wagon Company, of Chiswick, London.

Class II.—*Minimum load,* 5 *tons; minimum average speed,* 4 *miles per hour; minimum platform area,* 110 *square feet; platform to be not more than* 4 *feet* 3 *inches, nor less than* 3 *feet* 9 *inches, high.*

No. 3. A six-wheeled articulated lorry; the Steam Carriage and Wagon Company, of Chiswick, London.

Another lorry, No. 5, carrying over 5 tons, and also propelled by steam, was entered by the Lancashire Steam Motor Company, of Leyland, and was known officially as No. 5, but as it carried more than 2 tons it could not enter Class I, and as it carried less than 5 tons it could not enter Class II. This vehicle carried 4 tons.

It will thus be seen that the programme was sufficiently rigid, the classification adopted restricting the competition entirely to vehicles carrying heavy loads, and therefore necessarily propelled by steam. Whether it would have been advantageous to have extended the classification so as to embrace light goods' vans is a matter upon which opinions may differ. Considering the elaborate and extensive preparations made and the few entries in the heavy classes, it would have been well to have made the trials more comprehensive and more catholic in their scope. On the other hand, this was not the object for which they were being conducted, and inasmuch as the funds came mainly from those interested in heavy traffic, it was only natural that the latter subject should monopolise the attention. It will be observed that Continental manufacturers are conspicuous by their absence. This is due to the fact that the types of vehicles intended for heavy traffic in France, as exemplified by the Scotte No. 2 and the De Dion et Bouton No. 14*, weigh each considerably over 4 tons, which, being in excess of the weight allowed by the British law, renders any competition on their part futile. Indeed, these Liverpool trials could possess but little interest for French manufacturers; whereas, had the classification included light goods' vehicles, it would have been worth the while of our French friends to have entered the competition, as many of the French light vehicles possess several points which deserve to be known to British buyers.

The prizes offered were £100, £75, and £50. Considering the preparation necessary and the time occupied in the trials, it cannot be said that these prizes are of a very valuable nature, or that they would recoup their winners, or that they are altogether worthy of a city such as Liverpool, which has so much to gain from automobilism. The municipality which spends the ratepayers' money on organs and novels cannot seemingly find it consistent with municipal virtue to encourage automobilism, and so Liverpool is yet without an automotor dust-cart.

The judges appointed to conduct the trials were Sir David Salomons, Bart, P.S.P.T.A., Professor Boverton Redwood, F.I.C., &c., Professor Hele-Shaw, M.I.C.E., &c., E. R. Calthrop, Esq., M.I.C.E., S. B. Cottrell, Esq., M.I.C.E., and H. West, Esq., M.I.N.A. These gentlemen were assisted by a large staff of assistants, who were stationed at the depôt, and who recorded the weights of the vehicles, the quantity of fuel, water, and ballast put on board, and, in general, examined, measured, and noted the physical condition of each vehicle with a minuteness which comes of that teaching which says Science is Measurement. Every passenger who was carried was also duly weighed, and to each vehicle was appointed two official observers. These were young students from the Engineering Classes at the Victoria University, at which Professor Hele-Shaw occupies the Chair of Engineering.

The following is a complete list of the official observers:—J. Reginald Taylor, H. N. Giles, J. H. Lowery, Norman C. Lange, A. R. Ellison, E. A. Rosenheim, William Bayliss, L. H. Huddart, W. G. Hay, J. C. W. Humfrey, Francis E. Baron, A. M. Lodge, Henry Fowler, H. Owens, J. Walwyn White, Charles Stewart, C. A. Charlewood, and R. Edgar Boulton. In addition to these the following gentlemen were observers held in reserve in case of accident:—Robert Nelson, J. Bibby, Captain R. S. Walker, and W. S. Bushell.

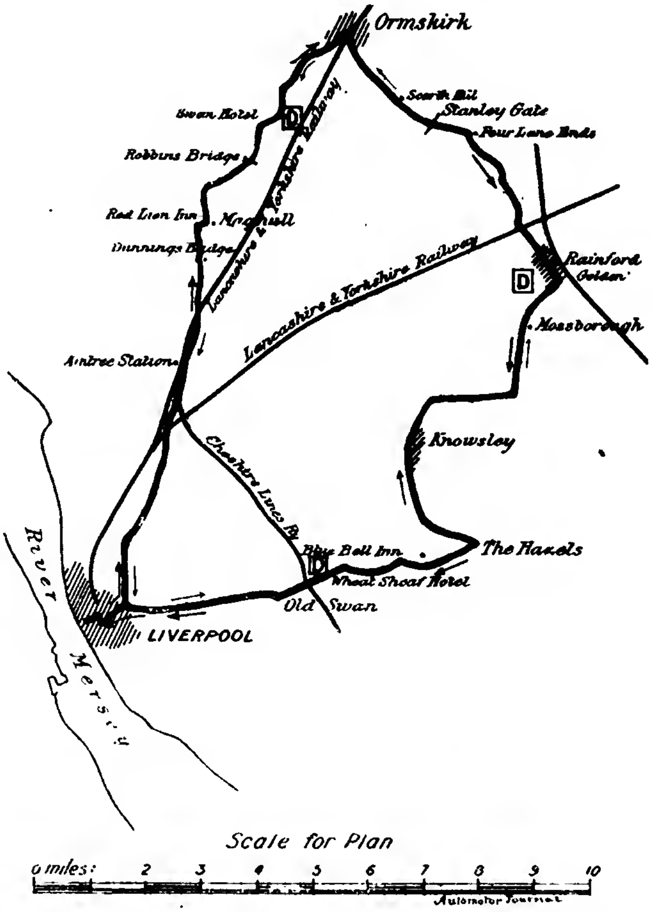
For the convenience of the judges, guests, and the Press there were several motor-vehicles provided, kindly lent for the occasion by the Daimler Company, who was represented by Mr. Critchley, the Blackpool Motor Company, &c. Messrs. Phillipson and Toward, of Newcastle, sent their steam wagonette, and the Llandudno Touring Company sent a Benz Motor wagonette. Mr. Sturmey, of the *Autocar*, was present with his well appointed Daimler, and had no lack of passengers. Particular attention must be given to the judges' wagonette; this was a magnificent Daimler, and it ran most admirably throughout the trials. It formed indeed an object lesson to the Liverpool people, especially to those who indulge in carriages. The advantages of dispensing with expensive and gorgeous coachmen and magnificent horses were plain enough, and we heard more than one wealthy magnate declare that after seeing this well-appointed Daimler he should give up his expensive stables.

Tuesday, May 26th, was a glorious day, with a fine westerly breeze blowing. At the Prince's Dock—the chief depôt—was assembled a crowd of shipowners, engineers, merchants, master carmen, journalists, and of others interested in the trials. One recalled mentally a somewhat similar scene that occurred some 60 years ago, when the first railway out of Liverpool was opened. Then, as now, a small band of men were waging the eternal and never-ending war of enlightenment against ignorance; then, as now, "ignorance," to quote Schoppenhauer, "sits in high places," "and folly" (still as in so many vital matters) "has the casting vote." Then the new movement of automobilism was bitterly opposed by the "Classes," now the new automobilism is obstructed by the representatives of the "Masses," who, through their County and Parish Councils, exhibit a deplorable ignorance and dislike of much that directly tends to their own moral and material welfare.

How hard is the path of those who have the misfortune to be, in vulgar parlance, "born before their time," is as well exemplified

PLAN OF ROUTE A.

May 24.—*Viâ* Ormskirk and Rainford.
" 25.—*Viâ* Knotty Ash and Rainford.



by the history of automobilism as by the history of civilisation; when we recall how Gurney, Dance, Hancock, and others were derided, thwarted, and finally ruined, because they were soldiers in this war of enlightenment against ignorance. Such thoughts must have passed through the minds of many as they contemplated the four vehicles that represent the progress and enterprise that have been made since the time of the early pioneers. Truly we make haste slowly, and our modern Gurneys and Hancocks have yet to do much—not so much, perhaps, in perfecting their machines, but in the more difficult task of converting the public, and persuading the humble shopkeeper, through his County Council, that with improved roads *his* tea, *his* oil, *his* sugar, can be sold in greater quantities—the people can buy more—*because the cost of the carriage of these commodities is cheaper to his shop.*

Whatever may be the future work of the S.P.T.A., one thing, at least, they might do, and that is organise a staff of lecturers to go through the country expounding the gospel of cheap internal transport and what it means to the working man.

* *See* Les Poids Lourds trials—THE AUTOMOTOR, January and February, 1898.

After all preparations had been made, and the vehicles finally inspected by the judges, a start was made at 9.47 a.m. by No. 3; No. 5 following at 10.6 a.m., No. 4 at 10.17 a.m., and No. 1 at 10.29 a.m.

The routes selected were well calculated to test the capabilities of the various vehicles, partly because the Lancashire roads are worse kept than other county roads, and also because they abound in gradients, some of which are very steep and difficult to negotiate. As will be seen from the accompanying maps, two routes were selected.

Route A was from the Prince's Dock *viâ* Dale Street to Walton, thence following the Ormskirk Road to the village of that name, thence to Rainford, Knowsley, The Hazels, Old Swan, Kensington, London Road, to Lime Street, Dale Street, and Prince's Dock. On this section of the road the steepest gradient is also 1 in 21. The remainder of the road consists of ordinary macadam, which might be in a much better state of repair, the steepest gradient on it being 1 in 32. In addition, the road contains several very abrupt turnings which called for considerable skill in manœuvring. As will be seen, too, the judges had carefully selected the worst possible spots for stopping and restarting. On this route there were three depôts for fuel, water, &c. On May 24th the vehicles traversed this route *viâ* Aintree, Ormskirk, and Rainford, and on the 25th this direction was reversed.

Route B was from Prince's Dock *viâ* Dale Street to Old Swan, Knotty Ash, to Prescot and The Hazels, and so far was the southern and return part of Route A. From Prescot the route was through

PLAN OF ROUTE B.

May 26.—*Viâ* Prescot and Rainhill.
„ 27.—*Viâ* Widnes and Sankey.

Scale for Plan.

REFERENCES TO PLANS AND SECTIONS.

Gradients are expressed thus ✯ - 1 in 24
Paved surfaces are shewn thus
Macadam „ „ „ „
Mixed „ „ „ „
Depots „ „ „ D
Stops „ „ „ S

Rainhill to Great Sankey to Widnes, thence to Hale and Speke to Aighurth, thence *viâ* Park Road, Parliament Street, Castle Street, Water Street, back to Prince's Dock. On this route, which is 35·9 miles in length, there were but about $6\frac{3}{4}$ miles of good paved road, but on many parts of this the gradients were very severe and numerous, there being one of 1 in 21 or about 3°; the remainder of the road was macadam, which in parts, as to the west of Widnes, was in a very bad state of repair. It was little better than what is known in the States as a "dirt" road, and the resistance was certainly not less than 100 lbs. per ton.

route, which is 35·62 miles long, there are about $10\frac{1}{2}$ miles of excellent paved roadway, which, however, contains some gradients varying from 1 in 21, or nearly $2\frac{3}{4}$°. There are then about five miles of mixed paving of an inferior description, often consisting of cobbles and loose stone, not in a very good state as regards surface. On this

Taking the vehicles in their enumerated order, the "Lifu" is a steam propelled lorry, 16 feet 2 inches long, 6 feet 6 inches broad, and 3 feet high. It has 64 square feet of available cargo area. The platform is fitted with a tailboard 5 inches high, and there are also side strakes 3 inches high.

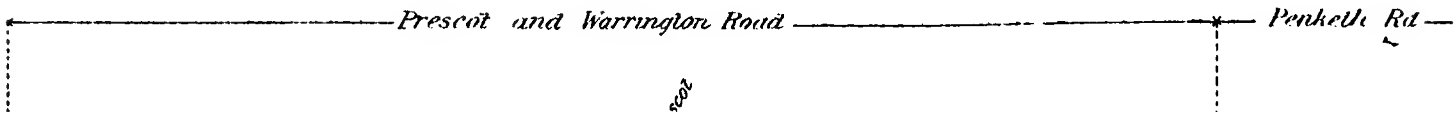
The framing of the "Lifu," as, indeed, of all the competing vehicles, is on the system so persistently advocated in THE AUTOMOTOR, that

SECTION 0

OUTE A.

SECTION O

ROUTE B.



2 c 4

is, it is made of high grade channel steel, thus combining lightness with strength. These longitudinal channels are united by transverse frames and the whole rendered secure against racking stresses by uniting the corners by means of gusset plates. In fact the framing is a small edition of the latest practice in railway carriage building.

The vehicle is carried on plate springs suspended in the usual railway manner, and to these are attached the axles, the fore axle being curved back to admit the lower part of the boiler. It is also bifurcated at the ends, so as to carry bronze bushed pinioned axles. These pinioned axles also carry a bell crank lever so as to permit of steering on Ackermann's principle, the tiller being very conveniently placed to the driver's hand. In order to keep the springs and axles in alignment, so as to prevent any longitudinal motion of the rear or driving axles, these are stayed together by longitudinal steel tube stays, the whole with the upper framing forming a perfectly double-acting pump, working direct from the engine crankshaft by means of reduced speed gear. The other is an injector. The former pump is so arranged that it can be used to fill the boiler by hand without use of steam, if required. Two oil tanks are fitted underneath the vehicle at the rear, each holding 20 gallons. These are filled by means of a funnel fitted with a strainer which extends beyond the vehicle, there is thus no danger whatever of spilling oil on the platform of the car. Two water tanks are fitted, one underneath the driver's seat, holding 60 gallons, and one underneath the platform, holding 75 gallons. These can be filled by means of the steam injector, with a suitable length of hose, in a very few minutes. The burner* is also of the "Lifu" pattern but much improved since we saw it last. There is none of that roaring noise which is so objectionable to hypersensitive people, most of whom, however, would regard the varied sounds of a horse, with their accompaniments, with indifference if not with pleasure. The burner is automatically regulated by the

Fig. 1.—"Lifu" Motor Lorry (No. 1).

rigid and very strong structure to resist deformation yet permitting vertical play. It is no doubt to this well thought out design, for which Mr. H. A. House must have every credit, that much of the good running of the "Lifu" is due. The wheels are of oak with bronze hubs and ash felloes; they are fitted with 3-inch tyres, ½ inch thick. Means are provided for ensuring copious lubrication. The boiler* is placed on the fore part and is suspended from the channel frames; it is of the well known "Lifu" type, *i.e.*, it is a water-tuber having 80 square feet of heating surface, the working pressure is 250 lbs. per square inch, and is rated as a 25 I.H.P. boiler. Its construction permits of easy examination and cleaning, and in the event of a tube bursting a new one can be inserted or the holes plugged in a very short time.

The boiler contains 16 gallons of water, and it can evaporate if forced as much as 50 gallons per hour; during the trials the evaporation was about 35 gallons per hour. Its weight in working order is about 700 lbs. There are two feed pumps, one being a steam pressure so that, should the steam go up over the working pressure, the supply of oil is checked, and as the pressure falls more oil is allowed to flow to the burner. The motor is a horizontal compound one of simple but strong construction, it is illustrated on p. 362. As will be seen, many improvements are embodied in the latest design, special means being taken to prevent the lubricating oil from reaching any hot surfaces and so vaporising and giving off an objectionable smell. The piston rods are made longer and pass through double glands. The engine runs at 600 revs. per minute, which gives a speed of eight miles per hour on a level road. The ratio of gearing is about eight to one. We should say that the cranks, crossheads, connecting-rods, eccentrics, and pump gears run in dustproof oil cases, which are half filled with oil, and so arranged that the water from the piston-rods cannot mix with the oil. No condenser is carried, but the exhaust steam is superheated and passes out of the funnel in an invisible vapour. The exhaust is also practically noiseless.

The power is transmitted to the driving shaft by means of steel cut bevel gears running in oil cases made dust-proof, provided with long white metal bearings, and a mild steel shaft made telescopic to

* *Vide* The Automotor, June, 1897; and The Automotor Pocket-Book, pp. 110 and 180.

allow for the action of springs and unevenness of roads. The countershaft is fitted with compensating gears to allow for turning curves, having long white metal bearings, well lubricated and dust-proof, bolted to the stiff frame to which the springs are fastened. This shaft is fitted with steel pinions on each end, running in large steel internal cut gears securely fastened to the spokes of each of the rear wheels. The countershaft is fitted and supported by two steel reaches fastened to front and rear axles. There is no changing of gears for different speeds, the regulating of speed being accomplished by means of the high-pressure cylinder steam valve, but when extra power is required high-pressure steam is let into the low-pressure cylinder. The large gears on the rear wheel are enclosed in mud guards securely fastened to the axles, thereby preventing any grit from getting into the gears. The brake power roads on the routes, Mr. House decided to fit much stronger and broader tyred wheels, and although, as the event showed, this was a wise and prudent course, it nevertheless brought the weight of the vehicle beyond the 2 tons limit. Under normal conditions this vehicle is capable of attaining a speed of eight miles per hour on fairly level roads when fully loaded, and of climbing grades of 1 in 10 at the rate of four miles per hour fully loaded. We may say that the whole vehicle was designed by and built under the supervision of Mr. H. A. House, jun., M.I.M.E., Engineer-in-Chief of the "Lifu" Company.

Throughout the trials the "Lifu" No. 1 ran most excellently and left nothing to be desired from the carman's point of view. At no time was there any visible vapour from the funnel—or at any rate none worth noting. The steam was raised in 25 minutes to 210 lbs.

FIG. 2.—THORNYCROFT'S SIX-WHEELED ARTICULATED STEAM LORRY NO. 3)

is unusually ample; not only does the reversing of the engines act as a powerful brake (the reversing lever properly handled permitting almost any pressure on the wheels), but in addition to this an emergency brake is fitted and arranged as a foot brake which acts dire t on the rear wheels by means of steel bands around the large gears fastened to the rear wheels. This emergency brake is capable of holding the wheels when the vehicle is fully loaded. Sand boxes are arranged that, when necessary, sand can be deposited directly in front of the driving wheels. They are worked from the driver's seat. In cases of starting or stopping suddenly on wet or slippery roads, and also for climbing hills where the rear wheels are inclined to slip, this has proved a most useful feature in the design.

The weight of the vehicle complete, without fuel or water, is stated by the makers as 38½ cwt., and with the full supply of oil and water 54 cwt. In view of the exceedingly trying nature of the per square inch, and was easily maintained at any required pressure according to the nature of the road. The gradients were for the most part, and all but the steepest, ascended at speeds which a three-horse loaded lorry could not possibly attain. At the same time one or two incidents occurred which gave useful lessons in practical experience. On one occasion a screwed plug on the separator worked loose and fell out; it was, however, happily recovered. On another, when travelling at a good speed closely followed by a light vehicle conveying guests, the official observer gave the order to stop, this was effected so quickly that the following vehicle ran into the "Lifu," damaging the tailboard of the latter and also the reserve oil fuel tank which is carried in the rear; much of the oil was lost, but the progress of the vehicle was in no way impeded. In the former case the lesson is that check nuts and split pins should always be used, and in the latter oil tanks should be fully protected with stout cleading. A more serious mishap was the blowing out of the low-pressure cylinder cover; this occurred just after leaving the depôt at Rainford on the 27th, and was due to the presence of condensed steam in the cylinder. The vehicle, however, came home at the normal speed, but, of course, exhausting into the atmosphere. Mr. H. A. House, however, promptly wired for another cover, and this was in place in time for the next day's run, which was accomplished without any mishap. On another occasion, when bringing up at a depôt, the vehicle being steered off the main road got on some soft ground and stuck; by unloading part of the ballast and with the willing aid of the villagers and guests the vehicle was quickly extricated. This incident shows the important influence that the road exercises on this question of heavy vehicle propulsion. Had it not been that the weather was fine and the roads dry it is certain that on that very bad piece of road just outside Widnes No. 5 would have found some difficulty in getting over a road which is little better than a dirty dust heap in fine weather and a filthy slough in wet weather.

A minor mishap was the breaking of a gauge glass, but, as two water gauges are fitted, this was of no moment.

Notwithstanding the excellent performance of No. 1, much of it will have to be discounted by the judges, as owing to the weight unladen being over 2 tons (it actually was 2 tons 7 cwt. 3 qrs.) the speed attained was on several occasions greatly in excess of that allowed by the regulations of the Local Government Board. By Article IV the speed for a vehicle weighing over 2 tons is restricted to five miles per hour. The "Lifu" actually at times made over nine miles per hour, and her average for all the runs is 8·02.

No. 3 was a Thornycroft six-wheeled articulated steam lorry, built by the Steam Carriage and Wagon Company, of Chiswick. It is intended to carry loads up to 5 tons at a speed of about five miles per hour up a gradient of 1 in 18. It has a platform area of 110 square feet, and the tare weight is 3 tons 19½ cwt. In running order this is increased to 4 tons 5 cwt.

The chief feature of this vehicle is the flexibility afforded by this articulated joint. Really this lorry consists of two vehicles. As will be seen, the one in front is the tractor and the one in the rear the trailer; the two are united by a peculiar universal joint or turn-table which permits the two vehicles to occupy different places longitudinally and horizontally relatively to each other. The tractor is built on framings of channel steel, well tied together by transverse and diagonal frames. The trailer is indeed much like an ordinary Liverpool lorry, in that it is merely a platform. It is fitted with a powerful steam brake which consists of a steam cylinder, the piston rod of which is connected with two hanging brakes. The wheels consist of T-rings surrounded by an outer tyre; this latter is riveted to the flanges of the T-iron. A little consideration will show that this design is questionable, as there is a tendency for the outer tyre to become slightly larger than the inner T-ring, with the result of unduly stressing the rivets. This seemed to have occurred with some of the wheels, as a few rivets had to be replaced or headed up during the trials. The spokes are of twisted bar, and arranged alternately on the two flanges of the hub. On the front part of the tractor is a kind of cabin in which is the boiler, feed-pump, &c. On the front again of this cabin is a coal bunker. On the roof of the cabin is an air condenser* made of light copper tubing. We understand that this condenser will condense about two-thirds of the exhaust steam. It strikes us, however, that the efficiency of this condenser is much impaired owing to its vicinity to the funnel, the hot gases from the latter being discharged just over the tubes. It is, however, useful, as it prevents very largely any great deposition of lime salts on the boiler tubes. It also acts as a silencer, as the blow-off both from the safety-valve and the ordinary exhaust pass into it; and although all the steam may not be condensed, its pressure is reduced to atmospheric.

FIG. 3.—THORNYCROFT'S SIX-WHEELED LORRY (No. 3). Plan.

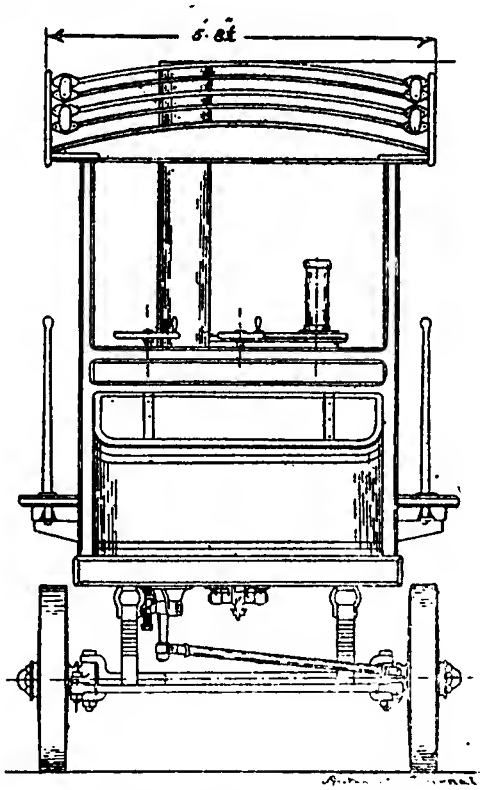


FIG. 4.—THORNYCROFT NOS. 3 AND 4 (Front View).

The boiler is of the annular vertical water-tube type, and is an improved modification of that previously described by us in THE AUTOMOTOR.*

We illustrate the present design of this boiler in the figures on next page.

As will be seen, this boiler consists of a circular D tube at the

* *Vide* THE AUTOMOTOR, April, 1898.

* *Vide* THE AUTOMOTOR, October, 1897.

bottom connected by tubes to an annular chamber above. The firing-hole is in the centre and the funnel at the side; it has 65 square feet of heating surface and 2½ square feet of grate area. It is worked with induced draught—a unique thing in automobilism—a small fan worked by a band from an intermediate shaft supplying the draught.

THORNYCROFT'S BOILER.

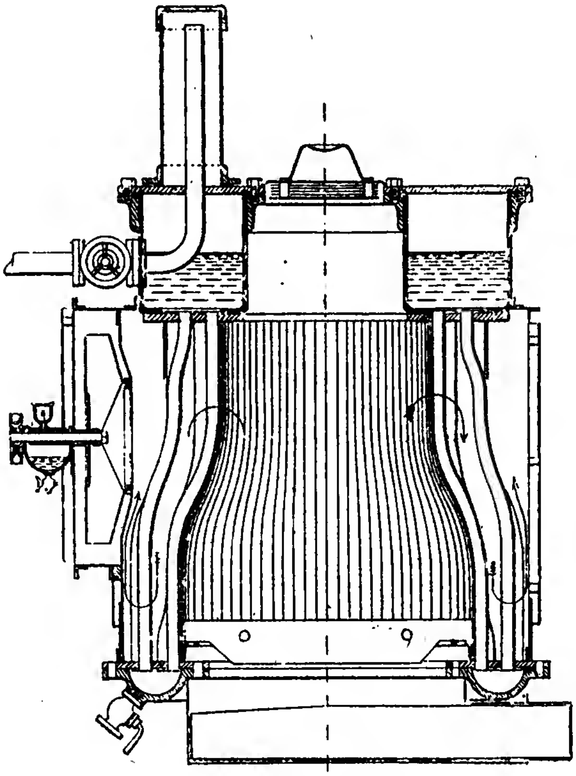


FIG. 5.—Vertical Section.

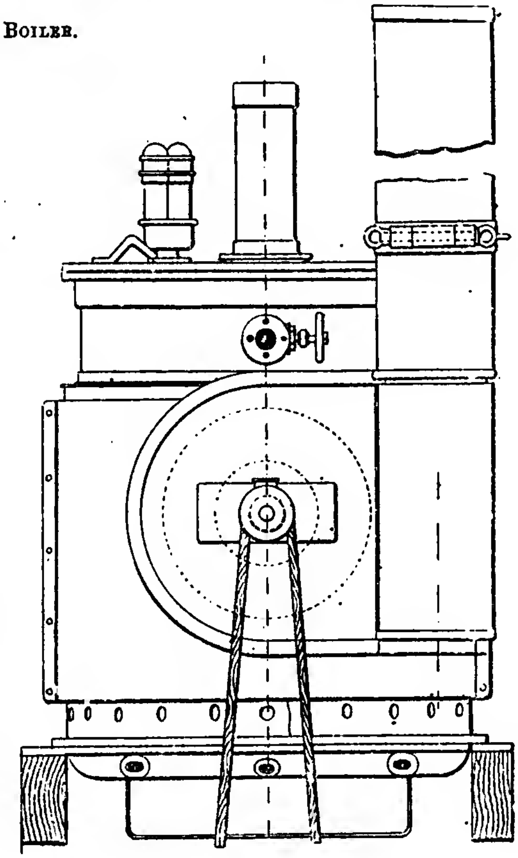


FIG. 6.—Side Elevation.

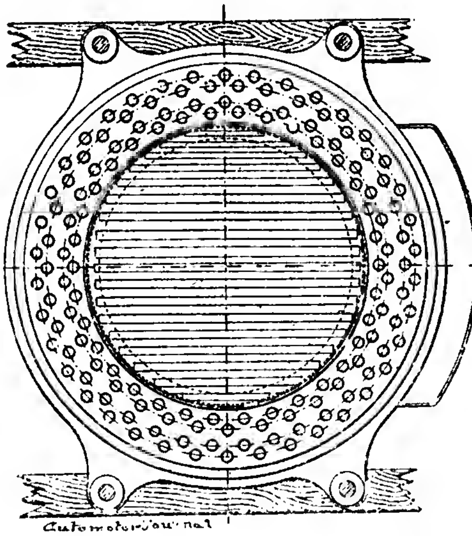


FIG. 7.—Plan on Tube Plate.

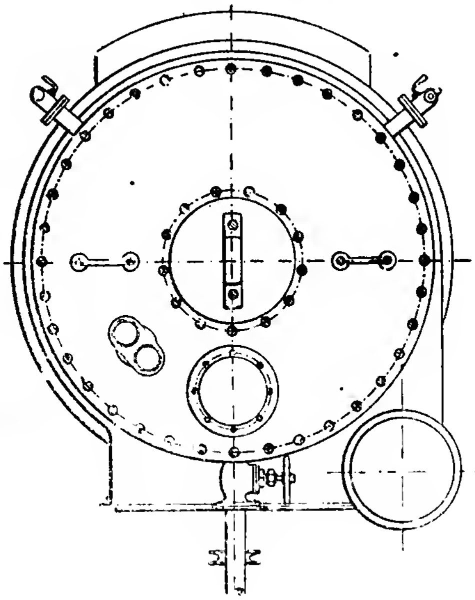


FIG. 8.—Top Plan.

The ordinary boiler pressure is 175 lbs. per square inch, which is half the test pressure. The fuel used is steam coal or coke, and steam can be raised in 15 minutes. The main-feed pump is worked off the engine shaft by gearing, and gives a constant feed at each speed of the engine. An independent "Blake" pump is also fitted for pumping up the boiler when the vehicle is standing. The motor is a horizontal compound, the cylinder being 4″ + 7″ × 5″. A bye-pass valve is fitted so that, if necessary, steam can be admitted to the low-pressure cylinder direct. The engine runs at 400 revs. per minute. It is enclosed in a dust-tight casing, the pinion on the main shaft gears into the driving wheel of the differential gear, and two other pinions, with helical teeth, on the shaft of this latter transmits by means of Renold's chain the motion to the rear driving wheel, the ratio between the engine shaft and driving wheel being 9—1 for the first speed and 12—1 for the second.

A feature about the Thornycroft tractors, although but a detail, is that as far as possible rods are dispensed with for working cocks, &c. In their place are light steel-wire leads, such as are used for opening and closing certain valves and cocks on board war vessels.

different kinds of work. Or a dynamo can also be fitted, so that, when stationary, the engine can be used to supply current; or again, the motor-part could be easily so arranged as to drive agricultural machinery generally. No. 4 is fitted with one speed only, and has double-helical gearing, giving very smooth running; otherwise, the particulars given to No. 3 apply also to this.

No. 3, the Thornycroft 5-tonner, ran very well considering the heavy load—some 9 tons—that had to be moved and the execrable nature of many of the roads. The boiler made plenty of steam, and from "all cold" a pressure of 175 lbs. per square inch was obtained in 19 minutes. The condenser, owing to the vicinity of the funnel and the rather high air temperature, did not seem to be of much service, and it was necessary to stop several times in order to take in water, the tank accommodation being rather too limited. The vehicle would

Fig. 9.—Thornycroft Lorry (No. 4).

No. 4 was also a Thornycroft lorry from the same builders. It is a four-wheeled vehicle designed for a load of 3 tons on the level at a speed of six to eight miles per hour. The platform or deck area is 60 square feet; the tare is 2 tons 19 cwt. in light and 3 tons 4½ cwt. in working order. It is unnecessary to describe the vehicle at length as the dimensions of the machinery, heating surface of the boiler, &c., are the same as in No. 3. Indeed, so far as the machinery and motive power are concerned, one design applies to all the various Thornycroft vehicles, the object of this design being that any particular kind of body can be placed upon the rear platform; thus in No. 4 the timber afterpart can be removed in a few minutes, and a steel tipping body, or watering-tank and fittings, or other spare bodies substituted for it; this will be seen to be an important advantage, as a user can, with one motor-part and under-frame and several spare after-bodies of various design, execute many

undoubtedly have completed the trials had it not been for her wheels. On the first day, when near home, one of the outer tyres came right off through the riveting giving way. A blacksmith effected some repairs, but the wheel again gave trouble, and ultimately some of the ballast was jettisoned and the vehicle returned light. On the second day she did not run, but on the third and concluding days she ran remarkably well, making nearly an average speed of 4 miles per hour; thus, eliminating the wheel trouble, there is no doubt but that this vehicle can be regarded as demonstrating beyond cavil that loads of 5 tons can be carried at a really very good speed on exceptionally steep roads. Messrs. Thornycroft have, by demonstrating this fact, done more than anyone else to carry out the objects of the S.P.T.A., and to them belongs the credit of being the first firm to do this since the passing of the Locomotives on Highways Act. As regards the trouble with the wheels, this is purely a question of design, and to such a firm, with its world-wide reputation for the very hest material and workmanship, this problem will, wo are sure, be adoquately worked out, and on original lines at that.

On the 27th a slight mishap occurred through a leaky tuhe, but this was quickly plugged, and nothing further happened. Some roughs, doubtless instigated thereto hy certain evil disposed members of the "horsey cult," attempted to board tbe car just outside Liverpool, hut were gallantly repulsed, one of tbe "unwashed" heing gracefully deposited in a horse-trough. On such occasions the conductors of steam vehicles would do well to keep the feed hose coupled up to the hlow-off cock. It is very curious to note tho extraordinary dispersive power of high-pressure steam on a moh. We have tried it.

On one point, however, No. 3 is disappointing, and that is her manœuvring power; this came out rather painfully at the trials held on the 28th, of these we speak later on. It is sufficient to say that No. 3 wonld not, in its present articulated form, do for dock work, but it is also only right to say that Mr. Thornycroft's idea in adopting this special design was to insure sufficient adhesion on his driving wheels, and, so far as this purpose was concerned, no trouhle was experienced, as a little sand enabled the vehicle to climh the stiffest gradients.

tremendously heavy—about the heaviest wheels we have seen; the tyres are 5 inches wide and nearly 1 inch in thickness. In spite of their size and apparent strength these wheels gave great trouhle, and one had to he replaced. On the front part of the platform is a cabin in which are placed the hoiler and engines, the former is of the vertical fire tube type and has 110 square feet of heating surface, the weight per square foot of heating surface being 6 lbs.; the working steam pressure heing 200 lbs. per square inch. The boiler is fired with liquid fuel, the burner being very quiet in its action; the supply of oil is regulated hy the steam pressure acting upon a diaphragm valve. Steam can he raised from "all cold" in 18 minutes. The engines are vertical uni-direction compound, entirely closed in and running in oil. They drive by means of pinions a second motion shaft which hy means of chain drives a third, which by chain gearing transmits the motion to the driving wheels. For reversing speed wheels are fitted on the second motion shaft, on which is also the differential gear. All the machinery is placed underneath the platform and is readily accessihle. The exhaust steam goes to an air condenser placed on the roof of the cabin, and it seemed to act fairly well. Powerful brakes are fitted to the driving wheels worked hy screw gear from the front. These brakes will hold the vehicle loaded on an incline of one in seven.

No. 5 was, on the whole, rather unfortunate, the wheels giving a great deal of trouhle. As we have said, these are of wood and unusually heavy. Indeed a little reflection will show that wooden wheels, as ordinarily made for wagons, are not suitable for driving wheels of locomotives. On the first day of the trials both tyres of the driving wheels came off, and later on one wheel broke up entirely; the vehicle ultimately arriving at half-past ten at night. A new wheel, the left rear, was shipped in place tbe next day, and a very excellent run was made, the average speed being nearly 5¼ miles per hour. Towards the end of the run a tyre got slack, and so it was determined to thoroughly overhaul the wheels; this occupied the whole of the third day, hut on the fourth and last day a very good run was made. The machinery ran perfectly throughout, and gave no trouble whatever. Steam can he raised to 200 lbs. in about 22 minutes. It would seem, however, desirable to carry larger oil tanks for supplying the hurner, as on one occasion the furnace was extinguished through lack of oil. In all other respects this vehicle behaved remarkably well. The load, 4 tons, was sufficiently trying, but had the wheels been more suitahle there is no doubt that this vehicle would have gone through each day's trial most successfully. The failure to effect this is to bo regretted, but after providing suitable wheels, Mr. Spurrier has in No. 5 a thoroughly good and practical vehicle.

FIG. 10.—THE LANCASHIRE STEAM MOTOR LORRY (No. 5).

No. 4 had a few mishaps hut nothing of a really serious nature. On the first day, when near Ormskirk, a hoiler tube burst, this necessitated blowing blown and opening out tho boiler. Mr. J. E. Thornycroft, however, has had too much torpedo-hoat experience to allow a burst tube to interfere with him, and he and his two ahle assistants had it plugged in a very short time, drawing the fire and relighting, however, meant another 56 lbs. of fuel. On the third day No. 4 had a mishap which, we think, will often be experienced unless the hearings, &c., are made unusually long and ample lubrication is assured. The fan for working the induced draught gave out, the hearings seizing. This, however, did not seem to make much difference as regards the steam pressure, as sufficient draught was created hy turning a steam blast into the funnel. It occurs to us, however, that the fitting of a fan is of doubtful advantage. Trouhle, as mentioned above, was also experienced with the wheels, hut these, we understand, are only experimental ones, and Messrs. Thornycroft have entirely new designs in hand. It may also he doubted whether hall hearings are suitahle for such vehicles.

No. 5 was entered by the Lancashire Steam Motor Company, of Leyland. It is designed for a load of 4 tons. It is a four-wheeled vehicle having an available platform area for goods of 78 square feet. This platform has folding sides something similar to a railway truck, and is carried on channel steel frames, these are well braced and tied together. This platform is supported hy douhle plate springs to which are attached the axles. The wheels are of wood and are

The manœuvring trials took place on the 28th at the principal depôt at the Prince's Dock, in the presence of Professor Hele-Shaw, who acted as judge. A distance about the length and a half of a vehicle was marked off against a wall hy a couple of fences placed at right angles to it, and it was required that each vehicle should be placed close alongside the wall between the two fences. A Liverpool carman with a pair of horses and a lorry would have dono this easily without the aid of any profanity. To the conductors of the motor-vehicles it was a hy no means easy task. Mr. Spurrier, in tho Leyland No. 5, was tbe first to essay the feat; hy judiciously "filling and backing" he accomplished it successfully; but, owing to the cabin in this vehicle having no windows in the hack, it is impossible for the man at the wheel to see how the rear is going, and a less careful and deliberate man than Mr. Spurrier would probably have done a good deal of damage before getting into position. No. 1, under Mr. House, then attempted the task, but it was not till after many efforts that he succeeded in accomplishing it. No. 4 also occupied much time in getting into place. This difficulty in entering an embayment is one that can only be got over by individual experience. Just as at a railway goods station, as one can see any day, some carmen will "back up" with certainty and ease, others will take much time and tear their horses' mouths to pieces in their efforts to get into position. It does not, therefore, depend so much upon the vehicle as upon the driver. With No. 3 the case was altogether different. This is, as before stated, an articulated vehicle, and to manœuvre such into such a path was, as it is needless to explain, an almost impossible task, and it occupied the better part of an hour to effect. It is for this reason that we think that articulated vehicles quite unsuited for dock work.

The following is the official abstract of the log of each vehicle during each day's run:—

this nomenclature is now obsolete and not now used by high-class engineering firms we have expressed these quantities in decimal notation for the convenience of engineers and of our French readers who may desire to express them in metric units for the purpose of making comparisons with the performances of other vehicles. These matters may appear trivial, but we think it right to inculcate the convenience of the decimal and metric systems, and we would here suggest to the S.P.T.A. that the value of the report of these trials would be much enhanced if all quantities were expressed in decimal notation and their values given in metric units.

Although we have not sufficient data to enable our readers to form an independent judgment on the trials it is not difficult to reach certain conclusions; and in order that our readers may be

Tuesday, May 24th, 1898.

Route A = 35·62 miles. *Viâ* Ormskirk, Rainford, and Knotty Ash.

Vehicle No.	Start.	Arrive.	Time at Depôts above 15 minutes at each.	Gross Time.	Delay for Repairs, &c.	Actual Running Time.	Gallons Oil.	Pounds Coal.	Gallons Water.	Load.
	a.m.	p.m.	h. m.	h. m.	h. m.	h. m.				Tons.
1	10.29	3.58	0 33	5 29	Nil	4 11	20	—	147	2·037
3	9.47	a.m. 3.26	1 20	17 39	8 10	7 24	—	623 coal, 255 coke	576	5·150
4	10.47	p.m. 9.6	0 4	10 49	4 12	5 48	—	384*	143	2·612
5	10 6	10.30	—	Returned by road from Ormskirk, tyre loosened.				No full return made.		4 050

Wednesday, May 25th, 1893.

Route A (reversed) = 35·62 miles. *Viâ* Knotty Ash, Rainford, and Ormskirk.

Vehicle No.	Start.	Arrive.	Time at Depôts above 15 minutes at each.	Gross Time.	Delay for Repairs, &c.	Actual Running Time.	Gallons Oil.	Pounds Coal.	Gallons Water.	Load.
1	10.5	4.19	0 34	6 14	0 4	4 51	26	—	163	2·100
3				Did	not run.					
4	10.7	5.17	0 8	7 10	0 5	6 12	—	309	147	2 675
5	10.31	7.27	0 19	8 56	1 4	6 48	18½	—	116	4·025

* Allow 56 lbs. for relighting.

Thursday, May 26th, 1893.

Route B = 35·875 miles. *Viâ* Prescot, Rainhill, Sankey, and Widnes.

Vehicle No.	Start.	Arrive.	Time at Depôts above 15 minutes at each.	Gross Time.	Delay for Repairs, &c.	Actual Running Time.	Gallons Oil.	Pounds Coal.	Gallons Water.	Load.
	a.m.	p.m.	h. m.	h. m.	h. m.	h. m.				Tons.
1	11.42	5.9	0 1	5 27	0 2	4 39	23	—	169	2·0375
3	9.58	11.16	0 20	13 18	1 45	10 28	—	582	310	4·5375*
4	10.21	5.25	0 12	7 4	0 19	5 48	—	317	107	2·4375
5				Did	not run.					

Friday, May 27th, 1898.

Route B (reversed) = 35·875 miles. *Viâ* Widnes, Sankey, and Prescot.

Vehicle No.	Start.	Arrive.	Time at Depôts above 15 minutes at each.	Gross Time.	Delay for Repairs, &c.	Actual Running Time.	Gallons Oil.	Pounds Coal.	Gallons Water.	Load.
1	10.0	3.4	0 10	5 4	Nil	4 9	27	—	187	2·000
3	9.43	12.0	0 12	14 17	2 0	11 20	—	787	284	5·225
4	9.53	7.4	0 0	9 11	1 43	6 43	—	431†	144	2·525
5	9.48	6.8	0 29	8 20	0 10	6 56	19½	—	132	4·2375

* Short load. † Allow 56 lbs. for relighting.

The information contained in the above tables is all that has been vouchsafed to us officially.

In these tables, as originally furnished to us, distances were expressed in miles and furlongs and weights in avoirdupois. As

enabled to form some approximately accurate estimate of the performances of the various vehicles we have compiled the following table which we have every reason to regard as correct under the conditions for which it is prepared. These are:—Coal is taken at

15s. per ton, petroleum at 3½d. per gallon, and water at Liverpool at 7d. per 100 gallons.* We bave taken the performances, loads, &c., of eacb vehicle and made average values.

After tbe manœuvring trials referred to above tbe vebicles were weighed, and this concluded the proceedings.

Official Tare Weights of Vehicles.

Vehicle No.	Builders.	T. Tons.
1	The Liquid Engineering Co. (Ltd.), East Cowes, Isle of Wight	2·3675
3 } 4 }	Tbe Steam Carriage and Wagon Co. (Ltd.), Cbiswick, London, N.	3·850 / 2·900
5	Tbe Lancasbire Steam Motor Co., Leyland, near Preston	2·850

Table of Average Values obtained from Results of Trials.
Compiled by Geo. H. Little.

—		Vehicle No. 1.	Vehicle No. 3.	Vehicle No. 4.	Vehicle No. 5.
1. Weight, light	tons	2·3875	3·850	2·825	2·900
2. " of fuel and water	"	·8178	·275	·275	·350
3. " of cargo carried	"	2·0800	4·970	2·560	4·100
4. Total moving weight	"	5·2853	9·090	5·660	7·350
5. Cargo / Total weight moved	..	·394	·546	·45	·558
6. Total miles run	..	143	107·3	143	71·49
7. Ton miles (cargo)	..	297·44	533·28	366·08	293·15
8. Net running time	hours	17·83	29·12	24·20	13·73
9. Average speed	m.p.h.	8·02	3·62	5·90	5·20
10. Consumpt of petroleum	galls.	96	—	—	37·75
11. " coal	lbs.	—	1,992 (coal) 255 (coke)	1,329	—
12. " water	galls.	666	970	541	248
13. " petroleum per t.m. of cargo	pts.	2·58	—	—	1·03
14. " coal " "	lbs.	—	4·21	3·68	—
15. " water " "	galls.	2·24	1·82	1·48	·84
16. Cost of petroleum per t.m. of cargo ..	pence	1·1274	—	—	·453
17. " coal " "	"	—	·3368	·2904	—
18. " water " "	"	·1638	·1274	·1036	·059
19. " motive power " "	"	1·291	·464	·394	·512

A study of tbe above tahle is interesting as several important facts are revealed by it. It will be seeu that the Tbornycroft No. 3 (*see* line 4) represented a moving weight of no less than 9 tons, or, assuming tbe load equally distributed (which it was not), 1·5 tons per axle. In No. 5 the total moving weight was 7·35 tons, or 1·84 tons per axle. In tbis vehicle it is more tban probable tbat there were 5 tons on the driving axle, and the balance on the front axle; this would give about 3 tons per driving wheel, and tbis fact, coupled with the stresses set up in transmitting the power, would account for the practical disintegration of one of the wheels of tbis vebicle. It is, however, bootless to follow tbis important matter up, as we cannot say what is tbe actual weigbt on the drivers.

Referring to tbe ratio between the weight of the cargo carried and tbe gross moving weight, line 5, it will be seen that wbile tbis ratio may approach unity it can never become unity, but tbe nearer it approaches unity tbe greater (otber things being equal) is the efficiency of tbe macbine. From this point of view No. 5 is surprisingly good, no less than 60 per cent. of the total weight being paying load. No. 3 approacbes this, but both are mnch ahead of No. 4 by something like 10 per cent., and ahead of No. 1 by some 16 per cent. This comparison sbows that the same law holds good for road vehicles as for marine vehicles, regarding both from the owners' point of view; that is, more freight can be earned by transporting a large quantity of goods at a low speed tban by carrying a smaller quantity at a higher speed. Tbus it will be seen tbat whereas No. 3 carried nearly 2½ times as much cargo as No. 1 her speed was but one-half that of No. 1, yet tbe horse-power of both vehicles was nearly alike. We may then conclude that it will pay carriers better to employ vebicles which will carry at least 5 tons of goods than lighter vehicles. It will he noticed that the average speeds, line 9, vary greatly. Considering the load, No. 5 again comes in for commendation. It is a distinctly better performance to carry 4 tons at a speed of nearly 5¼ miles per hour than it is to carry 2 tons at 8 miles per hour. Indeed No. 5 is in tbis connection a long way ahead of the others. Coming to the consumption data, lines 10-15, it will be noticed tbat although the ton miles for cargo of Nos. 1 and 5 are practically alike, yet the consumption of petroleum per ton mile in No. 1 is two and a half times that in No. 5; wbile tbe consumption of water is nearly tbree times as great in No. 1 as in No. 5. We should he inclined to doubt the accuracy of the figures relating to No. 5 were it not tbat in both vehicles the consumption of water per unit of petroleum is nearly alike, thus No. 1 consumes 6·9 units of water per unit of petroleum, and No. 5 6·5 units. The net result is tbat the cost of motive power per ton mile of cargo iu No. 1 is twice as great as in No. 5.

As regards the two coal burning vehicles, Nos. 3 and 4, the figures are, we think, remarkably good, hut in order to institute a proper comparison we give in tbe following table some figures relating to two otber vehicles, viz., the celebrated "Ravee," tried in 1871,* and the tractor trailer Scotte No. 2, one of the competing vehicles in Les Poids Lourds Competition at Paris last year:—

—	"Ravee."	Scotte No. 2.	Thornycroft No. 3.
Total moving weight in tons	19	11·51	9·09
Consumpt of fuel in lbs. per ton mile of total weight	8·63 (coal)	2·0 (coke)	2·8 (coal and coke)
Consumpt of water in lbs. per ton mile of total weigbt	17·17	10·7	9·94

It will he seen that a very noticeahle advance has been made since 1871 in the directions indicated. As regards the quantity of water evaporated per pound of fuel, the "Ravee's" hoiler would evaporate from 4·7 to 5·7 lbs. of water, while the Scotte evaporated 5·5 lbs. We have not yet tbe figures for the Tbornycroft hoiler before us, but we think they will not differ materially from those relating to tbe Scotte boiler.

Finally we have to consider the cost of the motive power. As will he seen on line 19, No. 4 costs the least of any, the fuel and water costing less tban ½d. per ton mile of cargo carried. No. 3 is also less than ½d. No. 5 is just a little more, while No. 1 costs more than 1¼d. per ton mile of cargo.

It will also be noticed that the cost of working boilers burning liquid fuel is much higher thau for coal fired boilers.

It is of course understood tbat our figures by no means represent the actual cost of working each vehicle; this can only be reached by discussing all the data—prime cost, depreciation, interest, wages, &c., but sufficient has been said to give those interested some idea of the nature of the problems involved in the question of Motor-vehicles v. Horse-drawn Vehicles for heavy traffic.

* This is the price at which water is delivered to the shipping in the docks at Liverpool.—ED.

* *Vide* Fletcher's "Steam on Common Roads," p. 196.

As is well known, Liverpool is the receiving depôt for practically the whole of the cotton used in the Lancashire district, *i.e.*, nearly all the cotton imported into England is through Liverpool. Should a service of steam vehicles be inaugurated and put in successful operation, it becomes interesting to consider how many bales the vehicles taking part in these trials could carry.

The average American (U.S.) cotton bale bulks about 31 cubic feet, and weighs 490 lbs., or 4·57 bales per ton. No. 1 vehicle could load 9 bales; No. 3, 23 bales; No. 4, 11 bales; and No. 5, 18 bales.

The trials were closely watched on each day by a large number of members of the S.P.T.A., representatives of railway and cartage companies, guests, &c. Among those present were Messrs. W. A. and Chas. H. Darbishire, A. Holt, Alfred Jones, S. Geogeban, W. Dean (G.W.R.), W. Hucks, A. W. Macleod, J. E. Thornton, Henry Mozley (Burnley and District Tramways Company), W. Bracewell, E. Samuelson, Alderman Greenwood, Hans Renold, A. Musker, Jno. A. Brodie (city engineer), R. C. F. Annett, Ernest Wilcox, Wm. Brodie, C. A. Still (Liverpool Cartowners' Association), G. Huttersley, R. R. Cook, W. H. Deaville, G. F. Borthwick, F. Thompstone, A. Heapy, F. W. Hodges, W. Murray (N.E.R.), W. Maide (N.E.R.), H. A. Butt, C. H. Bland (representing Lord Iveagh), Clifford Muspratt, Edward Samuelson, W. T. Carr and L. Carr (Carr and Co., Carlisle), H. Wardle Rushton, Anthony G. Lyster, Engineer-in-Chief (M.D. and H.B.), C. Melling, D. E. Phipson, Wilfred Webb, Major Dawson, Sidney Straker, A.M., — Mevor, Chas. T. Crowden, — Boyd, — Price, — Riley, Basil Wilson, C. H. Bland, Capt. Johnstone, A. H. King, H. Wardle Rushton, Cyril T. Thring, Henry Burton, James Taylor, — Webb, Henry Ashworth, A. H. Ashworth, — Gossage, — Forbury (Liverpool Cartowners' Association), — Bates, — Russell, Geo. Iden, — Cooke, Jno. Stirling, J. Thorp, — Baines, Jno. Robinson, W. Parkinson, F. A. Robinson, Chas. Manners, R. F. Borthwick, W. G. Chadburn, R. F. Vallance, James Leslie, J. Thorp.

The War Office had appointed Major Hippisley and Captain Johnstone to attend the trials; the former officer was unavoidably absent, and the latter was suffering from indisposition. Their places were taken by Lieutenant-Colonel H. W. Smith-Rewse, R.E., and Captain G. H. Harrison, R.E. Captain Johnstone, however, fortunately recovered in time to witness the trials, thus rendering it unnecessary for Captain Harrison to attend.

Letters of apology for inability to attend were received from the Baron de Zuylen, P.A.C.F.; M. G. Forestier, Engineer-in-Chief Les Ponts et Chaussées; M. Comte Henri de la Valette; M. Comte Chasseloup Laubat, and from other distinguished members of the Automobile Club Française.

The following deputations were officially appointed to attend these trials:—

War Office.—Lieut.-Col. H. W. Smith-Rewse, R.E., Capt. H. F. Gaynor, R.E., Capt. J. A. L. E. Johnstone, R.E.

Post Office.—Francis Salisbury, Esq., Postmaster of Liverpool.

Hull Corporation.—Councillors Hall and Holder, and Mr. Bricknell, Assistant City Engineer.

Wolverhampton Corporation.—Mr. J. W. Bradley, Borough Engineer, with the Chairmen of the Team and Sanitary Committees.

Liverpool Incorporated Chamber of Commerce.—F. C. Danson, Esq., President, Messrs. Alfred L. Jones and Geo. H. Cox, Vice-Presidents, Danson Cunningham, Elisha Smith, J.P., and Thos. H. Barker, Secretary.

Liverpool Cotton Association.—Danson Cunningham, Vice-President, R. W. Brown.

Liverpool Corn Trade Association.—John Blyth.

Liverpool Cartowners' Association.—Messrs. R. Procter, J. M. Garlick, R. Bennett, R. Edwards, Thos. Edwards, J. M. Walker, John Cowx, E. Burns, J. C. Harper, W. H. Robinson, John Davies, F. Norbury.

FIG. 11.—LIVERPOOL HEAVY MOTOR-VEHICLE TRIALS: GROUP TAKEN OUTSIDE THE DEPÔT, AT THE OLD SWAN INN, AUGHTON, BY MR. A. WRAGG, PHOTOGRAPHER, 30, BURSCOUGH STREET, ORMSKIRK.

The Dinner.

In connection with these trials a dinner took place on the evening of Thursday, May 26th, at the Adelphi Hotel, Liverpool. Sir David Salomons, Bart., presided, and he was supported by the Right Hon.

the Lord Mayor of Liverpool (Alderman John Houlding); Mr. Alfred L. Jones and Mr. Alfred Holt, Vice-Presidents of the Liverpool Centre; Mr. R. W. Wallace, Q.C., Chairman of the Automobile Club of Great Britain; M. Pierre Giffard, Membre du Comité de l'Automobile Club de France; M. François Thirz, Bourgomestre de Pecq; F. C. Danson, President Liverpool Chamber of Commerce; W. A. Darbishire, Penybryn, Carnarvon; Charles H. Darbishire; Richard M. Greaves; John I. Thornycroft, Chiswick Mall, W.; John E. Thornycroft; Herbert Niblett; Boverton Redwood, Church End, Finchley, N.; J. E. Thornton, Altrincham, Cheshire; J. P. Lea; Alfred J. Ling, Bollington, near Macclesfield; H. A. House, jun., East Cowes; R. F. Bothwick, Glasgow; H. E. Lytle; S. Geoghegan, Dublin; Francis E. Baron, Blackpool; Julius Harvey, London; Colonel W. Walker, J.P., Liverpool; John Wilson, C.C., Liverpool; Arthur Musker, Bootle; W. Churchward Dean, Swindon; Thomas Dean; Prof. H. S. Hele-Shaw, Liverpool; Anthony G. Lyster, Liverpool; Geo. H. Cox, Birkenhead; J. Walwyn White, Widnes; P. Souvestre, La Société Anonym de Traction "Automobile"; Charles T. Crowden, Leamington; M. C. Bannister, Liverpool; Henry H. West, Liverpool; S. B. Cottrell, Liverpool; J. A. Brodie, Liverpool; G. F. Ransome, Liverpool; Jas. A. Bradshaw, Liverpool; Cyril T. Thring, Dublin; William Hucks, Camden Town, N.W.; F. A. Robinson, Mansfield; Stanley Spooner, AUTOMOTOR JOURNAL; Henry Burton, Newport; A. H. Ashworth, Torton; Henry Spurrier, Leyland; Henry Spurrier, jun., Leyland; A. M. Macleod, Sidcup; J. H. Deakin, Windermere; John Harvey, Manchester; Jesse Ellis, Maidstone; Boverton Redwood, jun., London; T. H. Toulmin; William Philipson, Newcastle-on-Tyne; Thomas Toward, Newcastle-on-Tyne; H. S. Holt; Barras Reed, Newcastle-on-Tyne; J. H. Mace; James Leslie, Belfast; Wilfred le P. Webb, Caterham; G. T. Harrap, London; George Iden; J. Sydney Critchley; J. K. Starley; W. J. Davey; John Rogerson; Alfred Rogers; Sydney Lawson; Cecil E. Hawley; E. H. Gregson; W. B. Wood; J. T. Nicholson; Arthur G. Bean; J. T. Dawes; John Stirling, Hamilton, N.B.; Henry Sturmey; R. C. F. Annet, Sefton Park; Richard Barrett, Liverpool; John Blyth, Liverpool; Miles Kirk Burton, Liverpool; Charles Birchall, Liverpool; R. W. Brown, Liverpool; A. W. Barr, London; James Berry, Prescot; C. Harcourt, Town Clerk, Liverpool; D. Cunningham, Derby; Captain Leonard Dunning, Liverpool; W. Dean, Swindon; John H. Falk, London; Captain H. F. Gaynor, R.E., Chatham; Richard James, G.P.O., Liverpool; Lieut. Henry M. Liardet, R.N., Harbour Master; R. R. Lloyd, London; Thomas Parker; Norman C. Lange, Birkenhead; Edward George Mason, Mayor of Birkenhead; Dr. J. McMurray, Mayor of Bootle; G. B. Proctor, Liverpool; Charles Sandback Parker, Liverpool; C. R. Rowlandson, Manchester; E. A. Rosenheim, Liverpool; W. J. Stewart, Southport; A. T. Squary, Revenue Buildings, W.; Paris Singer, London; Edward Verspreeuven, Belgium Consul, Liverpool; Alderman Waring, Mayor of Widnes; Berkeley D. Wise, Belfast; Seymour B. Tritton; J. Percival Davies.

An excellent dinner having been partaken of, the CHAIRMAN said several letters of apology for non-attendance had been received, and he would ask Mr. Barr to read a letter received from Lord Derby, who enclosed 100 guineas.

Mr. BARR read the letter, which was as follows:—

Derby House, St. James's Square, S.W.,
May 24th, 1898.

My dear Sir,—Please express my sincere regret that I am unable to be present, either at the trials or at the dinner on Thursday. I feel that an apology is due from me for non-attendance, and I am especially sorry not to have an opportunity of welcoming those who have come from a distance, and who have done us the honour of being our guests. I trust that the trials may further demonstrate the advantage of the system of self-propelled traffic, and also may show what are weak points remaining to be remedied.

I have always been a believer in mechanical propulsion on common roads, and, indeed, I believe that a Report which I drafted for a Select Committee of the House of Commons more years ago than I like to think of, somewhere in the '70's, was the foundation for the rule governing the use of locomotives on roads, up to the date of recent legislation.

No doubt there are many difficulties yet to be overcome, and many prejudices to be met, but that self-propelled traffic will make its way I cannot hesitate to believe. It has made its way already in France, where public opinion seems to be ahead of ours. And especially in our own country, where there is much short-distance traffic, and where good roads are not wanting, mechanical traction seems to be almost a certainty.

You are aware, from a previous letter, that my absence is caused by the pressure of a number of engagements which have fallen together in London this week, and which I cannot forego.

The large Consumption Hospital at Brompton, of which I am the titular President, has an important meeting on Thursday, and I am bound to be there in the chair. That is mainly why I cannot join you. There are also four committee and other meetings of the Royal Agricultural Society, of whose council I am a member, to say nothing of other engagements. So that you will see that it is certainly not indifference which keeps me away from our Association meeting.

I wish you all success.

I remain, dear Sir, yours faithfully,
DERBY.

E. Shrapnell Smith, Esq.

Letters of apology were also received from Sir John T. Hibbert, Sir William Houldsworth, Sir John Willox, M.P., Sir John Brunner, Mr. Justice Bigham, Sir Chas. Cayzer, M.P., Sir Elliot Lees, Sir Edward Russell, Sir George Baden-Powell, M.P., Mr. Lawrence, M.P., Mr. Chas. McArthur, M.P., Messrs. Walter Long, A. H. Brown, Samuel Smith, R. Barker, Chas. Galloway, S. Williamson, J. Ernest Graves, R. S. Hippersley, R. P. Houston, W. H. Preece, W. P. Sinclair, W. W. Crosfield, Richard Henderson, Captain Nott Bower, W. E. Sproule, J. P. Brancker.

The CHAIRMAN proposed "The Queen" and the other loyal toasts, "God Save the Queen" and "God Bless the Prince of Wales" being sung.

The CHAIRMAN also proposed the toasts "France," the guests singing "La Marseillaise"; and "Belgium," after which "La Brabançonne" was sung.

Mr. ROGER W. WALLACE, Q.C., next proposed "The City of Liverpool." This, he said, was no mere complimentary toast, but a tribute due to the city, for Liverpool had given every encouragement to commercial undertakings of every sort, and had been foremost in every movement that had for its object the spread of commerce. One illustration of this was the fact that during the past week these motor trials had taken place in Liverpool. It was an interesting fact that during 1897 about 11¼ millions of tons of shipping had cleared from Liverpool. He had been looking back a little, and he found that the trade of Liverpool had been doubling itself about every eight years—it was frightful to think what would be the requirements of the future, but one thing was clear—that some means had to be found for distributing the enormous quantity of produce brought to Liverpool, and that in the quickest and cheapest way which would more easily get it to its destination. Liverpool was in the forefront of that enterprise which brought about the establishment of the Liverpool and Manchester Railway, and one could not help being surprised when one considered how enormous was the impetus given to railways and railway traffic by Liverpool. Unfortunately, the opening of that railway was signalised by the death of Mr. Hutchinson, but he hoped these motor trials would not be marred by any such event. When one remembered the railways and canals that had been constructed by Liverpool and for its trade, and of that canal that had been constructed for Liverpool by another city (laughter and applause), one wondered why Liverpool people should want anything more. But still he thought they were wise. The already enormous traffic of Liverpool must increase. Ships were being built larger and longer than ever, and would be built very much larger still if the Dock Board would give them docks sufficiently large and with the required draught. That was the only limit to the extension in this port. Of course, there must exist a means of taking the goods thus brought to its destination, and why should that means not be the motors they had seen working that day? With regard to the means used for the propulsion of cars, he was forced to believe that electricity was not likely to be successful as yet ("Oh!"), especially in the form of traction they had seen on trial that week. He was obliged to say this, though he was a great admirer of electricity, and used it on his cars. It was a pity that nature had selected the heaviest metal to be the accumulator of electricity, and it would not do unless someone invented a lighter metal for this purpose. He was of opinion that steam would still be the motive power for the class of traffic seen in Liverpool—at all events, he was certain that a large amount of the work would be done by steam. Of course, oil was very cheap, but there remained the difficulty of the fly-wheel, and they could not start the engine and carriage at the same time. That was a very great difficulty, but in the end something might be done in that direction. There were great chances of making rapid strides in this direction, and he thought there was a great future in store for this industry. He also spoke hopefully of the increasing use of aluminium in the construction of cars, but said that the engineering trade was not so brisk as it should be. If they did their work quicker there would be greater progress in this country. In conclusion, he expressed the wish that Liverpool might always prosper, and be always to the front in industrial and commercial matters. Might she always have as popular a Lord Mayor (applause), whose name be coupled with the toast.

The Lord Mayor, in responding, said he remembered the opening of the Manchester Railway, and very proud they were of being able to get to Manchester in three hours—it was a very memorable achievement indeed. Now they got there in 40 minutes. This development was the work of engineers like those who sat around him. He also remembered the wonderful development of the Liverpool and Birkenhead dock systems, and the time when the Liverpool docks were crowded with ships of 500, 600, or 700 tons. Now vessels of 5,000, 6,000, and 7,000 tons were comparatively small steamers, and the journey across the Atlantic was done in six days. This was also due to the engineers and others of inventive genius. Again the wonderful development of the bone-shaker to the perfect cycle of the present day and to the motor-car was the work of gentlemen such as he saw around him. He had witnessed with the greatest interest the arrival at Bordeaux of the motors which competed in the race from Paris and back again, and on the previous Tuesday be first sat in a motor-car. He was not nervous as had been suggested by the previous speaker, because he had been on every kind of railway in Europe, even on the perpendicular rail at Marseilles, so that a simple ride in a motor-car would not make him nervous. They did this first ride of 24 miles, exclusive of stoppages, in two hours, and he never had a more pleasant journey, and never felt more comfortable in any conveyance. If they could only make such improvements in the motor-car as had been made in the steam-engine and in ships he did not know where they would be in 20 years, but be hoped he would be here to see them. (Applause.) He wished the Association every success. He had now certain responsibilities and duties, but when he got back to his old position and had a little more time and fewer responsibilities, he would try what he could—he would do to improve the present system of cart traction by the Corporation. The Corporation was admitted to have the finest horses in the country, but their carts only went along at about two miles an hour; but when they could have 5 or 6 tons taken along at five or six miles an hour behind a machine like that competing in the trials, though the capital cost would be more, he felt sure there would be a great saving in revenue. (Applause.) He believed there was a great future for the motor-car. He would do all he could with pleasure in the interests of the Association. (Hear, hear.)

Mr. F. C. Danson gave the toast of "Self-Propelled Traffic." He said it was a most wonderful thing that until about 18 months ago legislative restrictions were so great in this country that motor-cars were almost an impossibility. They had to be preceded by a man with a red flag, and also accompanied by a degree of noise such

The Thornycroft Tipping Dust Van.

This vehicle has the same mechanism as Nos. 3 and 4, the only difference being that a tipping van is affixed, as shown, to the rear end.

as one might find accompanying a Sunday School procession, and their pace was the right thing for a funeral procession. Within the past two years, since there was a proposal to remove these restrictions, their engineers had been exercising their ingenuity, and with wonderful success. However, the industry was still in its infancy, but its infancy was most promising. There were doubtless difficulties in the way of the adoption of the motor-car for general use, but these would be overcome. When the railways were started it was said that horses would be relegated to the Zoo or the Museum, and the same was now said with reference to the motor-car. But there were more horses now than when railways were inaugurated, and the same would be the case, he thought, even after the motor-car was in general use. There were certain things a motor-car was adapted for and other things it would not do. As a commercial institution the motor-car was bound to make its way, and he had no hesitation in saying it would form a most important factor in the development of the trade of this port and of the country. Speaking of the means by which the restrictions to the use of motor-cars had been removed, he said they had one champion who took up the matter and urged upon all sides the necessity there was to remove all such restrictions. He succeeded in getting the necessary legislation, and finally inaugurated the Society under whose auspices they were gathered there that evening. He became the chief of the Society, the success of which was very largely due to the very able manner in which he had conducted its affairs. (Applause.) He need hardly say he referred to their worthy President, Sir David Salomons (renewed applause), and he had pleasure in coupling his name with the toast. There was another gentleman present who was foremost in doing anything he possibly could to promote any industry or undertaking which was likely to benefit the commerce of Liverpool and of England itself. (Applause.) He had tremendous energy, great influence, and he was fortunate in being able to assist with a very long purse. He was well known and appreciated not only there and in England but in many other parts of the world—he referred to Mr. Alfred L. Jones. He would ask them to drink to the success of the Self-Propelled Traffic Association, coupled with the names of Sir David Salomons and Mr. A. L. Jones.

Sir DAVID SALOMONS said he believed he was the right man to reply to this toast because he had his heart in the movement. They all believed that the extension of the motor traffic would be for the benefit of mankind in a trade or profession or in private life. They knew they had to convert a very large number of people who were—well, he would not call them enemies, but men who were ignorant of the value of motors. He would give the names of the chief amongst these, though these did not by any means include the whole of the classes they included a large number. These were the county councils and other local authorities, who thought that those interested in the motor traffic would demand better roads, and so cause the rates to be a little extra and probably jeopardise their seats on the council or board at the next election. They did not honestly tell their constituents that supposing they did pay a farthing in the pound extra, they would get their goods from the shops a trifle cheaper and quicker, and would save that farthing in the pound in the long run. (Applause.) Liverpool might well be proud that she had set others an example in showing for the first time a motor-car such as they had now—not the first motor-car, for they would have to go back to the days of Hancock for that. Indeed, France claimed the first, and it was difficult to say which was really first, and they must try and give credit where it was due. Everyone was once a little baby—a useless little article. (Laughter.) They were proud that Liverpool was the birthplace of the first railway—though he must really deny that, for the first engine ran in

THE "LIFU" WAGONETTE.

The illustration represents the lighter type of vehicle made by the Liquid Fuel Engineering Company, of Cowes, Isle of Wight.

the county of Kent (laughter and applause), and it was built by Stephenson. However, he did not pretend to deny that Liverpool had given a great impetus to the railway, and in the same way Liverpool had given the motor-car industry a great impetus by the fact of these trials taking place here, and those who were present were to be congratulated on their coming forward at this time. (Applause.) In their earlier days they had learned that there was nothing like leather, and now they knew there was nothing like wheels. (Applause and laughter.) Those who had gone in for these trials had done more than gain experience or give it to others. They had not got to perfection, and as long as they lived they hoped that perfection would not be attained—there would then be nothing to live for. (Hear, hear.) Perhaps he should say very little of the Association, as he was so much connected with it, but he would say that at the moment when nobody would take an interest in getting a Bill through Parliament, the existence of such an Association became an absolute necessity, and it could only be made a success by getting a large number of influential and well-known men, having no financial interests in it, to take the matter up, so that no member could rise in his seat in Parliament and say that so and so were doing this to enrich themselves at the cost of the public. (Applause.) He felt confident that now people would recognise how useful the Association was, and what a good work it had performed. The Association, he thought, had been an undoubted success. Since his visit to this city he had been brought prominently forward, and where he had done those things that were right he might say it was due to the promptings of their man of genius here—the hon. secretary. (Loud applause.) He had been his (the speaker's) guiding star, and he trusted Mr. Shrapnell Smith would be a comet leaving a bright tail behind him as he went through life. (Renewed applause.) He wished to refer to one point regarding which even their friends might do harm—that was with regard to the rules regulating the use of these motors. They wanted changes, but perhaps these changes might be accompanied by restrictions which would do them harm. Wait until the present rules were tried on a larger scale than was possible at present, before they asked for any change. This was a memorable era in the history of horseless carriages. It was a starting point from which they should all combine for the common good. Their strength should be applied in one direction. Mr. A. L. Jones would now speak. He was a master of his own particular line—the heavy traffic. Before closing he would like to say that next year they would have their competition at Tunbridge Wells, where guests from Liverpool would receive as hearty a welcome as they had given to him. Being near to London and nearer to France they might expect more competitors, and that their French friends would be able to enter the competition and show what they could do.

Mr. A. L. Jones also responded. He said they should be proud of the distinct success of the motor-car in Liverpool on this occasion. Their chairman was the president of a society they were glad to see established, and they were proud to welcome him amongst them. There was, he thought, one thing he was more successful in than another, and that was in finding the man to do a thing better he could do it himself. What they wanted was a cheap means of transit to Manchester and Lancashire generally. It is the railway system here that had stifled the port of Liverpool, and that was the reason of his connection with the Self-Propelled Traffic Association. He was convinced that that Association would be the means of reducing the charges very materially, and if they could do that they would succeed in making the city and the district much more successful than it is at present. There was no doubt that the motor-car for heavy traffic—he did not propose to deal with the pleasure car at all—but for heavy traffic over a moderate distance, the motor-car offered advantages far in excess of anything the railway could do for them. It did not need any argument to show that in unloading a ship and loading a car to carry goods 15 miles or so in a short time much time and handling would be saved. They could have the car to take the load from the ship's side for any place within a reasonable distance. The cars shown in Liverpool had, he thought, the element of success, and he would be very much surprised if before long they did not see companies formed to work such cars. (Applause.) They wanted to be in the front, and they thought Liverpool was the finest port in the world, and as far as they were concerned with this little society they would do their best to add to the importance of the city. They appreciated the kindly interest taken by the Lord Mayor in the motors. As for Mr. Smith, the success of the undertaking was due to him. (Applause.) Once he got on the track he would never leave it until he got what he wanted. Then some of the most eminent engineers of the city had been good enough to give their time in the interests of the movement. He thoroughly appreciated the President's invitation to Tunbridge Wells, but he would rather welcome the President to Liverpool again. They wanted to centre this institution in Liverpool. They did not want to go to Chiswick, or any other place, for what was wanted. (Applause.)

Mr. Alfred Holt proposed "Our Guests." He said the great difficulty that had forced its attention upon those who were competing was the question of weight. In order to limit the weights they had been driven to extreme lightness of construction. If they could have 25 cwt. to the ton they would have been extremely glad. (Hear, hear.) With regard to their speed he hoped they would have every success, but he thought it possible that if the ingenuity that had been expended had been utilised on the road instead of the vehicle greater success would have attended it. The metal pathway would have done what the vehicle could not. He thought they should give their attention to the hardening of the roadway, easy curves, and gentle gradients, and they would diminish the cost of transit much more than by the means now proposed.

The toast was responded to by M. Giffard, M. Thirz, and Lieut.-Colonel H. W. Smith-Rewse, who, in acknowledging the toast, hoped that the motor-car would follow in the footsteps of their old friend the traction engine, which had proved its usefulness and pulled them out of many a difficulty. (Hear, hear.)

Professor H. S. Hele-Shaw proposed "Our Hon. Secretary, Mr. Shrapnell Smith." The speaker referred at length to the excellence of the work done by their hon. secretary, his untiring zeal for the work he had in hand, and said that the success of the trials was an evidence of the thoroughness with which he did his work. (Applause.)

Mr. E. Shrapnell Smith, in response, thanked all present for their appreciation of his work. He appealed for greater help. The membership at Liverpool was under 60, and they had made a lot of noise in Liverpool notwithstanding their income was only £60. He had been well helped by the Council, and they had made the most of their opportunities. They had succeeded better than he had hoped for, and he would look back upon this day with pride. He hoped the people of Liverpool would rally round them and give them greater support.

Mr. Barr proposed "The Technical Press," coupling with it the names of Mr. Stanley Spooner and Mr. Henry Sturmey.

The proceedings then terminated.

GEARING FOR AUTOMOTORS.

By Rhys Jenkins, M.I.M.E.

The devices for transmitting the motion of the motor to the driving wheels form a most important detail in the construction of a self-moving vehicle; they demand a considerable share of attention, and this indeed they have received at the hands of inventors during the past year or so, with the result that many very ingenious mechanisms have been produced, some of which have been noticed from time to time in the columns of The Automotor.

Among the most interesting of these schemes is that for hydraulic or fluid pressure transmission, that is to say, the prime mover is employed to actuate a set of pumps, which are in a closed circuit with a set of motor-cylinders on the driven axle. Now there can be no doubt as to the smoothness in working and the range and graduation of the speed ratio obtainable in this way, but one is tempted to believe that these advantages can only be obtained at too great a cost in regard to the complexity and weight of the mechanism, to say nothing of a comparatively low efficiency.

The remarkable speed-reducing properties of epicyclic trains have caused these mechanisms to receive the attention of a great many inventors. But here again it will no doubt be found that the advantages are more than neutralised by increased friction and wear and tear, particularly in those forms in which internal gearing is employed. The use of brakes in these gears for allowing a variable slip to what is usually the dead wheel certainly affords a convenient means for varying the speed, but such a practice is radically wrong, as the variation is obtained by expending the surplus power in friction, and converting it into heat in the underpart of the carriage. Still this idea seems to have attractions for a great many people.

The worm and wheel form another compact and simple means of reducing speed, and of late efforts have been made in several quarters to show that this mechanism is not so inefficient a transmitter as it is usually regarded, still it does not seem likely to come into extended use in motor-cars.

In spite of the great ingenuity which has been brought to bear upon the subject, there appears to be little doubt that old and well-known types of gearing which have approved themselves in general engineering practice, if carefully and skilfully applied, will give us the most satisfactory results, or at any rate will fully answer practical requirements.

The problem to be solved is the transmission of the power of a fast-running motor to the road wheels of the vehicle at a considerably reduced speed, and with the possibility of variation and reversal, and this in a situation exposed to considerable jar, to dust, and to atmospheric changes of no mean extent.

Although belt gearing and friction pulleys have been used with a certain amount of success, for constant and daily work the circumstances appear to demand positive action—that is to say, the use of either chain or spur gearing. Chain gearing gives the designer great liberty in disposing of the details of his car, and it has been applied with considerable success; and, in spite of its well-known defects, there can be little doubt that it will continue to be used, either in combination with spur gearing or alone. But wherever possible spur gearing should be relied upon—not, of course, that this form of gearing is without defects, but that, properly carried out, it will be found to give the most satisfactory results, consideration being had to constant and everyday use in all weathers and over roads of all qualities.

This conclusion is supported by the results arrived at in electric tramcar practice in the United States, in which by this time considerable experience has been gained. Belts, chains, worm gearing, bevel wheels, and spur gearing have all in turn been tried, but there is now no question of the superiority of the spur gearing. The motor is connected to the car axle by a pinion and spur wheel running in a bath of oil; the gears are machine cut and of steel, or the wheel may be of cast iron. A good deal of trouble was encountered at first on the score of noise, and raw hide pinions were extensively used, but the enclosure of the gearing in a casing which forms an oil chamber has permitted steel pinions to be used with manifest advantage.

Now, decidedly the gearing of a vehicle for ordinary roads is a far more difficult problem than is met with in the tramcar, where variations of speed have not to be provided for, and the size of the road wheels is such that an electromotor may conveniently be geared to their axle by a single wheel and pinion. Again, the gearing is not so much exposed to dust as is the case in the ordinary road carriage. Nevertheless, the experience gained with the simpler problem appears to indicate clearly the manner in which the more difficult case should be attacked.

In a motor-car an intermediate shaft between the motor and the driven axle would, as a general thing, be indispensable. Three speeds and a reverse would probably suit most requirements. To effect this the connection between two of the shafts must be made by four trains of gearing, which may be conveniently arranged two and two with the clutches between each pair. Such devices as sliding keys and the like are merely toys, and should be avoided. Electromagnetic or fluid pressure clutches lend themselves very readily to this application, and are very conveniently arranged for actuation, although indeed there need be no difficulty in this respect with ordinary clutches. The wheels should never be thrown out of gear with each other; it is too much to expect good results if it is attempted to throw the wheels into gear while in motion; they should be of steel with machine-cut teeth, and they should run in a closed casing forming an oil bath.

THE TESTING OF SECONDARY BATTERIES.

COMPARATIVE figures are often given, says an exchange, for different types of storage batteries, quite regardless of the rate of discharge per unit weight of plates at which they were working, which figures may be, and often are, very misleading, for if a curve be drawn for any given type of cell, plotting the pounds per kilowatt hour of the cell, over a base representing the rate of discharge in ampères, it will be found that a line passing through the successive values of pounds per kilowatt hours so plotted falls at first very rapidly, then more slowly, until at about 100 ampères it becomes a straight line, so that a fair comparison of two or more types of cells can only be made at the same rate of discharge per unit weight of plate in each case. Hence reports on tests of storage batteries, giving a comparison of two cells, the rates of discharge of which may be very different, should be corrected for such difference before being accepted as of any value whatever in so far as the comparison is concerned, for it is now well known that the capacity of an accumulator increases as the discharge current is reduced, the relation between the strength of the discharge current and the capacity being of the form

$$C^n \times T = \text{a constant},$$

C being the discharge current in ampères, and T the time of discharge in hours, the value of the exponent n being found by experiment with the particular type of cell, and ranges from 1·35 to 1·5.

Then, by the aid of the equation

$$C^n \times T = \text{a constant},$$

and knowing the capacity for a definite rate of discharge, its capacity at any other rate can be readily calculated. For if K denotes its capacity for a discharge current, C, and time of discharge, T, its capacity, k, for some other discharge current, c, and time of discharge, t, will be given by the formula,

$$k = K\left(\frac{C}{c}\right)^{n-1}.$$

THE ECONOMICAL USE OF STEAM IN NON-CONDENSING ENGINES.

IN America, says James B. Stanwood in the *Engineering Magazine*, the non-condensing engine is almost universally employed, especially in those districts where fuel is cheap and condensing water is dear. These conditions obtain over a very large portion of the country, particularly in cities and towns. Any improvement, therefore, in the economy of non-condensing engines benefits a large majority of American steam users.

Not very long ago, but before the days of Mr. Corliss, steam pressures of 40 to 60 lbs. were in vogue. Plain slide valves cutting off at about three-quarter stroke, or adjustable cut-offs by means of which more expansion was obtained, were generally employed. The speed of the engine was controlled by a butterfly valve operated by a fly-ball governor. The small mean effective pressure, in conjunction with a high pressure of steam at the end of each stroke of the piston (the terminal pressure) caused by a reduction of initial pressure and a low grade of expansion, was absurdly uneconomical. Mr. Corliss, by the invention of the automatic cut-off, radically changed these methods of steam distribution. Steam was admitted to the cylinder with as low initial pressure as 60 lbs., and, with nearly uniform loads, the size of the engine was proportioned so that the cut-off occurred at about one-quarter stroke, and the pressure at the end of the piston stroke was slightly in excess of atmospheric pressure. Under these conditions a maximum mean effective pressure was obtained with a low terminal. This satisfied the conditions existing in factories at that time—a probable dead load of nearly 50 per cent.

Observe what would have been the result if these engines had been required to operate for long intervals with one-third or one-quarter load; the cut-off would have been automatically adjusted to one-eighth or one-tenth of the stroke, and with 60 lbs. of steam the degree of expansion would have been so great that the terminal pressure at the end of the piston stroke would have been 5 lbs. or 6 lbs. below atmospheric pressure, reversing the pressure on the piston and causing it to drag like a pump. At the same time the mean effective pressure would have been as low as 8 lbs. or 10 lbs. —far too small for economical operation.

This high degree of expansion sometimes occurred in Mr. Corliss's practice, especially where engines too large for the work required were installed; builder and user were sorely disappointed at the resultant waste, and were at a loss to account for it. It was easily seen that the drag of the piston, due to expansion below the atmosphere at the end of the stroke, accounted for part of it. But should not this have been offset by the high degree of expansion?

With recent developments in electricity a steam-engine driving a generator is the ordinary instrument for deriving energy from coal. In this application light loads and variable loads form a greater proportion of the engine's duty than formerly. For instance, in most factories with mechanical transmission a large portion of the power given out by the engine has gone to drive the transmission machinery

—that is, gearing, shafting, pulleys, and belts. This dead load frequently consumes one-third to two-thirds of the entire power. An engine in such a factory always has a large minimum load. When electrical transmission is employed, the transmission load appears only when work is being done at the motor or lamp, so that the minimum load on the engine is only that due to its own friction, together with the resistance of the generator—usually, in all, not more than 20 per cent. of the rated capacity of the engine. It is seen, therefore, that with electrical transmission the fluctuations in load between maximum and minimum are much greater than with mechanical transmission. On account of a high degree of expansion developed by this prevalence of light loads in this field, it has not been possible to operate engines economically.

Experience has shown that there is a limit to the degree of economical expansion, and this limit has been found to vary with different types of engines. Long-stroke engines were found to have a greater limit, and to be more economical, than short-stroke engines; short-stroke engines at high speed were more economical than short-stroke engines at slow speed; engines with short clearance spaces (the waste space between the piston head and cylinder head at end of stroke, including the steam ports) were more economical than those with large clearance spaces. In long-stroke engines the most economical degree of expansion was found to be about four; in some short-stroke engines it was as low as two. That is to say, in long-stroke engines the economical cut-off should take effect not earlier than one-fifth of the stroke, and in some short-stroke engines not earlier than one-third. Experimental investigations have shown the reasons for this limitation of expansion; practice and experience have devised methods of extending the limit.

Two serious losses develop with high expansion produced by early cut-offs in single-cylinder engines. The first and most easily discerned is known as the "clearance loss"; the second and more subtle is the "cylinder condensation loss." It is obvious that, if the clearance spaces have to be filled at each stroke with fresh steam from the boiler, there is a distinct loss, since this steam is thrown away without doing much work. Clearance space in long-stroke engines is ordinarily 3 or 4 per cent., though it has been reduced to about 1 per cent. in special cases. In some short-stroke engines the clearance is 15 or 16 per cent. This accounts for one advantage of long-stroke over short-stroke engines. Wherever clearance spaces are large, they can be partially filled by compressing into them some of the steam left in the cylinder during exhaust; but, as a rule, they give poor economy, as this gain by compression is only slight.

The "cylinder condensation loss," the largest of all the losses, is not generally understood by steam users themselves, although clearly recognised by intelligent engine builders and engineers. The laws which govern it have not been fully ascertained quantitatively, although the manner in which they vary is fairly well understood.

What is this loss?

At each stroke that any engine makes, fresh steam from the boiler meets the surfaces of the steam passages, cylinder head, and piston head, and the cylindrical walls of the cylinder up to cut-off, all of which have previously been cooled by exposure to the low temperature of exhaust steam, and by the abstraction of heat during the period of expansion. These cool surfaces have to be reheated by fresh boiler steam in order that the cylinder may be habitable for that portion which is to do work. A certain part of this fresh steam is thereby condensed, and becomes a loss, which is called the "cylinder condensation loss."

This amount of cylinder condensation seems to depend upon the amount of condensing surface exposed up to the point that cut-off takes place; upon the difference in temperature between fresh in-coming steam and out-going exhaust steam (known as the range of temperature); upon the time which these surfaces have for cooling and reheating (this is regulated by the speed of the engine); and upon the degree of expansion which takes place in the cylinder. The nature of the surfaces, whether smooth or rough, likewise has influence on the amount of condensation. It is difficult in any engine to forecast exactly the amount of cylinder condensation, but in any given engine it appears to be nearly constant at all points of cut-off at any given speed, boiler pressure, and exhaust pressure.

Under these conditions the "cylinder condensation loss" acts very much like a large clearance loss. It is least in long-stroke engines, as they offer less surface for condensation, per volume of steam used; it is most in short-stroke engines, for the opposite reason. High-speed short-stroke engines are an improvement upon slower short-stroke engines, as the time for condensation is less. In an ordinary long-stroke Corliss engine, working with either early or late cut-off, about 7½ per cent. of a volume of steam equal to the cylinder-full at boiler pressure is condensed to keep the cylinder hot. If 2 per cent. of the steam is thrown away as a clearance loss and 7½ per cent. as a cylinder condensation loss, the total loss is 9½ per cent. This loss is relatively much larger when steam is admitted for only one-sixth or one-fourth stroke than when it follows the piston for one-third or two-thirds stroke. Therefore the losses, together with the drag of piston on account of expansion below the atmosphere, are much greater with early cut-offs than with late, and the economical limit to expansion is reached when the gain due to expansion is neutralised by this increasing loss of clearance and cylinder condensation and "drag." It is thus easily seen that large engines with light loads, or engines which work under great variation of loads, must operate at early cut-off, and under three very disadvantageous conditions—to wit, with heavy clearance loss, with cylinder condensation losses, and with a positive resistance developed in the cylinder by the dragging of the piston against atmospheric pressure.

Since the days of Mr. Corliss, steam pressures have continued to increase; this increase of pressure has intensified, in single-cylinder engines, clearance and cylinder-condensation losses. The absolute clearance loss is increased, because the clearance spaces have to be filled by steam at higher pressure, which weighs more per cubic foot than steam at lower pressure. The absolute cylinder condensation loss is increased, because the difference in temperature between fresh incoming steam and outgoing exhaust steam (range of temperature) is increased. For example, the temperature of steam at 60 lbs. pressure is 307° F., while the temperature of steam at atmospheric pressure, at which it exhausts, is 212° F.—a difference of 95° F. The temperature of steam at 100 lbs. pressure is 338° F., making a difference of 126° F.; and this increase of temperature-range condenses a greater amount of fresh boiler steam (which is another way of stating that cylinder condensation is increased).

The increase of pressure, however, has reduced the loss due to the dragging of the piston against atmospheric pressure in single-cylinder engines. With a given maximum cut-off the ratio between the minimum mean effective pressure (that can be secured without expansion below the atmosphere) and the maximum mean effective pressure becomes greater, so that a lighter load in proportion to maximum load can be carried than with lower boiler pressure.

The clearance and condensation losses tend to prevent a gain in economy with high-pressure steam. To secure this gain, which was theoretically possible, engineers were compelled to abandon the plan of using steam in one cylinder only, experience having proved that higher degrees of expansion with less loss can be secured by expansion through two or more cylinders. A knowledge of these facts was obtained by experience in marine practice, where many practical advantages were secured, besides economy of fuel by the use of multi-cylinder expansion engines.

The success in this field of engineering naturally attracted the attention of steam users and builders of stationary engines. Manufacturers of automatic cut off engines began to compound their engines. When condensers were employed with these newly-arranged engines, a very satisfactory saving was effected, but, when these engines were built for non-condensing service, the result was a positive failure, except in a few rare instances, where the load was nearly constant and the engine properly proportioned and designed for that load.

Unless the amount of power required is so great, and the change in the load so gradual, that a number of units can always be kept in service with nearly a full load upon each unit, the compound-non-condensing automatic cut-off engine is ill-adapted for electrical plants in which there is a great variation between light and full load.

The conditions that have caused the failure of this type of engine under varying loads are the same that have caused the failure of single-cylinder automatic cut-off engines similarly loaded. Before considering them, it is well to state the different methods of distributing steam in these compound engines. There are two distinct methods of distribution: first, where the valve or valves of the high-pressure cylinder are under control of the governor; second, where the valve or valves of both cylinders are under control of the governor. Another dual classification can be made by grouping those engines in which the admission valves are under control of the governor, and those in which both admission and exhaust valves are under this control.

With light loads, the loss due to expansion below the atmosphere is greater than in simple engines, as this loss develops in the low-pressure cylinder, which has a large area and gives a great resistance. Frequently the low-pressure cylinder is converted into a pump, which has to be dragged along by the high-pressure cylinder. As boiler pressures increase, this difficulty is not lessened, because the minimum mean effective pressure that can be obtained without expansion below the atmospheric line increases with the boiler pressure, and at about the same rate as the maximum mean effective pressure, so that the ratio of minimum to maximum mean effective pressure is not reduced for light and heavy loads, as is the case in simple engines. In engines in which valves of both cylinders are under control of the governor, this drag develops in the high-pressure cylinder whenever its terminal pressure falls below the high receiver pressure induced by early cut-off on the low-pressure cylinder.

When the governor controls both the steam and exhaust valves on both cylinders, and the load is light, it is necessary to employ enormously large clearance spaces, into which the steam imprisoned by early compression can be compressed without overstraining the engine. The effect of these large clearance spaces is to maintain a very high terminal pressure in each cylinder, which, with light loads, greatly reduces the chance for the "drag," but, with heavy loads, greatly increases the loss from clearance. In fact, these engines operate with only moderate degrees of expansion, considering the neutralising effect of their large clearance.

By proper treatment of compression, clearance losses can be greatly reduced in compound engines. This is the case in engines in which the governor controls only the admission valves of both cylinders. By proper adjustment of these valves the receiver pressure can be kept nearly constant; with small clearance spaces and a fixed compression, the clearance losses can be kept very small, and become excessive only with very early cut-offs. But, in an engine in which the governor controls the valves of the high-pressure cylinder only, this loss is greatly augmented at light loads, because the high degree of expansion caused by an early cut-off gives a low receiver pressure, and the clearance spaces have to be filled at every stroke with a low back pressure by steam at boiler pressure.

The chief economical advantage of compounding is to reduce the cylinder condensation loss. We have already seen that the difference in temperature between 100 lbs. steam pressure and atmospheric pressure is 126° F. This difference amounts to 154° for 150 lbs. pressure, and 169° for 200 lbs. pressure. By expanding steam through two or more cylinders, this temperature range can be reduced to ½, ⅓, &c., according to the number of cylinders used, provided, however, that the expansion is properly divided in each cylinder. By reducing this temperature range a great reduction can be effected in the cylinder condensation loss.

We have seen that cylinder condensation in a simple engine is proportionately less at a late cut-off than at an early cut-off. This holds true in compound engines; but, whereas, in the simple engine, the late cut-off is uneconomical on account of the low degree of expansion, it becomes economical in the compound engine, as a high degree of expansion is obtained, and at the same time it is unhampered by excessive cylinder condensation.

Under these considerations it can be seen that in an engine in which the steam distribution is controlled by varying the cut-off, and in which light loads are developed by means of early cut-off, it must follow that these early cut-offs induce increase of cylinder condensation losses (and clearance losses), and in that way completely neutralise the object of the compounding.

These are the reasons which render compound non-condensing automatic cut-off engines a failure for variable loads. They can be successfully employed, as we have stated before, only when the load is uniform and the engine properly proportioned for that load.

The mistake of engineers and designers is in assuming that the average automatic expansion gears upon which they have bestowed so much care and attention are suitable for the proper distribution of steam in a non-condensing compound engine. Some of these gears may possess superior advantages for regulation and high speeds, but their advocacy stands in the way of economy and intelligent development of the steam-engine. With their use higher pressures cannot be employed, and they are unsuitable for the more moderate pressures now in vogue.

From the foregoing it appears that automatic expansion gears applied to non-condensing compound engines are inadequate for the proper distribution of steam for varying loads. Mr. Charles T. Porter, the celebrated American engineer, in a paper presented to the American Society of Mechanical Engineers in 1894, said:—"It is clear that, if the variable cut-off had not been already in common use, nothing so unsuitable would have been devised for this purpose." He also said:—"It has appeared to me that an opening presented itself for a large improvement in the direction of economy, by employing a fixed point of cut-off, suitably selected, and regulating by means of a throttling governor."

The writer believes that, where the load is variable, the employment of a throttling governor with a fixed point of cut-off as a method of distributing steam in non-condensing multi-cylinder engines will lead to a satisfactory solution of this rather intricate problem.

In another paper the advantages and disadvantages of such a system of distribution will be set forth. Here it is necessary to state only that this system has been extensively developed in connection with vertical engines in England, directly connected to bi-polar electric generators, and operated at speeds as great as 400 or 500 revolutions per minute. The success of the system is largely due to the efforts of the late Mr. Willans, who was led, after years of experimenting, to select the throttle as an instrument by which to control the well-known high-speed engine bearing his name.

THE MERITS OF THE DIESEL MOTOR.

THE following is taken from the paper presented by Mr. Aimé Witz to the Academy of Science, on the Diesel engine. As several of our readers wish us to publish this paper in its entirety, we comply with their request:—

The cycle of "internal combustion engines" consists of four distinct phases of operation, which are easily described. It begins with adiabatic compression from the atmospheric pressure H until a pressure π, having for its object to raise the temperature of the explosive mixture from t to θ. The second phase consists of a combustion at constant pressure under the same pressure π, during which phase the temperature passes from θ to T; the heat supplied by the stove (source of heat) being equal to $C(T-\theta)$, C being the specific heat of gas under constant pressure. It proceeds then with adiabatic expansion, which brings back the burnt gases to atmospheric pressure, and their temperature to t'. Finally the cycle becomes closed with a renewal of heat which makes the gases contract and re-establishes the initial conditions of temperature and pressure; the removed heat equals $C(t'-t)$ since this latter operation is effected under constant pressure of the atmosphere. Thus the cycle is described by two adiabatic curves and two straight lines parallel to the axes of the volumes.

The efficiency is easily calculated—

$$\rho = \frac{C(T-\theta) - C(t'-t)}{C(T-\theta)} = 1 - \frac{t'-t}{T-\theta}$$

The adiabatic transformations give us—

$$\frac{t}{\theta} = \left(\frac{H}{\pi}\right)^{\frac{\gamma-1}{\gamma}} \text{ and } \frac{t'}{T} = \left(\frac{H}{\pi}\right)^{\frac{\gamma-1}{\gamma}}$$

whence—

$$\frac{t}{\theta} = \frac{t'}{T} = \frac{t'-t}{T-\theta}$$

therefore—

$$\rho = 1 - \frac{t}{\theta}.$$

A Carnot cycle would have given a superior efficiency equal to $1 - \frac{t}{T}$; our cycle has therefore a generic efficiency smaller than the the unit. But at the utmost, this efficiency could have been reached if t had been equal to θ; it is true that then the work would have tended towards zero. The classic cycle of Joule has the same peculiar quality. The work developed grows with the removing of T and θ, but the efficiency of the cycle is independent of the values of T. We see, therefore, that the absolute efficiency remains the same, whatever the work may be; in other words, *the efficiency is the same at full and half load*, a peculiar and valuable property, to which great value is attached.

The power of a motor working on the lines of this cycle would be practically governed by the duration of the combustion and the amount of heat transferred during the first phase of the cycle, which is to say, by the removal of T and θ. Such a motor could have small dimensions, seeing that the area of the cycle is considerable and much larger than that of "explosion" engines; the smoothness of running would be remarkable, seeing that the pressure remains constant during the whole of admission.

It is the value of θ, and consequently the degree of compression, which govern the efficiency of this cycle.

Or let us assume that we could compress the mixture to 250 atmospheres (3,750 lbs. per square inch), when we would have:—

$$\theta = t\ (250)^{0.23} = t\ 3\cdot56$$

and

$$\rho = 1 - \frac{1}{3\cdot56} = 0\cdot719.$$

This extraordinary efficiency is the triumph of "high preliminary compression"; there is no other cause for it.

But one might be contented with a smaller degree of compression; if we assume, say, 35 atmospheres (525 lbs. per square inch), we still find ρ to be something like 0·557.

This is a figure to which the theory would have scarcely accustomed us, and which is much superior to the "efficiency" of the most brilliant steam-engine. The Diesel engine itself, the value of which has been so much exaggerated, does not give a theoretical efficiency superior to the efficiency of such "internal combustion engines of high compression" which we have just above calculated.

The compression of 250 atmospheres (3,750 lbs.) is that of which the German scientific engineer dreamt, that of 35 atmospheres (525 lbs.), is that which he had the rare merit to realise; applied to the classic cycle of "internal combustion engines," they would produce the same miracles as the Diesel engine.

The "internal combustion engine," besides, has the same good features as the new motor, from the point of view of power, elasticity, smallness of dimensions, &c.

Its cycle has even itself a superior advantage, that is, that it can be easily realised, and that it is not perceptibly deformed when one passes from theory to the application of the theory.

The Gardie engine has proved the latter fact. It is, therefore, in the high compression which Mr. Diesel has succeeded in rendering applicable in his engine that one must seek for the cause of the obtained good results.

With respect to the forogoing criticism, we may say that we think there is more than a "practical" evolution to be noticed in this interesting motor.

It has to be borne in mind that in an ordinary gas or oil engine fuel and air are being compressed by the piston on the compression stroke, whilst in the Diesel engine this compression only *affects the air* which, when thereby compressed, meets the fuel, ignites it by the compression heat and *not by external means*; then follows an almost isothermal expansion, since there is almost a constant and slow combustion taking place.

THE PRONY AND PONCELET.

By M. Hospitalier. (From *La Locomotion Automobile*.)

In 1889 the International Congress of Mechanism, held in Paris, at the Conservatoire des Arts et Metiers at the Universal Exhibition, adopted the poncelet of 100 kilogrammetres per second as the industrial unit of power. In spite of the advantages of this metric and decimal unit (of almost the identical size of the electrician's kilowatt), manufacturers continue to make use of a steam H.P. of 75 kilogrammetres per second, a purely empirical unit, obviously copied from the English H.P. so called, in order to be hidden among other English units in a future which, we hope, is near at hand.

Habit and routine, the sloth of intellect, are not the only reasons why the poncelet has met with a rather chilling reception from manufacturers; its chief fault is its being too large for sale. A motor of 4 H.P. is only 3 poncelets, and that suffices in our day, so proud of its civilisation, to kill the most legitimate reform. Grocers sell in pounds (demi-kilogramme) because the published sum is twice as little as if the unit of weight was a kilogramme. The crevettes actually sell at 2 francs the 125 grammes, and the price appears more accessible than if quoted at 16 francs the kilogramme. Electrical energy is sold at 10 centimes per kilowatt per hour—cheaper than gas; if it was tariffed at 1 franc per kilowatt per hour, it would appear to cost more than gas. The standard of light established by M. Violle in 1884 has not been adopted by anyone. The idea of taking as a practical unit (under the name of the "bougie decimale") the twentieth part of the Violle unit was mooted in 1889, and since then all the sellers of light have adopted the bougie decimal.

All our recriminations will serve for nothing, and we will struggle in vain against these relics of barbarism if we cannot profit by the suggestion of employing, in the cycle and automobile industries, a new unit of power of which we are about to show the advantages.

The kilogrammetre per second is too long a name and too small in size; steam H.P. or H.P. of 75 kilogrammetres per second is absurd, as it is neither in the metric system nor in the decimal; the poncelet of 100 kilogrammetres per second is too long. We propose an intermediary unit, the prony of 10 kilogrammetres per second, about the tenth of a poncelet in value, and perceptibly equal to the hectowatt of electricians.

The name "prony" calls to mind that of the inventor of the brake used partly by the power produced by the motors, and we do not know of a better and more appropriate name. The prony very perceptibly represents the power of a man of medium strength operating the pedals. The prony is worth exactly 98·1 watts, or practically 100 watts or 1 hectowatt, which facilitates the transmutation of the results of metric and electrical international units. The prony suppresses ordinary fractions in the designing of motors used for cycles and automobiles. The numbers explaining the power of the automobile motors are generally between 1 and 200, that is to say, very easily handled.

Lastly, an important consideration for engineers, the use of the prony considerably simplifies calculations of the power necessary for the propulsion of a vehicle.

Let P be the power in pronys.
F be the weight of the vehicle in tons.
k be the coefficient of traction in centimes; tan a the gradient in centimes.
v be the speed in metres per second.

Then—

$$P = F\ (k + \text{Tan}\ a)\ v \text{ (pronys).}$$

Example.—A vehicle weighing 1,500 kilogrammes is required to ascend a gradient of 2 per cent. at a speed of 4 metres per second; the coefficient of traction being 3 per cent.

The power necessary to apply to the periphery of the wheel will be:—

$$P = 1\cdot5\ (3 \times 2)\ 4 = 30 \text{ pronys.}$$

If the efficiency of the system is 80 per cent. the power of the motor to give the speed must be:—

$$P' = \frac{30}{\cdot8} = 37\cdot5 \text{ pronys.}$$

If an electric motor is in question it should furnish 37 hectowatts or 3,700 watts. By this example one can see how calculations can be simplified, as the formula we have pointed out does not draw out any superfluous factor to complicate calculations.

Now that the horse is so rapidly losing its importance as motive power it is reasonable to search for a substitute for him by creating a unit more suitable for the actual requirements of the cycle and automobile industries. The prony, such as we have pointed out, seems to us to fill the greater number of the required conditions, and it is with confidence that we submit it to the examination and criticism of our colleagues, and only await more powerful votes in proposing its adoption—or rejection.

The Storage of Petroleum in the Lancashire District.—The correspondent of *The Engineer* at Manchester writes to his paper to the effect that ample provision is being made for developing an important oil trade on the Manchester Ship Canal, large storage tanks having been erected at Mode Wheel by the Manchester Corporation, the Liverpool Storage Company, and Messrs. Bagnall; whilst at Eccles, on the opposite side of the canal, the Anglo-Caucasian Oil Company is erecting large tanks. These four depôts for the storage of oil will cover upwards of 20 acres of ground, and the output for which the Manchester Corporation and the companies already referred to have made arrangements seems to point to a traffic of considerably over 100,000 tons a year. The appliances in connection with the tanks are exceedingly simple and complete, all risk being reduced considerably below the average, and at all the tanks the oil is pumped direct from the tank steamers that come up the canal. As a further provision of safety, the whole of the oil trade will be dealt with below the Mode Wheel Locks, and no ship carrying oil in bulk will at any time enter the Manchester Docks. Other important work at Mode Wheel is a doubling of the sidings' capacity, to meet the requirements of the rapidly growing trade by extending the gridiron, which has now storage for 500 wagons.

THE AUTOMOBILE CLUB OF GREAT BRITAIN.

The following account of the second tour of the Automobile Club of Great Britain has been contributed by a member:—

On Friday, May 27th, there was not a great show of motor-vehicles outside the Club for the start of the Whitsuntide tour, for the reason that several machines were to join us *en route*. However, there were present:—

(a) The Club Wagonette No. I (kindly lent by the Daimler Motor Company) with Mr. E. Instone (as driver), Sir J. R. Somers Vine, C.M.G., Mr. Louis d'Egville, and Mr. Thos. Neale (of New South Wales), as passengers. This Wyley carriage ran splendidly throughout, and was driven most admirably by Mr. Instone, who shows skill and judgment, and avoids the reckless scattering of crowds and general bad form which go so far to check popular admiration for motor-carriages and their patrons.

(b) The Club Wagonette No. II (also lent by the Daimler Motor Company) driven by one of the Company's drivers, who, although very skilful, has a good deal to learn from Mr. Instone as to the proper speeds to use under varying circumstances. The passengers on this wagonette were Mr. R. Phillips, Mr. A. Boult, Mr. C. Cordingley, and Mr. C. G. Harper. The carriage ran without a hitch throughout.

(c) Club Wagonette No. III (the property of the Brighton Motor Company, and driven by their driver, Holland, an experienced and reliable man).—The passengers were Mr. C. K. Townsend, Major Howey (as far as Saxmundham), Mr. Holland Tringham, and the Secretary, Mr. C. Johnson. This wagonette was one of the two first machines built by the Daimler Company. It has run some 5,000 miles, and, except that it wore its india-rubber tyres through and required new ones, it has until now undergone no serious repair. But machinery will not run for ever without renewal. Parts on which there is friction or strain must be replaced from time to time, otherwise disaster must ensue. And in this case disaster resulted, for at Woodbridge a part gave and the old wagonette was left in that horse-loving town while its passengers were taken on in other carriages.

(d) Mr. P. Drummond and Mrs. P. Drummond, of Stirling, were on a Daimler Wyley carriage constructed by Messrs. T. C. Stirling, of Hamilton, N.B., and driven by a Scotch driver, Muir, by name, a thoroughly trustworthy Jehu. This carriage ran perfectly throughout.

(e) Mr. Estcourt (with Mrs. Estcourt and Mr. and Mrs. Michael as passengers) drove his own Daimler carriage. Since he had the holes in the exhaust silencer opened out, Mr. Estcourt has found this carriage has gone far better. It ran well throughout the tour.

(f) Mr. Frederick R. Simms (Vice-Chairman) was driving the Hon. Evelyn Ellis's Daimler with Mr. Harrington Moore (the Hon. Secretary), Mr. Lane, and Mr. Hankinson on board. Except for a broken valve, which caused an hour's delay, this machine ran excellently.

(g) Mr. Cecil Grimshawe joined the tour a short distance out of London on his very smart Daimler sporting car, and ran throughout the tour in most excellent style. No carriage in the Club is better kept or does more credit to the Club than Mr. Grimshawe's. Mr. Grimshawe had as passengers Mr. Elim and his servant.

(h) Mr. Frank Butler (the Hon. Treasurer) started from London late but overtook the party at Hertford. His pretty little Benz $2\frac{8}{10}$ H.P. ran well throughout except for the loss of a part which caused two hours' delay outside Norwich.

(j) Mr. H. Hewetson's $2\frac{8}{10}$ H.P. Benz also did well throughout the tour, except that it was refractory on the journey between Bury St. Edmunds and Norwich. It recovered its character by running from Colchester direct to London on Tuesday, after 4 p.m.

(k) Major-General E. L. England, C.B., ran throughout the tour on his De Dion tricycle, and was usually first to arrive in every town. General England evidently thoroughly understands his machine and treats it well.

(l) Mr. E. Townsend drove a Bollée all through the tour. Mr. Parker, his passenger, is no light weight, but for all that the Bollée went well, and pleased the eye, but certainly not the ear.

(m) The "Lifu" steam luggage van (kindly lent by the Liquid Fuel Company) carried an enormous quantity of baggage throughout the tour, and gave perfect satisfaction.

The 12 vehicles which started with the intention of completing the whole journey of 330 miles have now been dealt with, and it will be seen that all accomplished the distance except one (c).

In addition to the foregoing were:—

(n) Mr. Stopes, who ran on his Benz from his home at Colchester to Norwich and back.

(o) Mr. A. Mulliner (Daimler), who, with Mrs. Mulliner, ran from Northampton and joined the party at Cambridge, leaving it for the north again at Norwich.

(p) The Earl of Shrewsbury and Talbot, who, on his French Daimler, ran as far as Barnet to give the tour a "send off," and returned from there to keep engagements in London.

(q) Mr. Parr on the Headland's Electric Phaeton took Mr. Eyre and his son a short run to see the tour leave London.

(r) Mr. Crampton, on a De Dion, with the Club from Cambridge to Colchester.

(s) Mr. Egerton, on a De Dion, from Newmarket to Saxmundham.

Mr. R. E. Crompton and Mr. Blount rode throughout the tour on bicycles.

Mr. Worby Beaumont joined at Royston, and rode on a bicycle for the remainder of the journey.

The distances covered daily were 62¾, 68¼, 62, 54¾, 40, and 35½ miles respectively.

At Cambridge, Professor Ewing, the University Professor of Mechanics, presided at the Club dinner, and Mr. Oscar Browning (History Lecturer), the Hon. C. S. Rolls, and others, were present as guests of the Club. Professor Ewing rode out to meet the Club vehicles, and was seen timing their speed. In his after-dinner speech he congratulated Mr. Simms on the foundation of a Club which is doing a very useful work by encouraging interest in this new mode of locomotion. He added that he believed that the greatest development of the movement would be in the direction of goods traffic, and that the motor-vehicle would lead in some degree to the solution of one of the great social problems of the time, namely, relieving the congestion of towns by bringing back people into the country.

There was a big gathering of undergraduates to see the departure of the Club on the Saturday morning. The Committee arranged for some of last year's University crew to have seats as far as Newmarket, and took under their special protection Mr. Etherington Smith, the president of the University Boat Club.

These tours are taken very seriously by the Club Committee, who look upon them not only as pleasure trips, but as crusades against prejudice and ignorance, and as the means of proselytising amongst those who do not understand or appreciate the motor.

For instance, at Norwich, Mr. Roger Wallace, Q.C., the chairman, who had attended the Liverpool trials, joined the party, and at the Club dinner there on the Saturday night there were present as guests:—Mr. Deuchar (who presided); the Mayor of Norwich (Mr. Rix Spelman); the Deputy-Mayor (Sir Charles Gilman); Sir Harry Bullard, M.P.; Colonel, Mrs., and Miss Wood (Colonel Wood recently commanded the district); Baron Küssel; Colonel Dawson; and others.

On Whit Sunday Mr. Deuchar and Baron Küssel drove in Mr. Drummond's Daimler to Wroxham and back, and expressed themselves as being delighted with their first experience of "motoring," and on the Monday Mrs. Wood and her two daughters accepted an invitation to accompany the Club a "little way" on the road to Ipswich, and ended by journeying in motor-carriages 34 miles before luncheon. This is the proselytism carried out by this vigourous young Club. Wherever they go they make new friends for the movement. The Ipswich and Chelmsford newspapers give descriptions of their editors' first experiences in motoring. A photograph taken at Norwich shows the "turn out" of vehicles there assembled, viz., nine Daimlers, one Benz (two were out rambling), one Bollée, and four De Dion tricycles.

At Colchester Mr. Stopes (a member) entertained the party at luncheon, and Mr. Crompton (who took the chair on his birthday at the Club dinner at Chelmsford, and who was accorded a great reception by his fellow-members) showed the members over his firm's electric works.

All the members taking part in the tour expressed themselves as being delighted with it. The members have been summoned to attend a meeting on Wednesday, the 15th inst., at 8.30, to consider proposals for further tours, runs, &c., one of the suggested tours for August being the route described in William Black's "Strange Adventures of a Phaeton." This journey would split up well into nine days' travelling of an average of 50 miles a day, as follows:—

	Miles.
(1) London *viâ* Henley to Oxford	58¼
(2) Oxford *viâ* Woodstock to Worcester ..	56¼
(3) Worcester *viâ* Kidderminster to Shrewsbury	47¼
(4) Shrewsbury *viâ* Chester to Liverpool ..	56½
(5) Liverpool *viâ* Preston to Lancaster	52¼
(6) Lancaster *viâ* Kendal and Windermere to Keswick	51½
(7) Keswick *viâ* Penrith to Carlisle	37
(8) Carlisle *viâ* Gretna and Lockerbie to Moffat	40¼
(9) Moffat *viâ* Annandale to Edinburgh.. ..	52
Total	452

Monsieur le Baron de Zuylen de Nyevelt, the President of the Automobile Club de France, has written to Mr. Frederick R. Simms, the Vice-Chairman of the Automobile Club of Great Britain, stating that he will with pleasure place at the disposal of members of the Automobile Club of Great Britain cards of invitation, provided that, in order to comply with the rules, the Chairman of the Automobile Club of Great Britain supplies a list signed by him of members desiring to frequent the Club.

The following members have already notified their intention to leave London on Friday, the 17th instant, to visit in Paris the Exhibition of the Automobile Club de France:—Messrs. Frederick R. Simms (Vice-Chairman), Frank Butler (Hon. Treasurer), C. Harrington Moore (Hon. Secretary), Hon. Cecil Duncombe, Boverton Redwood, and W. Worby Beaumont (Members of the Committee), Drummond, Edge, White, A. Mulliner, A. Bird, B. Blount, Twist, Redfern, and the Secretary. Mr. Roger Wallace, Q.C. (Chairman), will also visit Paris during the course of the Exhibition.

It is proposed to run a Club motor-carriage from the Automobile Club of Great Britain to Ascot on the "Cup" day, and, if not too late in applying for space, an enclosure for the accommodation of members of the Club and their motor-carriages will probably be secured on Henley racecourse during the regatta.

The Spa Concours.—In response to the following invitation, addressed to the President of the Automobile Club, it is proposed that a party of members should leave London for Brussels and Spa on Friday, June 24th:—

To the President of the
Automobile Club of Great Britain.

The Automobile Club of Belgium begs you to invite in its name the members of your Club to assist at the competitions which it is organising at Spa, from June 25th to 30th, and Sunday, July 3rd next, competitions which will commence by the Brussels-Ardenne-Spa Race (June 25th to 26th).

We hope, Mr. President, that members of your Club will do us the honour to assist at, and even take part in, our competitions.

Comte F. de Villegas de Saint-Pierre,
Secretary General.
Comte F. van der Straten-Ponthoz,
President.

Since our May issue was published, the Automobile Club has been making steady progress. In addition to the very successful Whitsuntide tour, which we give an account of above, amongst the new members elected are:—Major H. C. L. Holden, R.A., F.R.S. (Army and Army Club), Major E. W. Howey (East India United Service Club), Messrs. Hugh Wequelin (St. James's and Bachelor's Clubs), Louis d'Egville (Sports Club), J. F. Medina (Automobile Club de France and City of London Club), F. M. Gowan (late North Staffordshire Regiment and Hurlingham Club), J. G. Lorrain (Whitehall Club), H. A. Mavor (Whitehall Club), Alfred Mavor (Whitehall Club), Sydney Tebutt (Royal Yacht Club, Southampton), Edmund Howl (of Derby), John Waddington (of Frant), J. H. Greenhill (Whitehall Club and Royal Ulster Yacht Club), S. H. Terry (Whitehall Club), A. Thompson (Royal Temple Yacht Club), J. M. Gorham (Whitehall Club), D. H. Halpin (Whitehall and Constitutional Clubs), B. Blount (Whitehall and St. Stephen's Clubs), J. Munton Jaffray, J.P. (Raleigh, Baths, &c., Clubs), J. F. Albright (Whitehall Club), H. Heatley (Constitutional Club), A. G. Hermann (Automobile Club of Vienna), &c., &c.

On May 24th Mr. Frederick R. Simms was appointed a Vice-Chairman, and Mr. Frank Butler was appointed Honorary Treasurer of the Club.

The Secretary of the Club notifies us that 300 members having been elected, the Roll of Founder Members is complete, and, in accordance with Rules 40 and 41, only applications for election as an Ordinary Member (annual subscription £3 3*s*., entrance fee £1 1*s*.) or as a Life Member (*i.e.*, a subscriber of not less than £25, who is thus exempt from entrance fee and annual subscription) can now be entertained.

The following further communications have been received by the Secretary of the Automobile Club of Great Britain in respect of the Customs duty upon motor-vehicles entering the various countries temporarily:—

Germany.

Sir,—In reply to your letter of the 26th ultimo, I am instructed by H.M.'s Ambassador to state that from inquiries made on the subject of the duty-free admittance of private motor-vehicles for pleasure purposes and for a limited period only, I am informed that in all probability the said vehicles would be admitted free of all charge at the Custom-house of entry (under paragraph 5, section 5, of the Customs Tariff Law of 1879-85), on a guarantee being there given to the authorities that they are only introduced for travelling purposes, and not for sale.

But in any case, if this were not allowed by the particular Custom-house of entry, it would only be necessary to deposit the amount of the duty that might be fixed, which would then be repaid at whatever place the vehicle again crossed the frontier. This duty would probably be that under No. 15B, and of the Tariff of 8*s*. per 100 kilogrammes (for locomotives), or that under No. 15, c. 2, of £7 10*s*. for a whole vehicle or conveyance.

It is not possible for the Central Customs Authorities of Berlin to take measures to provide beforehand for a free entry all over the Empire, as the Custom-houses of the different States of the "Customs Union" are still, to a certain extent, independent, and the question of a duty-free admittance might be differently viewed and treated in them.

It might be possible to ascertain the exact duty by writing direct to the authorities of whichever Custom-house at which it is proposed to enter the motor-car, under the provisions of a new law only in force since April 1st of this year, and of which I enclose a translation for your guidance.

I am, Sir, your obedient servant,
W. S. H. Gaskell, *Coml. Attaché to Embassy.*

Berlin, *May 10th*, 1898.

Italy.

To the President of the
Automobile Club of Great Britain, London.

You express a wish that the automotors for the members of the Club should be admitted free of all frontier duty when they are introduced temporarily into the kingdom. I hasten to inform you that it is impossible to accede to this request; moreover, our Custom-house regulations do not at present permit of the temporary importation of automotors.

Yours faithfully,
The Director-General.

Rome, *May 10th*, 1898.

Denmark.

Sir,—In answer to your letter of April 26th, I received a letter to-day from the Chief Inspector of Customs, saying that motor-carriages and motor-cycles could be brought into this country free of duty if the Custom authorities are of opinion that the vehicles are brought into the country for the owner's own use, and that they have already been used before. If owner brings his vehicle with him no documents are necessary, but if vehicles are sent and arrived before or after owner's arrival a declaration as to above facts must be produced. The delay in answering is caused by Custom authorities.

I am, Sir, yours faithfully,
SOMERS BOYLE, Capt., *H.M. Consul.*

British Consulate, Copenhagen,
May 12th, 1898.

AUSTRIA.

Sir,—In reply to your letter of the 18th inst., I beg to inform you that private owners of motor-carriages and motor-cycles coming to Austria only for purposes of pleasure, with the intention to leave the country again with their vehicles within a fixed time, have to notify this to the Custom-house on their crossing the frontier, when they will be required to deposit the duty of £7 10*s.* fixed for each carriage, and extra the amount for the machinery as per weight, for which they will receive an official certificate of deposit.

On their leaving the country within the prescribed time, the duty thus deposited will be returned to them against delivery of the official certificate of deposit, and after proper identification of the vehicle, which on entering the country will be provided with an official stamp.

I am, Sir, your obedient servant,
M. FELDSDIARCK, *H.B.M.'s Consul.*

British Consulate General, Vienna,
May 24th, 1898.

BELGIUM.

Sir,—The question contained in your letter of the 18th inst. has been placed before the Customs authorities here, and their reply is as follows:—

"Carriages imported into this country for touring purposes are admitted free *provisionally*, but the amount of the duty must be deposited with the Customs officials at the port of entry against a transit receipt, giving an exact description of the carriage; the deposit can be recovered on production of this receipt, when the travellers leave the country, which need not be by the same route as they entered it. The duration of the tour must not exceed six months."

The Customs duty is fixed at 12 per cent. *ad valorem.*

I am, Sir, yours faithfully,
W. LYDCOTTE, *Acting Consul General.*

British Consulate General, Antwerp,
May 25th, 1898.

REFERRING to the letter from the Director-General of Customs at Paris to the Secretary of the Automobile Club of Great Britain (*see* THE AUTOMOTOR, p. 289, No. 20, May 16th, 1898), stating that Customs dues paid on the introduction of motor-vehicles into France will, if those vehicles are used only for personal purposes during a limited period, be refunded, the Secretary of the Automobile Club has been making enquiries as to what the dues precisely are.

He has sent us the following letter for publication:—

[Translation.] Douanes. Direction de Boulogne,
Boulogne, *June 12th*, 1898.

To Monsieur JOHNSON,
Secretary of the Automobile Club of Great Britain,
4, Whitehall Court, London, S.W.

Sir,—You did me the honour to write to me on the 10th inst. to ask me what are the Customs dues applicable to motor-tricycles and motor-carriages on their entry into France.

Velocipedes, of all sorts, driven by a motor have to pay the tax of ordinary velocipedes on their total weight, including motor.

As to motor-carriages, they belong to the class of the "coaches, properly so called," but their motor is admitted separately under the head of "thermal engines," except in the case where it is impracticable to separate the motor from the carriage; then the whole is taxed as "coaches, properly so called."

You will find hereunder extracts from the table of dues which concern these various articles:—

I. *Velocipedes.*

			francs.	
Minimum tariff			220	per 100 kilog.
General tariff	products of European origin		250	,, ,,
General tariff	products of extra-European origin	imported direct	250	,, ,,
General tariff	products of extra-European origin	imported from European ports	253·60	,, ,,

II. *Coaches, properly so-called.*

			Carriages weighing 125 kilog. or more.	Carriages weighing less than 125 kilog.	
			francs.	francs.	
Minimum tariff			50	120	per 100 kilog.
General tariff	European products		60	150	,, ,,
General tariff	Extra-European products	imported direct	60	150	,, ,,
General tariff	Extra-European products	imported *vià* other ports	63·60	153·60	,, ,,

III. *Thermal Machines.*

			Motors weighing 250 kilog. and over.	Motors weighing less than 250 kilog.	
			francs.	francs.	
Minimum tariff			12	20	per 100 kilog.
General tariff	European products		18	30	,, ,,
General tariff	Extra-European products	imported direct	18	30	,, ,,
General tariff	Extra-European products	imported *vià* other ports	21·60	33·60	,, ,,

The vehicles in question being, as my Administration informed you on April 26th last, admissible by the privilege of deposit, it is on these bases that the total dues to be deposited until the time of re-exportation should be calculated.

I am, Sir, &c.,
THE DIRECTOR.

[A kilogramme = 2·2055 lbs. (avoirdupois); 2 cwt. = (roughly) 101½ kilogrammes.—ED.]

THE Secretary of the Automobile Club of Great Britain also gives us the following information, which may be of service to those who intend to spend their autumn vacation on a motor-vehicle in France or Belgium:—

Particulars concerning the Transport of Motor-Carriages between Newhaven and Dieppe.

Price of Ticket for Single Journey.—A motor-car with four wheels, £4 0*s.* 3*d.* A motor-car with three wheels, £3.

Boat Service.—Motor-carriages would probably be taken by the cargo boat, which starts from Newhaven in the morning between 10 and 2, and from Dieppe in the afternoon. A day's notice should be given to the Superintendent at these ports. It is possible that the Superintendent might arrange to take the carriages by the night passengers' service.

London, Chatham, and Dover Railway.

The rate for taking a motor-car from Dover to Calais is £2 12*s.*, and from Dover to Ostend £3 4*s.* 4*d.*

Self-Charging Motor-Vehicle.—Mr. L. Epstein has recently patented a new electric motor-vehicle, in which he claims to have overcome the difficulties presented by batteries becoming exhausted at a distance from a charging station. It is admitted that it is one of the great drawbacks of electric motor-cars that the batteries require periodical recharging, this necessitating the existence of charging stations, and considerable rough usage of the accumulators in taking them out for charging and putting back in position again. These drawbacks are said to be avoided by the Epstein motor-car, which is self-charging, inasmuch as it is equipped with the necessary apparatus for automatically charging the cells whenever and wherever required, with very little difficulty. The car is equipped with Epstein cells of a special type, and an oil engine, and the motor can be reversed for use as a dynamo for the purpose of charging the cells. The extra equipment is stated to be responsible for an additional weight of only 3 per cent., compared with the ordinary electric motor-car. The weight of a self-charging car, complete, with all equipment and four passengers, comes out at something under 30 cwt. The accumulators weigh 7 cwt., and are considered sufficient for a 60-mile run on ordinary roads. We understand, says the *Electrical Review*, that Mr. Epstein now has one of the cars in course of construction.

NOTICES.

Contributions and articles likely to prove of interest to our readers will receive due attention, but in all cases the name and address of the writer must be given, not necessarily for publication.

All matter intended for publication should reach us not later than the 10th of each month, and be addressed to THE EDITOR OF "THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL," 62, *St. Martin's Lane, London, W.C. Stamped envelope must be sent if the manuscript is required to be returned. The Journal is published the middle of each month.*

All Advertisements should be addressed to F. KING AND CO., LIMITED, 62, *St. Martin's Lane, London, W.C., where Advertising Rates may be had on application.*

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When any difficulty is experienced in procuring the Journal from local newsvendors, intending subscribers can obtain each issue direct from the Publishing Office, by forwarding remittance of 7s. for 12 months' subscription, post free (or at the rate of 7d. per copy).

Most of the back numbers can still be obtained at 6d. per copy, or 7d. per copy post free.

INDEX TO VOL. I

Is Published Free with the October Number.

NOTICE.—A few copies of Volume I, bound complete, can still be supplied at One Guinea net, in consequence of our having purchased some of the numbers out of print, enabling us to make up some more complete sets.

COVERS FOR BINDING VOLUME I

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The Automotor and Horseless Vehicle Journal.

A RECORD AND REVIEW OF APPLIED AUTOMATIC LOCOMOTION.

JUNE 15TH, 1898.

DIARY OF FORTHCOMING EVENTS.

Notices to be included under this heading should reach the Office not later than the 12th of each month.

1898.	
June	International Italian Exhibition of Motor-Vehicles (Turin).
June 10 to 25..	Motor-Vehicle Exhibition, Paris. Automobile Club of France. Sections—(*a*) Automotor vehicles which have given proof of their practical efficiency; (*b*) Industries connected with automobilism; (*c*) Motors adapted for automotors; (*d*) Vehicles adapted for automotors.
June 15 to July 15	International Concours of Automobile Tricycles and Bicycles in connection with the Turin (Italy) Exhibition.
June 25 and 26	Brussels to Spa Race. Organised by the Automobile Club of Belgium.
July 3 to 11 ..	Race from Paris to Amsterdam, under the auspices of the Automobile Club of France.
July 17 to Aug. 1	Lille (France) Motor-Vehicle Exhibition.
July 30 and 31	Automobile Race, Lille to Boulogne.
August 22 to Sept. 3	Engineering, Machinery, and Motor-Car Exhibition. Royal Agricultural Hall, Islington.
Nov. 18 to 26..	Stanley Show of Cycles, Motor-Carriages, &c. Royal Agricultural Hall, Islington.
1899	Race from Paris to St. Petersburg, under the auspices of the Automobile Club of France.
1900	Paris International Exhibition — Great Display of Automotor-Vehicles and Allied Trades.

ANSWERS TO CORRESPONDENTS.

JAS. REEVES (Hampstead).—It is said that the delay in putting more electric cabs on the streets arises from the fact that the Electrical Cab Company are full up with orders from private individuals.

PETROL.—You cannot make a joint with red lead or insertion, the oil will dissolve it. Cut a piece of cardboard the size of the flange and steep it in hot glue; then make your joint. When it leaks tell us.

J. CHALMERS (Coventry).—Perhaps the valves are wrongly set. Turn the fly-wheel over slowly and watch how they act.

X. Y. Z.—Mr. Crowden's address is Motor Works, Leamington.

J. H. (Ayrshire).—Your best plan is to apply to the solicitor who has been conducting the proceedings on behalf of the shareholders. He will no doubt give you full particulars of how the matter stands.

INVENTOR.—Two letters are waiting you here in respect to your advertisement, and will be returned by us if they are not claimed within a few days.

B. H. (Bournbrook).—By applying to the solicitor in the proceedings you may possibly be still in time, seeing that you have not consented to the scheme of reconstruction.

W. DAVY (Royton-on-Tyne).—These small high-speed motors, such as the Bollée and the De Dion, are fitted with two valves only, the admission and exhaust. You will see a good account of these motors in the "Manuel Pratique du Conducteurs d'Automobiles," par Pierre Guédou.

PETROL.—The present price of petrol at Paris is 32 francs per 100 kilolitres, or, retail. 23½ francs per hectolitre. Essence, sp. gr. 700-710, costs 37 francs per 100 kilolitres.

CHAIN (Liverpool).—You will see some excellent examples of the effect of wear and tear on the Renold chain in the London electric cabs. We have often stopped and examined this chain gear. The study is interesting and instructive.

H. W. (Liverpool).—Your letter is much too long for publication inasmuch as the criticism you make is not either in accordance with facts or with engineering science.

THE LIVERPOOL TRIALS.

THERE was a particular fitness in the general order of things in the selection of Liverpool as the place in which the first trials of motor-vehicles intended for heavy traffic should take place. As the cradle of railway locomotion it is only proper that heavy road locomotion on a practical scale should be inaugurated there also. Of the success of the new or rather revived system of transporting goods there can be no question. Not only have these trials demonstrated that loads of 5 tons, or including the vehicle 9 tons, can be moved at an average speed of four miles per hour over some of the steepest and most badly maintained county roads we know of, but that this can be done at a cost far less than can be done by horses drawing the same load. Indeed, it would not be possible to attempt with horses the work done by these vehicles, known officially as Nos. 3 and 5. To haul these loads by horses would require such a number as to make the cost prohibitive, and, secondly, no cart-horse can maintain a mean speed of four miles per hour for 8 or 10 hours continuously, even allowing time for baiting. Liverpool people exhibit a rather childish pride in their no doubt very excellent horses, but what do these animals effect? They laboriously haul loads of 3 or 6 tons at a pace which any respectable tortoise would certainly not call fast, while as for loading up a lorry with 5 tons of bacon or cotton and sending that to a destination 35 miles away, it is by horse haulage a commercial impossibility; such a journey would occupy 17 hours, and require, at least, this number of horses. To have publicly demonstrated that this can be accomplished by steam motor-vehicles with ease and certainty and in about 9 to 10 hours, is an object lesson of the greatest possible value. These trials have, in fact, revealed possibilities about road locomotion which even the most sanguine hardly anticipated. They mark the inauguration of the era of cheap internal transport, and the first to avail themselves of the many advantages of motor-vehicles for the collection and distribution of heavy goods will be, if our information is correct, the railway companies.

Concerning the trials themselves we fully describe these elsewhere. It may possibly be a matter of regret to some that only four vehicles took part in the competition, especially considering the elaborate preparations made. On the other hand, these four vehicles were essentially practical machines, and each and all demonstrated their ability to carry their loads. Throughout the trials there was nothing in the nature of a total breakdown. At no time was there any trouble with either the boilers or machinery. There was at all times ample power at hand, and this was at all times transmitted without any hitch. Even when, owing to the absence of drain-cocks on the cylinders, the low-pressure cylinder cover of No. 1 blew out, this caused no delay whatever. So far, then, we have this salient fact to remember—that as regards the bodies, framing, suspension, transmission gearing, motors, boilers, furnaces, &c., there are several designs which can be regarded as thoroughly practical and reliable. These trials abundantly prove this. The weak point about all the vehicles was the wheels. In the early days of the locomotive the village blacksmith fitted ordinary farm wagon wheels with disastrous results. Some of our designers have fitted the very heaviest lorry wheels as drivers on their motor-vehicles with equally disastrous results. The question of the proper design of wheels is not a difficult one, but we are rather surprised to see that makers cling to the wooden cart wheel, which is merely a roller and not designed for, nor capable of, transmitting power under such severe conditions as obtained during the trials. Messrs. Thornycroft have, however, taken up this wheel problem, and we may be sure that in their hands it will be satisfactorily solved. Had, then, it not been for faulty wheel design, these trials would have been one unqualified success. Of course all sensible people will recognise that this wheel trouble can be remedied. We take some credit for the success of these trials in that the principles of design that we have persistently advocated in THE AUTOMOTOR have been to a very large extent followed by the various competitors, although these features of design were utterly at variance with those advocated by so-called "authorities." Thus we have advocated framing of the highest grade channel steel, fast running motors, water-tube boilers carrying high steam, hard bronze pinions, steel wheels, wide tyres, &c. These features are found prevailing to a greater or less extent in all the vehicles. Yet the "authorities" recommended timber framing, slow-running engines, wooden wheels, and all the other characteristics of an absolutely impossible vehicle. It is this clinging to obsolete precedent that hampers progress in every direction. Had Mr. Thornycroft clung to the traditions of the elders he would never have produced his 30 knot torpedo-boats, and had he followed the advice of the "authorities" on automotor vehicles he would never have produced No. 3. We were also assured that the vehicles would experience a lack of adhesive power. We clearly laid down the conditions under which this would occur some time ago.* These conditions did not obtain at the trials, and so there was no lack of the necessary adhesion. As regards stopping and starting on steep gradients, these vehicles were all that could be desired. They were at all times under perfect control. Their brake power was excellent. In fact, in every respect, save that of the wheels, the trials must be considered a great success.

Although up to a certain point these trials are of very great value as telling us much of the capacities of the various vehicles, yet they were by no means so exhaustive nor so conclusive as they might have been. For instance, neither the brake horse-power nor the draw-bar pull of the vehicles was measured. As regards the former, this is perhaps not so important from the purely commercial point of view, but in any motor it is always desirable to have this information and a trial cannot be considered as possessing much scientific value if steps are not taken to obtain it. As regards the latter, it would have been of practical value to have ascertained what load and at what speed these light locomotives could haul other vehicles as allowed under the Act. It would also have been of great utility to have carried out brake tests in a more scientific manner. The stopping tests were all very well in their way, but it would be useful to know in what distance No. 3 can be stopped on a down grade of 1 in 25. It will thus be seen that the trials do not possess much scientific value as the dynamical issues have not been considered.

It only remains for us to cordially congratulate the Liverpool branch of the S.P.T.A. and their executive, especially the hon. Organising Secretary, Mr. E. Shrapnell Smith, on the completeness of their arrangements and on the general success that deservedly attended their efforts. But how can we find words to express our appreciation of the Lancashire County Council for their provision of such atrocious roads, the worst of which were, with a discrimination that deserves every praise, carefully selected by the executive of the S.P.T.A. as the scene of the trials? Liverpool is a magnificently paved city and an example to many others, but if a heavy steam motor-vehicle can negotiate the disgracefully kept roads of the Lancashire County Council it can with every confidence be relied upon to go anywhere. No trials could have been more severe. We attended Les Poids Lourds trials at Versailles last year and thought the *pavé* was bad enough; but the routes around Versailles are, compared with the Lancashire roads, as asphalte to macadam. Roads such as one sees in Lancashire would not be tolerated in the environs of London, Paris, or Berlin.

In dismissing the subject of these trials, there are some matters which might call for candid criticism, but for the present we leave them.

* *Vide* THE AUTOMOTOR, March, 1898.

THE BRITISH MOTOR SYNDICATE AND GREAT HORSELESS CARRIAGE COMPANY.

WE publish a letter from a correspondent, which is only a sample of several others that we have received, in consequence of the statement in our last issue that the *dissentient* shareholders in the British Motor Syndicate had been settled with. Another gentleman writes from Ayrshire as follows:—"I have been advised to consult you and ask for information regarding a committee of shareholders in the British Motor Syndicate, which has been formed to look after their interests in that unfortunate concern. I had allotted to me 50 shares, on which I paid 10*s.* per share; but, finding that certain statements in the prospectus were misleading, especially the one referring to the price in the market, I bought 50 shares in the market, for which I paid £73, and refused to take up the 50 allotted or to pay the calls on them. I have been lately threatened with an action in Court for recovery, and, being informed that a committee has been formed of those in like circumstances, I would take it as a great favour if you would give me particulars at your earliest convenience concerning it." And, again, another reader from Torquay writes:—"I am an unfortunate holder of a considerable number of Great Horseless Carriage Company shares, being an original allottee. Observing an article on this subject in your journal for May of this year, I should esteem it a favour if you could put me in the way of obtaining some return for the money I have paid—110 shares, £1,100. I did not concur in the recent reconstruction scheme, and have declined to accept the reconstruction terms, as it appeared to me to be throwing good money after bad. At the same time, I have always considered that the way in which the original Company's shareholders were treated was quite unreasonable, and that this good money had been recklessly squandered." Having given the names of the acting solicitors in this matter as requested, we understand from one of our correspondents that the reply he received was to the effect that he was too late in seeking to co-operate with the other shareholders, and would require, therefore, to make the best terms he could for himself. The terms upon which the actions were stopped are that each of the plaintiff shareholders received 20*s.* in debentures for every pound paid by them. Thus fully-paid holders received £3 in debentures for each £1 share held by them, and in addition the Syndicate and Mr. Lawson conjointly and severally covenanted by deed to purchase such debentures at the price of 15*s.* in the pound at any time within a certain period at the option of the holders. Partly-paid holders were relieved of all liability for calls and received debentures to the full amount of the money paid by them, with a guarantee to purchase at rates varying according to the calls they had paid. In addition to this Mr. Lawson has paid the costs of the solicitor who acted for the shareholders. On the whole, considering the great uncertainty of litigation, we cannot help but think the shareholders have been well advised in accepting this settlement, and no doubt if our several correspondents communicate direct with Mr. Lawson, under existing conditions, we should imagine there would be very little difficulty in their exchanging their old shares for new debentures in like manner with the rest of the shareholders.

PETROLEUM AS A FUEL FOR AUTOMOTOR VEHICLES.

By BOVERTON REDWOOD, F.R.S.E.

IT is well known that liquid fuel has for many years been very extensively employed in steam raising, and those who have travelled in the oil-burning steamers on the Caspian Sea, or behind the oil-fired locomotives on the southern Russian railways, have had an opportunity of observing the advantages attaching to the employment of this source of heat. Amongst these advantages are the following:—

(a) Comparatively high thermal efficiency, the evaporative power being, under favourable conditions, practically double that of good steam coal.

(b) Economy of space in stowage, liquid fuel being far less bulky than coal, weight for weight.

(c) Saving of time and labour in handling, oil-tanks being filled far more quickly than coal bunkers, and the manual work inseparable from the employment of solid fuel being almost entirely dispensed with.

(d) Facility of control in firing, the regulation of the heat being effected with remarkable ease in accordance with varying requirements.

It is obvious that these features of superiority must be specially valuable in the use of liquid fuel in vehicles propelled by steam on the highways, and it is not surprising that this combustible agent has been thus applied with remarkable success. By the provision of a suitable regulator the supply of oil to the burner is so controlled that the working pressure of steam is automatically maintained, and blowing off at the safety valve is prevented. It must be admitted that in the construction of the burners difficulty has been experienced in the attainment of satisfactory combustion without the production of noise, and that in this respect there is room for improvement; but this is not a serious defect, especially when the vehicle is employed for commercial purposes, and will not weigh heavily against the important advantage that in using liquid fuel, with an automatic feed, it is not necessary to have a stoker in addition to the driver.

It appears unquestionable that the steam-engine may be utilised as a source of power in road vehicles carrying heavy weights, with the same measure of success as now attends the employment of the Daimler motor for lighter work; and as some description of mineral oil seems to be the ideal fuel, it is necessary that those who are interested in this development of automobilism should preserve an attitude of watchfulness in reference to projected legislation, lest the use of the cheapest and most suitable oils for the purpose should be interfered with.

THE LIVERPOOL TRIALS AND THE LOCAL PRESS.

SPEAKING generally, the Press has exhibited a commendable spirit of impartiality in discussing these, and we note with pleasure that the feelings of rabid hostility, born of intolerance and nursed on ignorance, which have characterised the utterances of not a few London and provincial journals, have now given place to more enlightened views. Journalists, like other preachers, have had to recognise that there are more things or more latent possibilities in various masses of matter than have been contemplated in their philosophy. The motor-vehicle is one, and illumination by electric oscillations is perhaps another. Judging from the general tone of the Press on these and kindred matters, it would seem that very few journalists possess the scientific mind, or realise or appreciate the significance of the conclusion reached by a very great authority to the effect that we are now on the eve of some discoveries in physics that will give mankind the control of hitherto unknown, although suspected, natural forces. It is quite likely that just as an uninstructed public opinion retarded the introduction of railways, and just as an uninformed Press hindered the progress of automobilism, so it is likely that a similar lack of appreciative discrimination on the part of the Press may positively act as a brake upon the wheels of progress, and it may happen in the future that the great power of the Press may be much lessened owing to its inability to lead public opinion in the paths of progress. These conclusions are forced on us as the result of studying the wavering and wobbly attitude of the Press since the passing of the Locomotives on Highways Act. But a little acquaintance with history, a little knowledge of the mechanical history of our own times, would, if honestly reflected on, have saved many a newspaper from stultifying itself. We could mention influential newspapers which a year ago made automobilism the occasion for much silly and hostile diatribe, but which now recognise that it is a practical factor in our social life.

On the other hand there are a few newspapers that from the first have recognised the importance and significance of the new movement. Among these the *Liverpool Daily Post* deserves honourable mention. It has done a great deal in impressing common-sense views upon that very common but very singular person the "man in the street"—without whose co-operation even a Ministry cannot exist. Speaking of these heavy motor trials our contemporary says in its issue of the 28th ult.:—

"Liverpool has had abundant evidence this week that motor-cars have passed the purely experimental stage. . . . . Whether the trial of the lorries will convince business men of their value for the conveyance of heavy goods by road instead of by rail or canal has yet to be seen, but that a self-propelled lorry can do what no horse-drawn vehicle of similar type can accomplish is conclusively demonstrated. . . . . So far as these various matters are concerned, the trials, we believe, have established the fact that self-propelled lorries are much more under control than horse-drawn vehicles, and the success with which they mounted the long and steep hill from the bottom of William Brown Street to the top of Prescot Street places their climbing powers beyond question. On the country roads, on a fairly level or gently undulating surface, about six miles an hour was attained by two very business-like vehicles, one carrying about 2 tons and the other a load of 4 tons. A third lorry carrying 2 tons travelled at a much greater speed, and kept up a velocity of about nine miles an hour. The speed, however, was accompanied by a deafening noise that greatly alarmed horses, whereas the vehicles going at about six miles an hour caused less noise than an ordinary horse-drawn lorry would if it were possible to drive it at that speed. . . . . The trial of these heavy goods self-propelled vehicles, therefore, is a matter of very great importance for Liverpool, and the opinion of practical business men upon them will be awaited with deep interest. It is quite possible that they may entirely revolutionise heavy road traffic, and compete successfully with railways over comparatively short distances."

Tyre or Tire.—Writing to the *Morning Post* of the 31st ult. "Philologus" says:—"Now that all the world is mounted on wheels is it not time that the orthography of this indispensable part of a bicycle were settled? One cannot take up a newspaper without seeing the virtues of so-and-so's 'tyres' extolled. Yet I cannot find any English dictionary which recognises any other spelling except 'tire.' Skeat says: 'Tire, a hoop of iron that binds the fellies of wheels,' and quotes from Phillips, ed. 1706, 'Tire, the ornament of women's heads, the iron band of a cart wheel,' adding, 'Probably identical with tire, a woman's head-dress.' It is surely appropriate that the wheel which so many ladies adorn should have the same 'tire' as the heads of the owners display." We may point out that, notwithstanding the authority of Skeat, custom, the sole arbiter on these questions, has always spelt the hand of a wheel as "tyre." Shakespeare, no mean authority—we quote from the "Universal" edition—always uses "tire" in the sense as pertaining to a woman's head-dress, while the Local Government Board Regulations on the Locomotives on Highways Act also spells the hand of a wheel as "tyre." We submit that this latter spelling is the more correct as it means a definite thing, whereas "tire" means, according to Shakespeare, a head-dress, to fasten, to fix talons on, to be idly employed upon; while "tired" means to be adorned with ribbons. We might thus say a locomotive or motor-vehicle was "tired," meaning either that it was adorned with ribbons or had hands of some material on its wheels. "Tyre" is good English. "Tire" savours of philological agnosticism, and reminds us of those barbarisms much affected by the *Daily Chronicle*, such as "program," "labor," "honor," &c. We prefer "tyre."

THE SECRETARY OF THE SELF-PROPELLED TRAFFIC ASSOCIATION.

AT a recent meeting of the Council of the Society of Accountants and Auditors, Mr. Andrew W. Barr, of 30, Moorgate Street, was unanimously elected President. Mr. Barr is known to our readers owing to his being professionally associated with the Self-Propelled Traffic Association, and his portrait will be found in our special Supplement issued with the present number.

Mr. Barr, who has only been in practice on his own account since 1886, has, before reaching the age of 33, attained the highest honour his profession can confer on him. Everyone who knows Mr. Barr will, we feel sure, agree with us in congratulating him on his elevation to a post of considerable professional importance.

The London Carriers and Automobilism.—Our big carriers are evidently one by one seriously taking up the question of utilising motor-vans for their business, the latest, we notice, being the well-known firm of Messrs. T. M. Fairclough and Sons, who are connected with the Motor-Van Syndicate (Limited), recently formed for the purpose of exploiting motor-vans, both Messrs. M. and A. Fairclough being associated as directors.

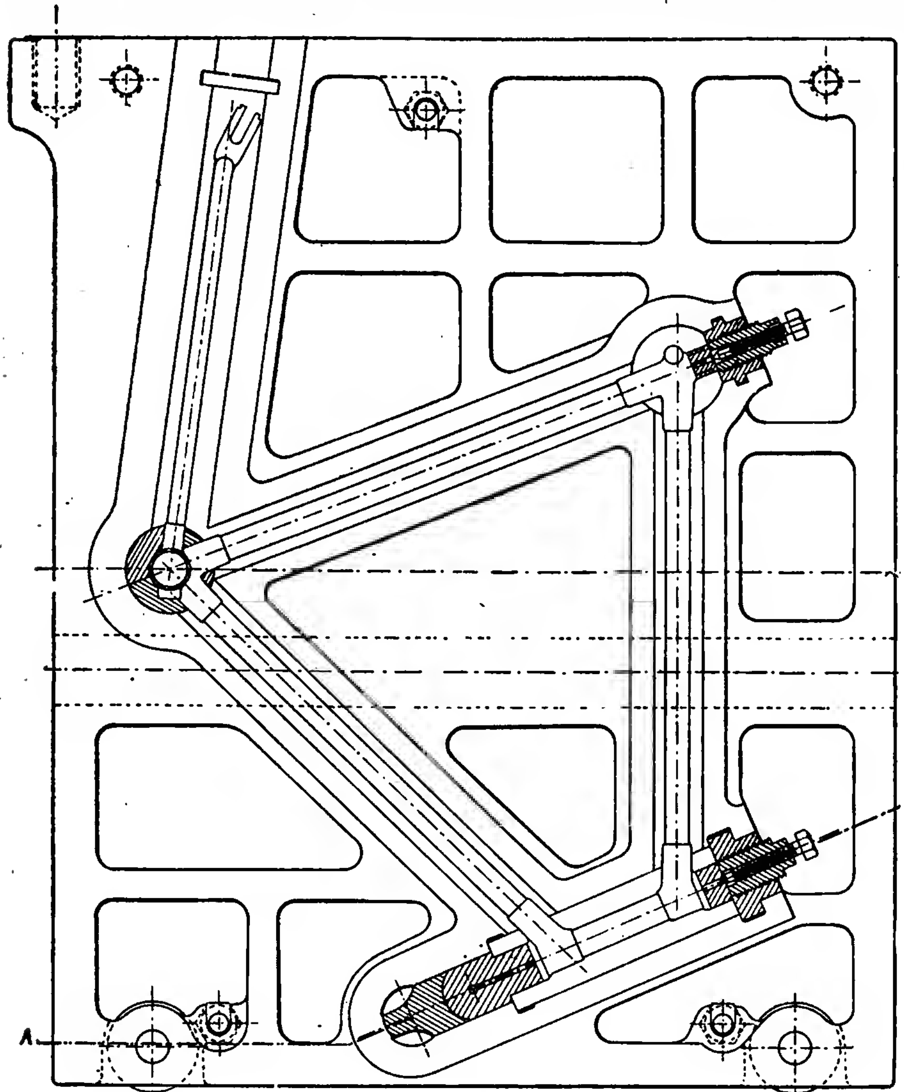
THE Société des Automobilce "Elan" has been formed in Parie with a capital of £800, and the Société Anonyme du Palais de l'Automobile et du Cycle with a capital of £12,000.

HYDRAULIC JOINTING.

OF all the parts that go to make up a steam-engine, or indeed any motor that works by the pressure of gas or fluid, none are less mechanically satisfactory than the joints of the pipes that convey the motive power. Especially is this so in the case of steam pipes; the general practice is to braze on the flanges to each length of piping, but this produces a joint which may or may not be reliable, and if the machine is subjected to much vibration, the chance of a rupture, with possibly disastrous results, is by no means remote. Indeed, many disastrous explosions of steam pipes have occurred during the last few years from the fracture of the pipe at the brazing. Even for lighter work, such as attaching the sockets to cycle frames, brazing is unsatisfactory, as the great heat takes the elasticity out of the metal and causes it to twist. With a view to obtain a perfect mechenical joint, it occurred to Mr. Chas. T Crowden, of Leamington, to form the socket with a series of internal corrugations, and to expand the tube into these. This he ultimetely effected by assembling the parts together and placing the whole within a mould or matrix, and then subjecting the tube to internal hydraulic pressure. The effect of this was to force the metal of the ends of the tube into these internal corrugations, and thereby a very stroug and mechanically perfect joint was obtained. By placing the tube and sockets in a mould as stated, the only place at which the metal could flow was et the ende within the sockets. A joint so formed is homogeneous throughout, and is much stronger than the rest of the tube. The security of the junction is increased by the fact

FIG. 1.—HYDRAULIC JOINTING (General View).

that during the process the outer tube is itself slightly expanded, but well within the limits of elasticity; so that after the internal pressure is removed, and the process is completed, the outer tube, from its elasticity, closely grips the inner tube. Hydraulic pressure up to



INSIDE VIEW

SECTION THROUGH A.B.

FIG. 2.—HYDRAULIC JOINTING.

5 tons to the square inch can be readily applied, but in practice it has been found that with iron or steel tubes of light section very much less than that is sufficient to expand them. Where softer material than steel is used it can be worked with simpler apparatus, and in these cases expensive machinery is not required.

In the latter part of 1896 Mr. Crowden demonstrated the practicability of his process before sever
although he was only working a small
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what is termed hydraulically welded tubes. By means of this plant a cycle frame with
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press and hydraulic ram actuated by a steam piston, 24-inch diameter by 15-inch

FIG. 3.

stroke, it is worked by steam at 120 lbs. pressure per square inch; the total pressure on the piston being about 24 tons. The mould is shown in Fig. 2, with a cycle frame in position. As before said, this mould is made in two halves, one being mounted on a travelling carriage. A frame having been assembled together in one half, the other half is placed against it and clipped to it; steam is then admitted to the cylinder and the piston urged forwards, closely pressing, by means of the toggle levers, the two parts of the mould together; while so held by the piston rod means are provided for securing the levers in this position and the piston is allowed to go back, in order to make its second stroke. A prolongation of the piston rod, 2 inches diameter, forms the plunger or ram of a hydraulic pump, which now comes into action. Water is automatically admitted to the cycle frame, and the orifices in the press closed. Steam is now again admitted to the cylinder, and by means of suitable nozzles a connection is made from the pump barrel to the cycle frame, the water within the latter is put under pressure, and a final pressure of 3½ tons per square inch given. The piston is now allowed to go back, the toggle joint released, and the press opened, by sliding one part back, the cycle frame is taken out completed, ready for the enameller, and another put in its place, the whole operation taking about three minutes.

The completed joint is shown in Fig. 3; as will be seen, the corrugations are given a helical shape, this is to prevent any twisting. The press, as shown in Fig. 2, can only be used for that particular shape of frame, but as these presses are of cast iron there is no difficulty in moulding them to take any desired shape; in this way tubes of any size can be flanged or socketted. There is an extremely wide field for the operation of this process, cycles being but one of the many purposes to which it is applied. We may expect to see it extensively used for the framing of light motor-vehicles.

A DAIMLER MOTOR-VEHICLE FOR HEAVY LOADS.

Our illustration represents a goods wagon for 5 tons load as built by the Daimler Motoren Gesellschaft, of Cannstatt, Germany. The wagon is equipped with a 10 H.P. motor, and has a four-speed gear, besides a reversing motion. The carriage is said to be able to negotiate gradients of 10 per cent. when fully loaded and can go at 12 kilometres (seven miles) per hour on the level road.

From our engraving it will be seen that steering is in front, the motor and regulating mechanisms being arranged above the front axle. A suitably journalled shaft conveys the motion to the rear portion of the wagon acting upon the rear (driving) wheels. The tyres of the latter are notched on the periphery to assist adhesion. The front wheels (steering wheels) are of 960 millimetres (38 inches) diameter, being 100 millimetres (4 inches) wide in the rim, whilst the drivers are of 1,150 millimetres (46 inches) diameter, and 120 millimetres (4¾ inches) wide. Petrol and cooling water are stored below the platform. The seat of the driver is immediately behind the engine, the steering being effected by means of the handwheel visible in the accompanying engraving.

Wagons of this description carrying building materials in the southern districts of the Schwarzwald on a road eight kilometres (five miles) long, having gradients of 7 and 8 per cent., consume per hour 4·5 litres (one gallon) of petrol, which costs just now 70 to 80 pf. (8·4*d.* to 9·6*d.*). With this quantity the empty wagon can run 11 to 12 kilometre hours (6·8 to 7·5 mile hours), whilst it will suffice for eight kilometre hours (five mile hours) when fully loaded, allowances made for the state of the road and gradients encountered.

THE FRENCH LAW OF MOTOR-VEHICLES.

By M. G. Plé.

(From *La Revue de Méchanique.*)

Horses are often frightened when they see an automoter carriage for the first time. The form of these vehicles, the noise they make, the smoke they pour out cause these animals such fright that they rear, swerve on one side, and often cause accidents more or less serious. Are the conductors of automobiles always responsible for accidents? and when are they? A judgment given by the Court of the Seine appears to lay down the exact principles necessary to determine these questions.

The conductor of a horse-drawn carriage was following a course by keeping to the right, when he perceives two automotors coming towards him on the same side of the course as he was himself. In order to leave a free passage the conductor took the left side of the road. At the instant that the automotors arrived near the carriage, the frightened horse swerved aside and upset his master into a ditch, who, in his fall, broke his leg. In consequence of this accident the injured man made a claim for damages against the proprietors of the automotors. He based his demand at the time on the error they had made in keeping to the right of the road, and that conductors of automotors should be made to take greater precautions than ordinarily in consequence of the dangers which this class of vehicle gives rise to.

The Court held at first that the fact of the conductors of the automotors keeping to the right had nothing to do with the accident; that this fact and the injury failed to establish a ground of action, and in effect failed to establish a lien which was necessary in order to establish the responsibility of the defendants. Moreover, they had proved that they had not committed an imprudence; that the automotors were not going at an excessive pace; that they were not making an abnormal noise; that the horse had not shown signs of fright before the accident, and that its movement was made abruptly in the passage of the automotors, that is to say, too late to stop the vehicles; that under these conditions the defendants had not infringed any rules that discretion had imposed in such matters. Consequently the demand was rejected, and the judge did not consider the responsibility rested with the proprietors of the automotors (Civil Court of the Seine, February 16th, 1898).

In order to fix the responsibility of an accident on a person it is necessary for the fault to be committed by him. This principle is applicable to proprietors of automotors as to everyone else. If they cause an accident through going too quickly or not stopping or slackening speed when a horse shows signs of fright, they commit an error of which they must take the consequences. But if the accident is caused through the sudden and unexpected fright of a nervous horse at sight of an object new to him, they cannot be declared responsible. However, as prudence and imprudence are things on which opinion is liable to vary, personal interest, not to mention humane reasons, command proprietors of automotors to exercise extreme care, as they run a risk of incurring grave consequences in the event of it being shown that they in any way omitted to do anything which prudence and common sense would suggest.

Motor-Vehicles and the Police. — The polices authorities at New Scotland Yard have granted a new kind of traffic license. They have been waited upon by a deputation of motor manufacturers, and several types of petroleum motors and omnibuses have been submitted for examination. Some singular tests were applied, says the *Daily Chronicle*, the chief inspector riding by the motor man, and directing operations. These included driving in and out between moving traffic, turning in small circles, and suddenly pulling up short at given signals. Results clearly proved that the motor traffic is quite as safe in London streets for all practical purposes as the present horse-drawn traffic. The outcome has been that Mr. Lawson duly received on Saturday morning (the 4th) an intimation that the Commissioners have decided to license for ordinary carriage work in London the type of motor-vehicles submitted for examination, which included petroleum and Daimler cabs and carriages. It is said that a new type of London omnibus, driven by motor engines, will now follow. It is intended that these buses shall run to and from Brighton daily, calling at all the small towns and villages *en route.* To bring the green fields round London and even sea shores within easy reach by turnpike road will prove an unlooked-for public benefit to the credit of our motor-car inventors.

NOTES OF THE MONTH.

The new Electricab for London will be painted blue with white lines.

The Mechanical Traction Syndicate and the Westralian Motor Company have been wound up.

The lightest tubing ever made is of nickel aluminium, and measures 0·036 inch outside diameter with walls 0·0015 inch thick; 3,000 feet of this tubing weigh only 1 lb. avoirdupois.

A second motor-vehicle has been delivered at Dundee from the makers for the Dundee and District Tramway Company. After a satisfactory trial it was put into service. A third vehicle is expected next week.

We regret to record that Mr. Charles Herbert, manager of the Mannesmann Tube Works, Swansea, committed suicide, on the 6th inst., by leaping from the railway bridge near Llandore Station, falling on the flags in the river below. Excessive overwork is assigned as the cause of the act.

Street car axles are being made at Krupp's works, Essen, with 7 to 8 per cent. of nickel, as are also hollow driving axles for locomotives. In fire-box steel as much as 25 per cent. of nickel is said to be used. Less than 7 per cent. of nickel does not seem to be thought of any value in locomotive axles.

"Furniture moved in our own motor-vans" is the announcement that one enterprising firm make in the Midlands, and another equally enterprising firm of grocers "dispatch all parcels the same day as ordered by motor-van, thus saving the delay and expense of railways and Post Office parcels post."

A new line of omnibuses has been started in London, running from Child's Hill, Hendon, to Oxford Street, while the London General Omnibus Company have, in response to a deputation from local tradesmen, extended the route of some of their Kilburn buses to the Finchley Road, in order to provide better communication between the various parts of Hampstead. Arrangements are also being made to start an electric omnibus line from the Swiss Cottage, running up Fitzjohn's Avenue to a point close to the summit of Hampstead Heath.

The coachmakers and wheelwrights of London are, it is said, trying to arrange for an amalgamation of their forces. There are about 15,000 employed in those branches of trade, only about 1,500 of whom are in union. According to the reports, the rates of wages are so low that they are little better than those paid to unskilled labour, and yet considerable skill is required of men working at those trades. The objects of the federation are to abolish piece-work, establish a minimum wage, and generally to improve the condition of the workers.

Several of the American railway companies are experimenting with nickel steel as a material for locomotive parts, such as piston-rods, stay-bolts, crank-pins, and driving axles. The increased cost is said to be ¾d. per lb. for 3 per cent. nickel steel, as compared with ordinary mild steel; so that the cost of a locomotive having these parts of the new material would not be greatly enhanced, whilst it is hoped to greatly reduce breakages by the change. The use of nickel steel for the framing and wheels of motor-vehicles has been persistently urged in The Automotor.

Handsome gold and silver medals have been awarded by the Edinburgh Cycle Trade Association to Stirling's Motor-Carriages (Limited), and the Beeston Cycle Company (Limited), respectively, in connection with the motor-carriages and motor-tricycles exhibited at the February show of the Association. The medals are large and very handsome.

At the recent meeting of the Horses Committee of the St. Helen's Town Council, Councillor Forster suggested that the committee should consider the advisability of purchasing a couple of steam or electric motors for scavenging work. The motors would probably be found much more economical than horses. Councillor Brown, deputy chairman, said he would be glad to bring the question before the committee.

One of the strongest agricultural associations in Lancashire has been formed for that most important portion of the county comprised between the Lancashire seaboard at Lytham and Bleasdale Hills in the east, sweeping round the outskirts of Preston and including a portion of Clitheroe Union. The society is headed by the principal influential territorial owners of the county, and Lord Derby has signified his acceptance of the presidency, to which he was unanimously invited.

More newspaper science! The *Globe*, in the course of an article on "The Motor's Delay," gives the following explanation of the difficulties of automobilism on roads:—"But the jarring which is set up on a rough macadamised road knocks the machinery to pieces, and if this is strengthened all round it becomes too heavy both in weight and price, *while if a particular bar is made heavy to resist strain, it will break by its own weight.* The condition of our roads is, therefore, the real cause why the automobile has as yet only so narrow a margin of advantage over the horsed vehicle as to make its introduction slow." The italics are ours.

Motor-cars were somowhat in evidence at this year's Derby, and in proof of the rapidity with which the prejudice of the public against these vehicles is being lived down, whore 18 months ago they would have beeu greeted with howls and shouts of derision, it is worth noting that during the whole route there was hardly a voice raised other than to cheer. The Coventry Cross Cycle Company, of 80, Oxford Street, and Coventry, who are generally to the front when any special form of advertisement can be procured, chartered three Daimler vehicles, which ran to Epsom and back without the smallest hitch from first to last.

The Scotch Court, says a writer to the *Times*, with reference to patent case trials, does not allow more than two expert witnesses on each side, it does not permit the introduction of irrelevant matter, and it discourages a practice which has taken root in the English Courts of allowing advocates possessing some scientific attainments to assume the functions of experts instead of confining themselves to law. In cases of doubt or difficulty the judge summons to his assistance a man of science or of practical knowledge in whom he has confidence, and obtains from him definite answers to specific questions framed by the judge himself. We commend the Scotch practice.

Road railways—for such the new tramway lines worked by electricity are—will have a great impetus given to them this year in the number of schemes soon to be put before the Light Railways Commissioners, and in others now formulating. It is proposed to apply for the sanction of a line of this kind to run between London and Oxford, and another, which would really be only two miles longer, although the scheme sounds much more important, is proposed along the old coach road between London and Brighton. Through services would not, of course, be run on these lines, but between such centres, for instance, as Brixton and Croydon, Croydon and Redhill, and so forth.

Electric motor-vehicles are gradually being introduced on the South Side Elevated Railway—Alley Line—at Chicago, to replace the steam locomotives which have hitherto been used. Experiments have been in progress for a long while, and some of the cars are now in service, the trains consisting of four or five cars. The Sprague system is used, in which each car has its own electrical equipment, but all controlled from the front car. This is the last line to make the change to electric traction, and when its engines are taken off there will be no steam locomotives on any of the Chicago elevated railways, but steam locomotives will be used for many years yet on the London underground lines.

THE PARIS-AMSTERDAM RACE.

This race, or race and tour, to Amsterdam has been organised by the Automobile Club de France, and will start from Paris on July 5th. There will be three classes of four-wheeled vehicles, the first class being those carrying two persons, the second those carrying four to five, and the third class those carrying six or more. The motor-cycles will include two classes: those weighing from 100–200 kilogrammes, and those less than 100 kilogrammes. These two classes will again be subdivided into those carrying one or two persons. The following are the programmes for those taking part in the tour and for those racing:—

Touring.

July 5th.—Paris-Reims, *vid* Meaux, La Ferté-sous-Jouarre, Montmirail, Champaubert, Epernay.
„ 6th.—Reims, Rocroy, Fumay, Givet, Dinant, Namur.
„ 7th.—Namur, Liège, Maestricht.
„ 8th.—Maestricht-Nymègue.
„ 9th.—Nymègue-Amsterdam.
„ 10th, 11th.—Stay at Amsterdam and excursion to La Haye.
„ 12th.—Amsterdam-Nymègue.
„ 13th.—Nymègue-Liège.
„ 14th.—Liège, Pepinster, Spa, Trois-Ponts, Houffalize, Arlon, Luxembourg.
„ 15th.—Luxembourg, Longwy, Verdun, Châlons-sur-Marne.
„ 16th.—Châlons-sur-Marne, Paris.

Racing.

July 7th.—Paris-Dinant.
„ 8th.—Dinant-Nymègue.
„ 9th.—Nymègue-Amsterdam.
„ 10th, 11th.—Stay at Amsterdam and excursion to La Haye.
„ 12th.—Amsterdam-Liège.
„ 13th.—Liège, Luxembourg, Verdun.
„ 14th.—Verdun, Châlons, Paris.

An elaborate set of rules has been drawn up, indeed, the Automobile Club apparently like a good number of rules, and in this respect it resembles our Jockey Club and our Yacht Racing Association, and all arrangements made to provide petrol *en route*, effect repairs, accommodation, &c. The trip should prove very interesting and enjoyable.

HORSE AND MOTOR-VEHICLE ACCIDENTS.

Turning Corners.—On the afternoon of June 3rd, as the pony trap of Mr. E. Pearson, J.P., was being driven from Morton House to Gainsbro', a motor-vehicle belonging to Mr. Heinle, a local tradesman, came suddenly around a corner, causing Mr. Pearson's pony to swerve to the opposite side of the road. The pony was thrown down, the trap was damaged, and the driver received a severe shock.

The Dangers of Nervous Horses.—While Colonel Spilling was driving, on the 25th ult., from Casterton to Tukencote in a trap, his horse shied at a passing motor-vehicle and, taking fright, dashed off at a great speed, upsetting the trap and throwing out the occupants. Colonel Spilling was badly hurt and the trap much damaged.

REVIEWS OF BOOKS.

Owing to the great pressure on our space in this issue, we are compelled to hold over our notices of the following works till our July issue:—

"Electro Dynamics: The Direct Current Motor," by Chas. Ashley Corus Wilson, M.A., &c. (Longmans, Green, and Co., Paternoster Row, London). Price 7*s*. 6*d*.

"Lubricants, Oils, and Greases" (Spon and Chamberlain, London and New York). Price 4*s*. 6*d*.

"Acetylene Gas and Calcium Carbide," by G. F. Thompson, Consulting Engineer, Liverpool. (Published by the Author at Liverpool Chambers, Sixteth Street, 1898.)

"Garnet du Chauffeur," par le Comte de la Valette (Paris: Riberre et Fils, Éditeurs, 15, Rue Grevier-Saint-Lazare, 1898).

The Engineering Magazine, Cassier's Magazine, La Revue Mechanique, &c.

CATALOGUES.

A brightly written and copiously illustrated catalogue of the "Monarch" marine and stationary gas and gasoline engine has been sent us by the makers, the Grand Rapids Gas Engine and Yacht Company, of Grand Rapids, Michigan, U.S.A., whose agent on this side is Mr. A. Evans, of 107, Wool Exchange, Coleman Street, London. For all purposes to which light oil-motors are applied the "Monarch" seems, from the numerous testimonials given, to answer admirably, while the prices are such as should lead to an extensive business. For launch and small yacht propulsion the motor appears to be well designed and of very moderate weight. It, of course, works on the Beau de Rochas cycle, but its valve motion seems to possess some improved features.

We have also received:—*The Journal of the Society of Arts, The Indian Engineer, Industries and Iron, The Practical Engineer, Coach-Builders' and Wheelwrights' Art Journal, The Journal of Acetylene Gas Lighting, Knowledge, Machinery Market Review, The London Chamber of Commerce Journal, Indiarubber World, Cyclist, Scottish Wheel, Irish Field, The Yachting World, The Engineering Magazine, La Revue de Méchanique, La Locomotion Automobile, La France Automobile, L'Industrie Velocipédique et Automobile, L'Automobile Illustré, La Moniteur Automobile, La Revue des Transports Parisiens, Les Sports, L'Energie Électrique, Der Motorwagen, Samokat, Horseless Age, American Wheelman, The Motocycle, Australasian Coach-Builder and Saddler*, &c., &c.

THE BRUSSELS-SPA MEETING.

This meeting has been organised by the Belgian Automobile Club and it will commence on June 25th. On this and the next day the motor-vehicles will run from Brussels to Spa in two stages. There will be seven prizes for voitures and the same number for motor-cycles, ranging from 2,500 francs and a gilt medal for the winner in the former and from 500 francs for the winner in the latter. There are also numerous other competitions in which large money prizes, medals, &c., are offered, including prizes to the most suitable vehicles for touring, country service, &c. The race from Brussels to Spa is confined to amateur as distinguished from professional drivers. Owing to the legal regulations as to speed it would not appear that much in the nature of racing, as understood in France, can be accomplished.

On the 27th and following days there will be held at the Brussels Exhibition various receptions, banquets, &c. On the 29th the prizes will be presented, including two from Sir David Salomons, President of the S.P.T.A., one of 300 and one of 200 francs for the most elegant vehicle. On July 3rd there will be a race for motor-cycles, in connection with which prizes of 1,000 francs will be awarded.

THE CAIL MOTOR.

M. EDOUARD CAIL, of the Société Anonyme d'Automobilism, has endeavoured to deal with the important problem of vibration in motor-vehicles, and with a view of lessening this vibration and also to improve the carburisation of the air forming part of the charge to the cylinders he has designed a motor which we illustrate in the accompanying drawings. Fig. 1 is a sectional elevation and Fig. 2 a horizontal cross section on line 1—2 of Fig. 1, of what is termed an equilibrated motor, according to this invention, while Fig. 3 is a central longitudinal section of the carburettor.

The motor comprises several juxtaposed cylinders, the one illustrated by way of example having two cylinders, A and A^1, independent of each other and mounted on the same casing, B, which serves as a bed plate. This casing carries the bearings receiving the journals of the crank-shafts, C and C^1, provided with balance weights, D and D^1, and driven by rods, E and E^1, respectively connected to the pistons, F and F^1. On the cranks, C and C^1, on the opposite side to the balance weights, are mounted cylindrical toothed wheels, G and

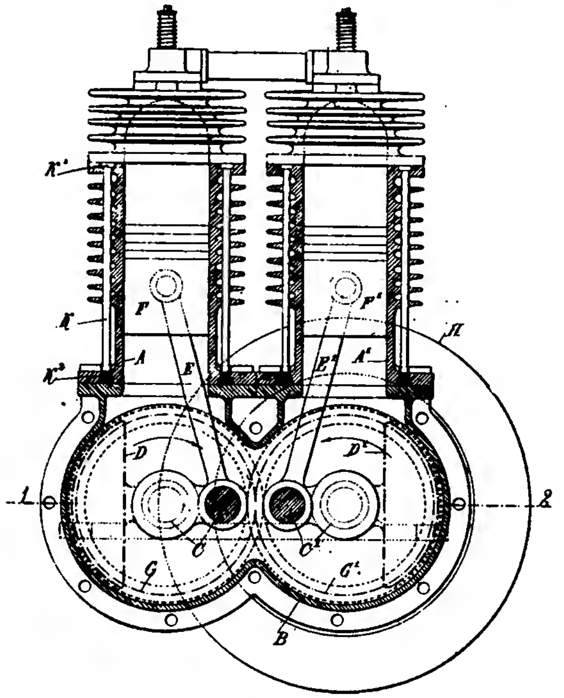

FIG. 1.—VERTICAL SECTION.

G^1, of equal size. All these parts—cranks, balance weights, and gears—are enclosed in the casing, B, where they work in oil. Only one of the crank-shafts, say C^1, carries the fly wheel, H, and at the other end, at I^1, the ignition mechanism for the cylinder, A^1. The other crank-shaft, C, only carries, at I, the ignition mechanism for its cylinder, A. Each cylinder has a separate valve gear similar, like the ignition devices, to those of ordinary motors. The cylinder walls, A and A^1, are very thin and strengthened by ties, K, the heads, K^1, of which are let in into the upper flanges of the cylinders, the other ends being screw-threaded for receiving nuts, K^2, sunk in the opposite flanges, these nuts being suitably tightened to stretch the ties, K. A sufficient number of such ties considerably strengthen the cylinders and enables the latter to be made much thinner, thus considerably reducing the weight of the motor.

The cranks, C and C^1, are opposite each other and rotate in the opposite directions owing to the engagement of the toothed wheels, G and G^1. Each piston, F and F^1, completes a four-stroke cycle, and the two cycles are so performed relatively to each other as to effect one explosion for each revolution of the fly wheel. The pistons have the same advance movement, that is to say, they move together and when the explosion acts, say on F^1, the piston, F, is drawing in its charge and *vice versâ*, which is easily obtained by suitably arranging the valve gear. In this way, it is claimed, the shocks produced by the explosion or compression of gases on one of the pistons are compensated for by the shocks on the other piston, which act in the opposite direction—a rather questionable assumption. The momenta of the two balance weights, D and D^1, are added to the force of the explosion, the result being, we are told, a complete suppression of vibrations.

The carburettor for this motor comprises a chamber, *a*, to which oil is supplied through a nozzle, *b*, ending in a capillary orifice, *b*^{1}, which may be closed by the point of a rod, *c*. This rod can move in a passage made for the purpose in the wall of the chamber, *a*, and is under the influence of a spring, *c*^{1}, which always tends to hold it against one of the ends of a lever, *d*, whose other end carries a float, *e*, which may be lowered from the outside by pressing on a spring knob arranged for the purpose on the cover of the chamber, *a*. The

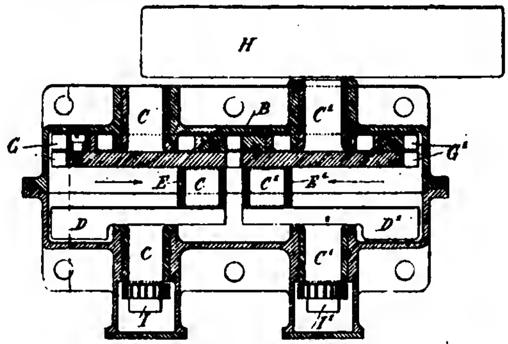

FIG. 2.—HORIZONTAL SECTION ON LINE 1—2.

oil passes through the conduits, *n n*^{1}, to a capillary orifice, *n*^{2}, at a small distance above which there is a disc, O, arranged like the orifice, *n*^{2}, in the centre of the chamber, *l*, communicating on one side with a hot-air supply pipe, Q, and on the other side with a suction pipe, R, leading to the cylinders, A and A^1 (Figs. 1 and 2), and with a pipe, S, opening into the atmosphere. A cock or plug, T, which can be operated from the outside by means of a small lever, *t*, can partly or entirely close the opening through which the pipe, R, communicates with the chamber, *l*.

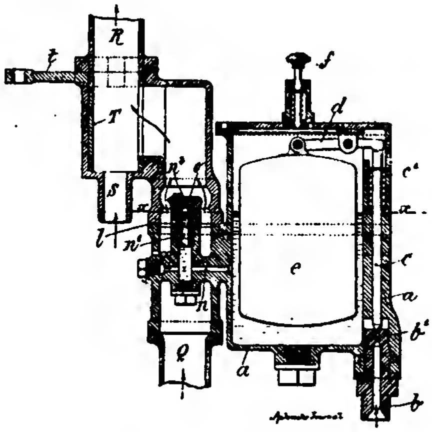

FIG. 3.—SECTION OF CARBURETTOR.

The oil is always maintained at a suitable level, X—X. When the engine is to be started, the fly wheel, H, is rotated as usual and the knob, *f*, is pressed so as to sufficiently lower the float, *e*. The result is that the level of the carburetted liquid in the chamber, *a*, and conduit, *n*^{1}, rises and the oil escapes in the shape of a very thin sheet under the disc, o. During the suction period the air entering by the pipe, Q, takes up the liquid thus divided, becomes suitably carburetted, and the mixture passes to the cylinders through the pipe, R, together with the cold air drawn in through the branch, S. When the explosion takes place the knob, *f*, is released and the suction produced by the piston draws in the oil through the opening, *n*^{2}, under the disc, o, where it mixes with the hot air arriving through the branch, Q, and the same operations are repeated as described. When the level of the oil sinks the float, *e*, descends and turns the lever, *d*. The rod, *c*, rises under the influence of the spring, c^1, its point opens the passage, b^1, through which the liquid enters the chamber, *a*, which is arranged lower than the supply tank which communicates with the branch, *b*. When the level rises the float, *e*, also rises, the lever, *d*, lowers the point of the rod, *c*, into the passage, b^1, and shuts off the supply of oil to the chamber, *a*.

THE PARIS MOTOR-CAB COMPETITION.

It is not too much to say that in Paris, as in London, the public are heartily sick of the typical cabman. For generations this individual has been tolerated as a necessary nuisance, and he has taken full advantage of the position. In both cities, and, for that matter, in nearly every city, he exhibits the same characteristics. Horsy and coarse in his general behaviour, he is abjectly civil to those who, careless of money, pay him not less than twice or thrice his proper fare, but a bully of the first order to women and defenceless persons, from whom he will endeavour to extort as much as possible. He is one of the few tradesmen who deem themselves affronted by the tender of a legal fare. In his driving, especially in Paris, he is often criminally reckless, and in London it is only by a very necessary and wholesome police supervision that he is restrained at all. The cab, too, is like its driver—an uncomfortable but necessary nuisance; both are now, thanks to the advance of automobilism, in the course of being improved off the face of the earth, but the process has only just begun. In Paris, so rapid has been the growth of automobilism, and so popular are motor-vehicles, by reason of their greater safety and comfort, that the ordinary voiture is likely to be, within the next few years, wholly eliminated from the streets. Apart from the reasons we have mentioned as accounting for the popularity of the motor-vehicle, there are two others. Only fairly wealthy companies can afford to run them on commercial lines; this means that the charges and earnings are fixed on commercial principles. It also means that the driver or conductor becomes the servant of the company owning the vehicles, and hence can be made amenable to the civilising influences of discipline and good behaviour. We have a notable instance of this in our London omnibuses, the conductors, as a rule, being very civil and well behaved men. Again, some skill is required, or rather skill demanding a higher order of intelligence is required of the driver of a motor-vehicle; this means that instead of a hulking, horsy person, smelling, speaking, and thinking of the stable, a distinctly superior person, and more reliable, has to be employed. For these reasons it is not surprising that Parisians favour motor-vehicles so much.

In order to select types most suitable for the Paris traffic, the French Automobile Club instituted a competition which, at the time of writing, is in progress. A strong Committee was appointed to arrange the details, consisting of MM. Bixio, Monmerqué, Jeantaud, Baron Rogniat, Hospitalier, Comte de la Valette, Comte de Chasseloup-Laubat, Thévin et Houry, Solignac et Eschwège.

It was decided that the competition should embrace a period of 12 days, commencing on June 1st and terminating on the 12th. The vehicles were required to traverse Paris and its environs in various directions, and to ascend the steepest gradients, the steepest, we understand, being 1 in 15. Each vehicle was required to cover a distance of about 36 miles each day. The Judging Committee was required to pay particular regard to the working cost of a journey of about 36 miles as a minimum in a day of 16 hours; also comfort, ease of manipulation, frequency of replenishing the source of motive power, and the facility for repairs were points to which they had to pay special attention. The vehicles were classed as under:—

1st Class.—(*a*) Closed vehicles for two persons.
(*b*) Open vehicles for two persons, but fitted with a hood.
(*c*) Vehicles for two persons, that can be readily made open or closed.
2nd Class.—(*a*) Closed vehicles for four persons, with roof for carrying 66 lbs. of baggage.
(*b*) Open vehicles for four persons, fitted with hood.
3rd Class.—Closed vehicles for six persons, with roof for carrying 66 lbs. of baggage.

The rules for the construction of the vehicles were very stringent, and, needless to say, the police requirements had to be scrupulously observed. In Paris the speed was not to exceed 12 miles per hour. Official observers were appointed to accompany each vehicle and take notes of the proceedings. Arrangements were made for recharging the batteries of those vehicles using electricity as the motive power; these charging stations were under the control of special commissioners appointed by the Automobile Club. At the Clichy Central Station the charge for current was 0·30 franc per kilowatt. In order to determine the amount of current, &c., taken by each vehicle a special jury was formed, consisting of six members of the Automobile Club and of six persons appointed by the competitors. Each competitor was required to furnish particulars as to the voltage necessary for recharging; whether the current required was constant or intermittent; time required for recharging, &c.; whether the vehicle could perform each day's run without recharging, &c. Each vehicle was required to be furnished with a tested ammeter and voltmeter.

The depôt was situated at the corner of the Rue de Courcelles and the Quai Michelet. The first day's run on June 1st was devoted to obtaining data as to resistance to traction and consumption trials. It was arranged so that the batteries should be weighed either on the day or on the last day, at the option of the competitors. On the last day—the 12th—there was a procession of vehicles to Versailles, returning *viâ* Longchamps. Prizes of 2,000 francs were given by the General Cab Company of Paris and of 1,000 francs by the Association of Cabowners.

It goes without saying that the competition was entirely between petrol or spirit motors and storage batteries supplying current to electrical motors. In all 25 vehicles were entered as will be seen from the following table:—

—	Makers.	Type.	Method of Propulsion.
1	Krieger	Coupé ..	Electricity.
2	"	Victoria ..	"
3	"	Tractor ..	"
4	Panhard-Levassor	Coupé ..	Petrol.
5	"	Victoria ..	"
6	"	Landau ..	"
7	"	Fiacre, roofed.	"
8	"	Omnibus ..	"
9	Prétot	Tractor ..	"
10	Cie. franç. de Voitures Electromobiles	Coupé ..	Electricity.
11	" " "	Victoria ..	"
12	Société des Automobiles Peugeot	Coupé ..	Petrol.
13	Cie. Gle. des Transports Automobiles	—	—
14	Brùlé & Cie.	Cab	Petrol.
15	Cie. Gle. des Automobiles ..	—	—
16	Krieger	Coupé ..	Electricity.
17	Cie. Gle. des Voitures a Paris ..	" ..	"
18	" " " ..	Victoria ..	"
19	Agence générale des Automobiles	Coupé ..	Petrol.
20	Doré	" ..	Electricity.
21	Jeanteaud	" ..	"
22	"	Mylord ..	"
23	"	Coupé ..	"
24	"	Landaulet ..	"
25	"	Drojski ..	"
26	"	Cab avec, seat behind	"

Of the 15 vehicles but 12 put in an appearance. Eleven of these were electrically driven, all of which were fitted with the Fulmen accumulator, of which a long and interesting description appeared in the last number of THE AUTOMOTOR.

Very great surprise was experienced that only one petrol motor-vehicle appeared to take part in the trials, this was a Peugeot cab. The competition hence resolved itself into a test of various types of electric cabs. The reason for the withdrawal of the makers of petrol motors is stated to be that the Paris cab companies, after exhaustively testing various types of vehicles propelled by the latter means, have concluded that for, at any rate, cab service in the city petrol motors are unsuitable, by reason of the heat, smell, and vibration to which they are liable, especially in the hands of unskilful drivers. This decision will come as a serious blow to those who look forward to the employment of petrol cabs in London. On the other hand, the great improvements that are constantly being made in storage cells, the extension of electric-light stations, and the continual diminution in the price of current, coupled with the freedom from vibration, the absence of noise, heat, and smell, all point to the electric cab as the most suitable motor-vehicle for town service. For country and private use the petrol motor has, however, the field to itself. This conclusion is of far-reaching importance, and deserves the most serious attention of all interested in automobilism.

The data obtained of the power consumed in the electric cabs is very valuable, as throwing considerable light upon the rather debated question as to the power necessary to propel vehicles. Thus the Krieger No. 1 weighed, in running order, with three persons and 150 lbs. of luggage, 2,992 lbs. On the flat, on wood pavement, the current was 20 ampères at an E.M.F. of 80 volts; on asphalte the current was 15 ampères; and on macadam 26 ampères. On a steep gradient with macadam the speed was 3·6 miles per hour and the current 56 ampères at 85 volts E.M.F. The total consumption of energy for the route of 36 miles, and a very hilly one with indifferent roads, was 8 kilowatts. In our next issue we hope to describe these trials more fully.

The trials at the time of writing are in full progress, and all the vehicles are, so our Paris Correspondent advises, behaving remarkably well, notwithstanding the very severe conditions of the tests. The report will take quite a month to prepare, so, as with our own competition, judgment must be suspended for the present.

THE WORK DONE IN HAMMERING.

MR. CH. FREMONT has recently contributed to the "Proceedings" of the French Society of Civil Engineers the results of some very interesting observations on the work done by hammer-men in riveting or at the forge. By means of kinematographs he was able to trace the full line of travel of the hammer in different cases, and to calculate the work done with considerable accuracy. The rivet hammers used weighed from 3·3 lbs. to 3·7 lbs. each, or 4·4 lbs. with handle included. Completing the head was done with hammers weighing 9·9 lbs. to 11 lbs. each, these being used either swung or raised. The photographs showed that on the rise the hammer moves slowly, but rapidly increases in speed on its descent. Using heavy hammers without swinging them, a good striker makes 12 blows in 15 seconds, and does in this time 2,386 foot-pounds of work or 159 foot-pounds per second. This rate cannot, however, be maintained, and if the periods of rest are few and short, as in horse-shoe making, the rate of work falls to 108 or 115 foot-pounds per second.

On the other hand, an exceptionally good man can for a short period work at the rate of 202 foot-pounds per second. When in place of the hammer having a movement of a quadrant only, it is swung the full circle, fewer blows are struck per minute, but the work done by each blow is greater. Thus, with a 15·4-lb. hammer about nine blows would be struck in 15 seconds, each of which would accomplish 231 foot-pounds of work; but the rate of working falls to 137·4 foot-pounds per second. Striking a side instead of a down blow, an ordinary man not specially accustomed to such work strikes 12 blows in 15 seconds with a heavy sledge, each of which is equivalent to from 145 to 149 foot-pounds, and the rate of work is 123 foot-pounds per second. With riveters accustomed to strike in this fashion, about 10 per cent. better results are obtained. Usually, however, they use a lighter sledge, weighing about 10 lbs., and with this can strike 13 to 14 blows in 15 seconds, doing 108 foot-pounds per second. Swinging the sledge, the number of blows falls to 10 in 15 seconds, but the rate of work is unaltered, owing to the blows being heavier.

When striking on a snap, the rate of work is 20 per cent. less. The hand-hammers used by riveters weigh 4 to 4½ lbs. each, and the work done per blow is 58 to 65 foot-pounds per second, four blows being struck in five seconds. Smiths using a 5½-lb. hammer strike one blow per second, and do work at the rate of 72 foot-pounds per second. In a shoeing forge the results are about 20 per cent. better. In general, it was found that with hammers weighing from 2 to 15 lbs. the work done was very uniformly equivalent to that due to a fall from a height of 13½ feet.

AN automobile club has been founded at Amiens on the initiative of M. Berson.

DOINGS OF PUBLIC COMPANIES.

"The Referee" Automatic Cycle Pump Company.

THE statutory meeting of this Company was held, on the 20th ultimo, at the offices, 4, Ludgate Circus, E.C. The directors, Mr. J. Adams, Mr. J. Cuthbertson, Mr. E. H. Neville, and Mr. J. B. Boyle, were in attendance.

The CHAIRMAN reported that the Company possessed a working capital of £6,500, and in addition owned the patents which had all been completed in France, Germany, Belgium, and Canada, and on these no liability in any way existed. The Company had not as yet parted with any of its foreign patents, though offers had been received for France, Austria, Australia, Canada, &c. The terms which the directors insisted on were in all cases a cash payment of not less than £1,000, and 25 per cent. of the shares in any Company to be formed, and they had obtained these terms in most cases. The contract for making the pumps had been placed with an English firm. Over 1,000 orders for pumps were now on the books for delivery, and 5,000 pumps were at the works being fitted, so that now there would be a continuity of supply and no delay in supplying customers. Inquiry had been made by a new firm who had introduced a pneumatic carriage wheel for a supply of pumps to them, and the development of the business would undoubtedly extend to all classes of vehicles, including motor-cars. Evidence of the utility and demand for the pumps was shown by inquiries which had been received from St. Petersburg, Canada, India, China, and, in fact, all over the world. Industry on the part of the directors had not been wanting, and the shareholders could rely on the best results attending their efforts.

Metropolitan District Railway Company.

THE QUESTION OF ELECTRIC TRACTION.

A SPECIAL general meeting of the proprietors of the Company was held, on May 17th, at the Westminster Palace Hotel, S.W., Mr. James Staats Forbes presiding, for the purpose of submitting certain Bills now pending in Parliament.

The CHAIRMAN said the first Bill referred to in the notice convening the meeting was entitled "A Bill for conferring further powers upon the Metropolitan Railway Company in relation to their own undertaking, and for the ventilation of their railway, and upon that Company and the Metropolitan District Railway Company in relation to the working of their undertakings by electrical power, and upon those companies and the South Eastern Railway Company with respect to certain lands at Cannon Street; and for other purposes." This Bill contained clauses which affected the District Railway, and it could not pass through Parliament until the proprietors had sanctioned it in respect of those particular clauses. In the early part of last year they passed two or three Bills, which were subsequently submitted to Parliament and approved. One of these gave them power, whenever the time was convenient and the method sufficiently developed, to apply certain funds of the Company for the purpose of working by electricity the railways of the Inner Circle. The Metropolitan Railway Company was applying for similar power, and, of course, the District Company could not dissociate itself from that Company in respect to electrical communication—they were bound to work in harmony. The clauses in the Bill affecting the District Company were Nos. 24 and 38. The former empowered the Metropolitan and District Companies to enter into agreements as to working of traffic by and supply of electrical power, and the latter empowered the South Eastern Railway Company to grant and the Metropolitan and District Companies to hold a lease of the portion of the forecourt of the Cannon Street Station of the South Eastern Company which was occupied by so much of the station and works of the Metropolitan and District Companies as was above or upon the surface of the forecourt. As the result of much negotiation and the award of an eminent judge the claims of the South Eastern Company had been settled, and would take the form of a lease of the land upon which the station stood, in respect of certain financial payments by the two underground companies. Of course the adoption of electricity was a matter they could not go into with absolute indifference as to the question of cost. A good deal, however, was now known about this form of traction. It had its advantages and its disadvantages; but the proprietors decided as far back as February last year that it was a matter they ought to be prepared to face at the right moment. Their idea was that £500,000 would be extremely well spent in adapting their railway to electrical traction over that particular part of it which he had mentioned, which was crowded with traffic, and so much of which was incapable of anything but very imperfect ventilation. They were instructed by very eminent authorities that the financial burden cast on the two companies would be extremely moderate in comparison with the great advantages to be secured not only by getting rid of many of the offensive qualities of the air in the tunnels, but also in the saving in the cost of traction, which they were advised would be considerable. The matter was one demanding some care, and they naturally wished to be in the hands of perfectly responsible engineers of eminence. In Sir J. Wolfe Barry, a man of considerable experience, who had advised the Company almost from its inception, and Mr. Preece, the electrician of the Post Office, and one of the most distinguished members of his profession, they had thought well to vest the preliminary inquiries. Those gentlemen were now concerned in the matter, and the directors would not proceed until they were assured by the report and recommendations of those gentlemen that it was safe to do so. They were gradually gaining experience in the matter of electrical traction. The greatest enterprise of the kind yet approaching to anything like development was the Central London Railway. They knew a little about the question from what had been done on the City and South London line and the Liverpool Overhead Railway, but the Central London Railway, which would be running by the end of this year or the beginning of next year, would doubtless open their eyes to a good many things. The experience of that Company would be very useful to the District and Metropolitan Companies. The Chairman then moved the approval of the Bill in so far as it affected the Company.

Lord Gort seconded the motion, and it was agreed to.

The Chairman explained that there was another Bill down for consideration relating to the Whitechapel and Bow Railway, empowering the District Railway and the London, Tilbury, and Southend Railway to subscribe to it; but the Bill was *in nubibus*, and therefore the consideration of the clauses affecting the District Company would have to be postponed. They would accordingly adjourn the consideration of that Bill until Thursday, June 9th.

Motor Manufacturing Company (Limited).

The first ordinary general meeting of this Company was held on the 17th ultimo, at Winchester House, Old Broad Street, E.C., Mr. John H. Gretton, presiding.

The Secretary (Mr. Alfred Burgess) having read the notice convening the meeting,

The Chairman said:—I think I shall be able to show you to-day that we have laid the foundation of a business which will, I think, be of an extensive character, and one which, I hope and believe, will be very profitable. I daresay you will agree with me that it will not be necessary to go back over the history of what took place in the past, except, perhaps, to contrast the conditions which prevailed previously with those which exist now. You are aware that under the old condition of affairs your Company only had the right to use patents which had been granted some time ago, and it was not entitled to use improvements upon those patents. Excluded from the rights which your Company enjoyed were the vehicles which, if I may use the expression, are practically at the present moment in fashion, namely, the Daimler motors on the one hand, and vehicles such as motor tricycles and bicycles on the other hand. Under the new condition of affairs your Company has the right to use all the patents of the British Motor Company in existence or which may be taken out in the future, together with all improvements connected therewith, and included in the rights which you possess are the rights to make Daimler motors, and also to manufacture the tricycles and bicycles over which the British Motor Company has rights, and if it purchases or becomes possessed of any other patents your Company will have the right to use all those patents. Then you have for working capital the considerable sum of £50,000, and your representatives on the shareholders' committee have the right to nominate all the directors with the exception of two, and it is due to that fact that I have the honour to appear before you to-day. I trust that the selection of my colleagues and myself which has been made by your representatives will meet with your approbation. Of course, you will want to know what steps have been taken to utilise the advantages which have been secured. I ought to have told you that, in addition to the advantages which I have enumerated, we have had handed over to us, free of any outlay on our part, the premises which were occupied by the former Company at Coventry, together with the plant and tools, and we have entered into negotiations for securing a large piece of land immediately adjoining, upon which it is our intention to erect a foundry, in order that we may manufacture the castings and fittings for the business which we intend to carry on on your behalf. I need hardly tell you that it is most important that the castings and fittings for these motor-vehicles should be most carefully constructed, and not only will this be of advantage to us in making it certain that the vehicles will be turned out without any risk of accidents happening subsequently, but we know that we shall have a business in supplying these castings and fittings to others. The next point which I think will interest you is that we have secured the services as manager of your works of an exceptionally good man. I refer to Mr. Iden, who for many years was in a prominent position in the locomotive department of the London, Brighton, and South Coast Railway at Brighton. He has there acquired an experience in the making of carriages, and he has particularly devoted his attention to the manufacture of motor-cars; he has, in fact, constructed a motor-car which we believe is certainly in advance of anything that has been previously constructed in this country, and equal to anything that has been constructed in France. I can assure you that your directors, without exception, are most desirous of doing everything they can in order to bring this business to a profitable result. Their time and energies will be devoted to endeavouring to produce satisfactory results in the shape of returns upon the money you have invested in this undertaking. In order to guide your directors in the course which it was advisable to pursue, and in order to carry out prudently the policy which I have indicated to you, one of your directors recently went to Paris with our manager. While there they went over all the principal works in Paris, they examined all the newest kinds of vehicle, and they have come back with knowledge of a very important nature. With regard to the industry in France, as you are probably aware, it is at the present moment in a very prosperous condition. The manufacturers there are not only full of orders, but it is very likely that if you wanted any of the popular vehicles at the present moment you could not procure one within at least four months, while in some cases you would have to wait as long as nine months. Now, we are, of course, devoting our attention principally to those vehicles which are in vogue at the present time. Our idea is not to manufacture a large variety of vehicles. We want to restrict our operations to certain types of vehicles which we believe will command public favour and will come within public requirements. We have had some experience, because we have been doing a fair amount of business already at the works. We cannot say, of course, that we are doing that amount of business that would be considered a highly remunerative industry just as it stands, but considering the short time that we have been in existence upon this new basis, I may say that our business is so far very satisfactory, and it teaches us a very important point, namely, the kind of vehicle to which it will be advisable for us to devote our attention. We have, among other things, been making small omnibuses for use in Scotland, and if that industry develops as it promises to do, it will, I need scarcely tell you, be a very important matter. We have in this hall a motor-bicycle, and I think that if you look at it you will come to the conclusion that it is a very handy little machine. One of the great advantages of it is that we should be able to sell it at a price which will come within the means of a great many people. My colleague, Mr. Robinson, who is intimately connected with the manufacture of these articles, will explain to you the different vehicles which are taking up our attention at the present moment, and which we intend to push ahead with. I might tell you in passing that out of 3,000 shareholders in the old Company 2,000 have come into this new Company. There is one thing that you can congratulate yourselves upon, and that is that you are in the movement of the future. I should imagine that no sensible man who sits down to think for a little while could doubt that this motor industry has an enormous future before it.

Mr. Thomas Robinson. I should like you to bear in mind the very grave difficulties which are associated with the starting of an engineering business. We have had the utmost difficulty, and are still experiencing it, in getting the necessary machinery delivered. It often takes from nine to twelve months to get delivered the machinery which is absolutely necessary for us to fit up our works properly. One of the first difficulties which this Company had to contend with was that our late works' manager at Coventry was unable to continue with the present Company. Everyone knows—

and especially those who have the management of engineering businesses—that there is no more difficult position to fill than that of works' manager. If he is not a clever man, the works' manager does more to wreck a company or a business than anything else. When your directors came in contact with Mr. Iden, the principal foreman of the locomotive works at Brighton, they came in contact with a man who was thoroughly fitted for the post. You may be interested to hear that at Brighton in one year he erected 32 locomotives and had over 400 through his hands for repair. In conjunction with Mr. Stroudley he erected a steam locomotive which was exhibited at the Paris Exhibition and gained the first prize. In addition, he had under his control the repair and keeping in order of all the machinery upon the boats running between Newhaven and Dieppe; and, as our chairman has said, Mr. Iden has experimented and made bicycles, tricycles, compressed driving apparatus, and, lastly, the motor-car. When in Paris recently I asked to be shown one of the latest motor-cars manufactured. I was considerably surprised to see that the motor-carriage brought out as one of the latest in Paris was a victoria of a type almost identical with that constructed by Mr. Iden. Following on the lines which the old Board had only initiated, we have mainly confined our attention to the manufacture of oil-motors. Ever since the present Board has been in office there has been a regular weekly turn-out of motor-cars of the pattern which you see illustrated on the walls to-day. If you will kindly look at the catalogues which have been distributed in the hall, you will see that types Nos. 1 and 2 are dog-carts, and these have been extremely popular. Only a fortnight ago we had a type No. 2 in our window at Holborn Viaduct. About three days after we had first shown it, a gentleman came in and purchased three of these, together with a wagonette, handing us a cheque for £1,000 as deposit with the order. If you turn to type No. 6, you will see the large wagonette to which the chairman has referred as being supplied by us with very great success to a company in Scotland. It is, of course, well known that the motors used in all these cars are Daimler motors, manufactured by the Daimler Motor Company. This has been a purely reciprocal business arrangement. We have manufactured different articles for the Daimler Company, and they in return have supplied us with motors; but we are under no obligation to order our motors from them; the arrangement under which we have worked being purely voluntary. This matter is one which has occupied the attention of your directors to a considerable extent, and as soon as they are satisfied that it will be in the interests of this Company for them to manufacture Daimler motors themselves, from that moment they will begin to manufacture them. Passing on to the next type of car which we manufacture, we come to No. 7, the Bollée voiturette. The French (Bollée) voiturettes which were put on sale by the former Company we do not consider of a satisfactory character. They were of French make, and were not at all to our satisfaction. To-day we have in hand and going through our works a number of these Bollée voiturettes of the latest type. It will no longer be necessary for the driver to get off the machine, and to go down upon his hands and knees, or perhaps to lie flat upon his back, to get at some portion of the machinery, as in the latest type that we are building all the parts have been fitted so that you can easily lift up the back seat and get at the machinery. Not only so, but the cars are being manufactured without the front seat, so that a gentleman can easily ride it himself, it being simply fitted for one. This voiturette in France has done 35 kilometres—21½ miles—in 36 minutes; but I would not advise any purchaser to attempt emulating that speed without first insuring his life. As our chairman has pointed out, this Company has the right to make cycles, and we propose to exercise that right, and to go in for the manufacture of motor-cycles. At the present time we are manufacturing a large number of De Dion motors, the same as is used in type No. 8 for the motor-tricycle; we have also an important order in hand for the motors alone. No one who has been in Paris and seen the hundreds of motor-tricycles running along the boulevards, or running down through the woods, can help being struck with the immense popularity of this form of oil motor for tricycles, and we believe that there is a big future for us in this direction. Then we have recently brought over and are arranging to manufacture a new moto-cyclette, a sample of which is exhibited this afternoon. It is the latest motor-cycle. The motor is just above the front wheel of the bicycle. It is very compact, the whole of it not weighing more than about 55 lbs. This motor is now being sold very rapidly in France, and we anticipate getting a number of them through our works within a month from to-day. The price will be somewhere about £45 or £50, which makes it the most moderate article of the kind yet placed upon the market. I had hoped to be able to show it in actual working in this hall to-day, but the room is hardly suitable. We should, however, be pleased to allow any shareholder to see it in actual operation upon the Company's premises, and I may here add that we shall be pleased to supply shareholders with this moto-cyclette at £5 less than the ordinary price. So much for oil; then there are also steam and electricity as motive powers. So far as steam is concerned, there is no doubt that for heavy traffic, such as a big omnibus trade, steam will play a very important part, and upon this point we have not been sleeping. I had the advantage of going down with Mr. Iden to see, I think, all the steam omnibuses now being made in France. The steam omnibuses of Count de Dion are now doing daily passenger service at Mentes. We motored down there one afternoon—a distance of nearly 40 miles from Paris—and upon inquiring of a proprietor of a horse drawn omnibus whether the steam bus was running there, he poured forth a dismal tale of misfortune into our ears. It appears that since the steam bus has been upon the road he has had to reduce his price from 1 franc to 50 cents. and 75 cents., and, notwithstanding this, he finds the greatest difficulty in securing passengers. We learned that if there were 20 persons in the station each would prefer paying a slightly higher fare in order to complete the journey of 7½ miles in from 28 to 30 minutes, instead of being in a horse-drawn bus for nearly an hour and a half. While we were at the Count de Dion's he showed us a cheque for 23,000 francs which had just been received as a deposit upon three motor-omnibuses, and judging from the saving which is made, and from the working and running upon the roads, we are of opinion that there is a very great future for the manufacture of these steam buses in this country. We feel that, from Mr. Iden's long experience on locomotive designing and building, he is pre-eminently fitted to advise the Company in the manufacture of steam buses, and your directors are determined to place this Company ahead of all others in this particular branch. So far as electricity is concerned, experiments will have to be made; and here the ground is less sure. Your board has decided—I think, wisely—to, as far as possible, avoid experimenting, and to let this Company's business proceed upon sound, known, definite lines. At the same time the British Motor Company has arranged to give this Company the option of building the cars for the Electric Cab Company, if we wish to have it, and we hope that in the future there will be a considerable business in that direction. In conclusion, I may say we calculate that at the present time the receipts about balance the expenditure. Since the present Board has been in office, in orders and receipts we have come somewhere near £10,000, and we have only to steadily proceed upon the same lines for this Company to be a sound commercial success. When all the various cars and bicycles now in course of manufacture are turned out, we anticipate that this Company will be placed in a totally different position even from what it is to-day. We have laid, and are still laying, broad foundations, and the result, we believe, will be a solid, sound, and yet rapid development. If any unprejudiced shareholder, or if any prejudiced shareholder, were to go to Paris and visit the various motor manufacturing works there, I have no doubt he would be convinced, from the astounding results and the great development of the business, as to the future of the industry. He would see businesses which a short time ago made no profit—in fact, which made a loss year by year—now for the first time in their history doing an enormous business and making great profits. If he went, for instance, to the works of M. Chauvu he would find that Bollée voiturettes are being taken out at the rate of 45 to 50 per month, and would find an order-book with 200 to 300 orders in arrear. If he went further on, to Puteaux, he would find that Messrs. De Dion and Bouton's factories, covering some two acres of ground, are turning out 400 to 500 motors weekly, and that they are some 1,650 motors and motor-cycles behindhand in delivery. If he went on the other side of the road, to the enormous factories of two or three acres which they are now building for erecting steam omnibuses, he would learn that it will be a difficult matter to secure the delivery of omnibuses under about 12 months. If he went to the other side of Paris, where Messrs. Panhard and Levassor are turning out motor-cars, he would find that their orders for motor-cars alone for the month of March amounted, roughly, to £51,000. If you go to Paris you will see that under the very patents under which we are working, and in the manufacture of the very cars that we can make, they are doing this prodigious business. We believe that by turning out cars which shall rank side by side with any that are produced on the Continent the prospects of this Company cannot fail to increase, and we believe that upon those lines it has a bright, solid, and I believe I may properly say a brilliant future before it.

Replying to questions, the CHAIRMAN said that the directors appointed by the shareholders' representatives were Mr. R. Hoffman, Mr. J. H. Mace, Mr. Buckea, and himself, and that Messrs. H. J. Lawson and Thomas Robinson were appointed by the British Motor Company. With regard to Mr. Lawson, he was authorised to say that that gentleman's resignation was at all times in the hands of the Board, and if at any time they thought it advisable, in the interests of the Company, to dispense with his services, they were free to do so. For the present, however, they certainly did not wish to take advantage of Mr. Lawson's resignation because they had a controlling power on the Board, and they believed his knowledge and experience would be of great value in the interests of the shareholders.

A vote of thanks to the chairman, proposed by Dr. DRYSDALE, closed the proceedings.

New Motive Power Syndicate (Limited).

THE report of the directors for the year ended December 31st, 1897, submitted to the general meeting held at the Holborn Viaduct Hotel on May 19th (when a motion to admit the Press was negatived by 20 votes to 14), states that the Board had hoped before this to have made satisfactory arrangements for the sale of the Syndicate's interests, but the negotiations which were pending were unfortunately interrupted by Mr. Guattari, the inventor, and engineer to the Syndicate, suddenly leaving London, professing to have been called to the Continent by illness in his family and not returning. Inquiries were immediately instituted, when it was discovered that Mr. Guattari had settled in Belgium. By request of the directors their chairman was deputed to go over and see him, and he there made arrangements for his return to England, but the directors regret having to report that, up to the present, those arrangements and promises made from time to time have not been kept. The inventor's failure in carrying out his undertaking to return has interfered with the directors' plans and caused considerable delay, but they have now entered into a conditional contract for the sale of all the patents held by the Syndicate, except the Belgium patent. The directors believe the proposed sale is beneficial to the shareholders, and submit it to them for their consideration and approval if so decided. The full details of this arrangement and the contract were submitted at the meeting. The secretary, in a circular accompanying the report, asked for proxies to be signed in favour of the directors. To this request a counter circular was sent out by Major-General Henry P. Babbage and Messrs. Thomas Holden, Charles G. Dean, Thomas Neary, John W. Kersley, and John Kiofe, asking shareholders to cancel any proxy already given and "await a full and satisfactory exposition of the terms proposed, which it is hoped will be attained by the appointment of a committee to fully consider them and to report thereon to an adjourned meeting of the shareholders."

New General Traction Company (Limited).

THE second annual general meeting of this Company was held on May 17th at Cannon Street Hotel, Captain Francis Pavy (chairman) presiding.

The SECRETARY (Mr. A. De Turckheim) having read the notice calling the meeting,

The CHAIRMAN, during his speech, said: The history of the Company can be told in a very few words. Some few years ago my friend on my right, Mr. E. A. Hopkins, conceived the idea that there was room for a Company doing electric traction business, and he with a few friends started a Company and began operations. He began at Coventry and at Douglas, in the Isle of Man, and after he had made some progress he found so many matters submitted to him that he put himself into communication with me with the object of my giving him some assistance in enlarging the Company's sphere of operation. We began in a small way and went on quietly, and succeeded in getting Acts of Parliament for Norwich and for the extension in Coventry, and we have been able, without any difficulty, to issue £100,000 of preference capital, which brings our total capital, including ordinary shares, up to an amount of £270,000. That progress in electric traction must be made in Great Britain I have very little doubt about. We are far behind most other countries in this matter. I find, for instance, that there are over 1,300 companies in the United States, with 16,000 miles of electric tramways and 45,000 motor-cars, and that the amount of capital invested in the United States in this particular kind of business is over £100,000,000 sterling. It is true they have a population of 70,000,000, and a very much larger area than we have. We have only 38,000,000 to 40,000,000, and our country is much smaller; but there is more activity and more movement in English towns than in the towns and cities of the United States, and I think that public attention should be directed to the immense facilities for travel that would be afforded to people if they had electric tramways. There is no city in the United States with a population of 6,000 or 10,000 that would not think itself disgraced if it had not a tramway and the electric light. The circumstances are different there from those existing here, because they are new towns, and have not had gas introduced; but at the same time there is room for a great business in the future of this particular kind. In England there are 20 such companies, with 127 miles of tram lines, and 1,000 motor-cars, as compared with 1,300 companies possessing 16,000 miles in the United States. It is true that we have 1,700 miles in course of construction, and that is no doubt a very great point. I find that Seattle, in the United States, with a population of 60,000, has 102 miles of tramway, which is a ratio of mileage to population of 1 to 588; Denver has a population of 106,000 and 275 miles of tramway, a ratio of 1 to 720; while Chicago, with a population of 1,098,500, has 513 miles of tramway, a ratio of 1 to 2,141. Now I will give the figures of three towns in our own country. Northampton, with a population of 70,872, has 6 miles of tramway, a ratio of 1 to 11,812; Blackburn, with a population of 120,000, has 8 miles of tramway, a ratio of 1 to 14,125, and Leeds, with a population of 367,000, has 23 miles of tramway, or 1 mile to every 15,978 of the population. Now, with regard to the undertakings in which we are interested. Norwich has a population of 115,000 people, and it will have 20 miles of tramway, a ratio of 1 to 5,700, and Coventry, with a population of 75,000, 10 miles of tramway, a ratio of 1 to 7,500. I think these figures are of interest, and if they come before the public I hope the public will pause and consider what they mean. After providing for the expenses, including office charges and directors' fees, there is a balance of profit of £10,246. To pay the dividend on our 6 per cent. preference shares requires £6,138, which leaves us £4,108 to be carried forward.

The adoption of the report and accounts was then agreed to.

Reservoir Hub and Components Company (Limited).

THE second annual general meeting was held on May 31st, at Mullen's Hotel, Ironmonger Lane, E.C., for the purpose of receiving the directors' report and accounts, which after considerable discussion were adopted. An extraordinary general meeting was afterwards held for the purpose of considering and, if thought fit, passing the following extraordinary resolutions, namely:—"That the Company be wound up voluntarily, as it has been proved to the satisfaction of the Company that the Company cannot, by reason of its liabilities, continue its business, and that it is advisable to wind up the same"; and "That Mr. Arthur Edward Darville, of 28, Basinghall Street, E.C., be and is hereby appointed liquidator to conduct the winding up at a remuneration of 50 guineas." In view of the statement of affairs set forth in the circular to the shareholders dated March 1st last, and the further explanations given by Mr. W. Jeaffreson Woods at the general meeting just concluded, to the effect that although the Company had magnificent prospects they could not go on as they "had not a copper," and although it was suggested that reconstruction might put the Company into a sound position once more, it was finally agreed to adopt the resolution for voluntary winding up, with one dissentient. An endeavour was, however, first made to get the meeting adjourned to arrange a reconstruction scheme if possible, but without success. The chairman stated that the Company's representative was on his way to America, and they had asked £6,000 cash for the American patent, and that under all circumstances voluntary in preference to compulsory liquidation was the best way out of their difficulties.

New Companies Registered.

[Under this heading we give a full list of new Companies registered which take power to make, deal, or become interested in any manner in automotor vehicles.]

Birmingham Manufacturing Company (Limited).—Registered by C. Doubble, 14, Serjeants' Inn, London, E.C.; capital £11,000, in £1 shares. Object, to enter into an agreement with

C. T. Mitchell, and to carry on the business of cycle manufacturers, motor and carriage builders, engineers, &c. The first directors are C. T. Mitchell, E. S. Lermit, W. Davies, and T. Spencer.

British Alcolite (Limited).—Registered by Walker and Rowe, 8, Bucklersbury, E.C.; capital £50,000, in £1 shares. Object, to acquire from David C. Davies the patent rights and benefits of inventions agreed to be bought by him from the Alcolite Syndicate (Limited), to enter into an agreement with the said David C. Davies, and to carry on the business of aluminium and alloy manufacturers and merchants, manufacturers of and dealers in cycles, motors, carriages, and mechanical engineers. The first directors are to be nominated by the subscribers.

British Hydraulic Jointing Company (Limited).—Registered by Maddisons, 1, King's Arms Yard; capital £1,200,000, in £1 shares. Object, to adopt an agreement between E. T. Hooley of the first part, this Company of the second part, and E. Legge, as trustee for and on behalf of this Company, of the third part, for the acquisition of certain patents, patent rights, &c., relating to improvements in the manufacture of tubular joints and frame joints, the jointing of tubular frames, wheel hubs, &c.; to develop, deal with, work, and turn to account the same, and to apply the same to cycle frames, boiler tubes, as builders of motors, general engineers, &c. Registered offices, 9, Pall Mall, S.W.

Challiner and Willoughby Carriage Tyre Company (Limited).—Registered by Burn and Berridge, 11, Old Broad Street; capital £50,000, in £10 shares. Object, to adopt an agreement between the Challiner Tyre Carriage Syndicate (Limited), of the first part, C. Challiner of the second part, and this Company of the third part; and a second agreement between F. S. Willoughby, G. Everatt, G. Hardwick, A. and E. Ramm, H. Hesse, J. Evans, and E. B. Saxby, trading as the Flexible Steel Shod Rubber Company of the first part, F. Willoughby of the second part, and this Company of the third part, and generally to carry on business as ironfounders, mechanical engineers, manufacturers of and dealers in cycles, motors, motor-cars, and the component parts thereof, pneumatic and other tyres, &c. The first directors are:—G. Everatt, W. H. Wilson, F. S. Willoughby, and C. Challiner.

Collins' Patent Lever Gear Company (Scotch Registration).—Capital £2,700, in £1 shares. Object, to adopt an agreement with John M. Collins, engineer, Glasgow, and to acquire inventions for improvements in crank driving mechanism for motor-cars, &c. Registered office, 139, St. Vincent Street, Glasgow.

Drake and Gorham Electric Power and Traction (Pioneer) Syndicate (Limited).—Registered by Ashwell and Co., 79, Queen Street, E.C.; capital £20,000, in £10 shares. Object, to carry on the business of electricians, electrical and mechanical engineers, &c., in all or any of their respective branches.

Falkirk District Motor Company (Limited) (Scotch Registration).—Capital £5,000, in £1 shares. Object, to run motor-cars or self-propelled vehicles for the conveyance of passengers and goods in the United Kingdom and elsewhere. Registered office, 61, High Street, Falkirk.

Kendal Bicycle Company (Limited).—Registered by C. Doubble, 14, Serjeants' Inn, E.C.; capital £20,000, in £1 shares. Object, to carry on the business of cycle and motor manufacturers, carriage builders, engineers, &c. The first directors are:—W. Iliffe, C. J. Cropper, W. H. Sawrey, W. Gaddum, and P. Manning.

Leyland and Birmingham Rubber Company (Limited).—Registered by Jordan and Sons (Limited), 120, Chancery Lane, W.C.; capital £300,000, in £1 shares. Object, to adopt an agreement between the Leyland Rubber Company (Limited), in liquidation, and J. C. Forrester, the liquidator thereof, of the first part and this Company of the second part; and a second agreement between S. Morrison and Co. (Limited) of the first part, A. S. Morrison of the second part, and J. Schutt, as trustee for and on behalf of this Company, of the third part; and a third agreement between R. T. and W. Byrne, trading as the Birmingham Indiarubber Company, of the one part, and J. Schutt, as trustee for and on behalf of this Company of the other part; and, generally, to carry on in all or any of their respective branches the businesses of dealers in indiarubber, asbestos, electricians, electrical engineers, as manufacturers of and dealers in cycles, motors, motor-cars, and the component parts thereof. The first directors are:—J. A. Baxter, A. S. Morrison, R. T. Byrne, J. W. Brown, and S. Whitehead.

Mossberg Roller Bearings (Limited).—Registered by Littledale and Co., 7, King's Bench Walk; capital £80,000, in £1 shares. Object, to adopt an agreement between F. Mossberg of the first part and this Company of the second part; to deal in all manner of articles referred to in Sub-clause A of the said agreement, or any other inventions, for which the Company for the time being may hold; to acquire and turn to account any patents, patent rights, as ironfounders, mechanical engineers, &c. The first directors are:—H. P. Holt, S. Lowe, and E. P. Bainbridge.

Motor-Van Syndicate (Limited).—Registered by M. W. C. Smelt, 5, Lancaster Place, Strand, W.C.; capital £2,000, in £1 shares. Object, to manufacture, sell, experiment on, exploit, repair, let out on hire, and deal in motor-vans, carriages, cycles, wagons, &c., and to enter into a certain agreement. The first directors are:—M. Fairclough, T. C. Palmer, and A. Fairclough. Registered office, 5, Lancaster Place, Strand, W.C.

Porous Accumulator Company (Limited).—Registered by Deacon and Co., 9, Great St. Helen's, E.C.; capital £3,000, in £1 shares. Object, to enter into an agreement with John C. Howell, and to acquire, own, and turn to account an undescribed invention.

Redditch District Electric Traction Company (Limited).—Registered by W. Webb and Co., 37 and 39, Essex Street, Strand, W.C.; capital £2,000, in £10 shares. Object, to carry on business in the manner suggested by the title. Registered office, 37, Waterloo Street, Birmingham.

Werner-Cadmium Electric Accumulator Syndicate (Limited).—Registered by G. Goodman, 21, St. Helen's Place, E.C.; capital £6,000, in £1 shares. Object, to adopt a certain agreement, and to carry on the business of an electric accumulator company.

THE Heilmann Company is about to be reconstituted and additional capital introduced.

MR. J. T. NIBLETT having resigned his position as general manager to the Lithanode Electric Storage Company, begs to notify that he has entered into partnership with Mr. Malcolm Sutherland, and in future the firm will trade under the name of Niblett and Sutherland, Electrical Engineers, 61, Chandos Street, Strand, London, W.C.

MR. ARTHUR F. EVANS, A.M.I.E.E., 107, Wool Exchange, Coleman Street, E.C., has recently been appointed the sole European agent for the well-known "Monarch" petrol engine, which for some time now has done such good work in America. There are several special points about this motor which the makers of the "Monarch" claim as particularly suitable for automotor work. It consumes petrol or any other light oil; it has few working parts; no carburetor, and, therefore, no air regulation valves or other complications. We hope, in a future issue, to give some particulars of this motor after some practical experience with it in motor-vehicle work.

THE LIQUID FUEL COMPANY'S MOTORS.

RECENT IMPROVEMENTS.

IN the latest motors designed and built by this Company for motor-vehicle work are many improvements conducive not only to better running but also to the elimination of that objectionable odour of burning oil which arises in consequence of the lubricating oil getting splashed on hot surfaces. These are shown in the accompanying drawings, of which Fig. 1 is a plan of the general arrangement, and Figs. 2 and 3 side and end elevations.

The oil case, A, is made quite independent of the working cylinders, B, B[1], separating the two from one another by a space, C, open to the atmosphere, but staying the two together by means of distance pieces, C[1]; the piston rods, D, D[1], passing through stuffing boxes in the adjacent covers of both, as seen in Fig. 1. By these means the end, A[1], of the oil case, A, adjacent to the working cylinders, B, B[1], is kept comparatively cool because the steam does not come in contact with it, and consequently any oil that may be splashed on to it is not heated and therefore does not emit an objectionable odour. Furthermore, as there are in this arrangement two stuffing boxes interposed between the working cylinder and the oil case, both of which stuffing boxes are open to the atmosphere, there is no chance of water passing from the working cylinder into the oil case as often happens when the end of the oil case forms the cylinder cover and the piston rod passes through tho same with a single stuffing box.

Another improvement consists in placing the valve chests, E, E^1, in a low position with regard to the cylinders, B, B^1, so as to allow water to drain from the latter into the former, from whence it is taken off into an exhaust box (not shown in the drawings), and thence passes into the exhaust pipe, which is preforably taken from the bottom of the exhaust box. By this means, it is claimed, opening of the drain

Fig. 1.—General Plan.

cocks at starting the engine may be entirely avoided, the water being driven out into the atmosphere, or into the condenser, as the case may be.

Still another improvement relates to the working of the slide valves when, as in the case last referred to for example, the valves are placed low down with reference to the centre line of the working cylinders, so as to be in a lower plane than the centre line and crank-shaft, G. In such case sliding actuating spindles, H, H[1], are used, which are arranged nearly in the same plane as the centre line of the cylinders and crank-shaft, and are operated by eccentrics, I, I[1], in the oil case. These actuating spindles have on them arms, J, J[1], projecting laterally, which are connected with the spindles, K, K[1], of the slide valves, L, L[1], to be operated. When an oil case is used containing the working parts of the engine as thus mentioned, the actuating spindles are arranged to pass through stuffing boxes or guides, M, M[1], in the end, A[1], of the oil case, A. The inner ends of the actuating spindles, H, H[1], are connected, in the oil case, with the link motion, the arms, J, J[1], on the actuating spindles being connected with the slide valve spindles, K, K[1], outside the oil case, A.

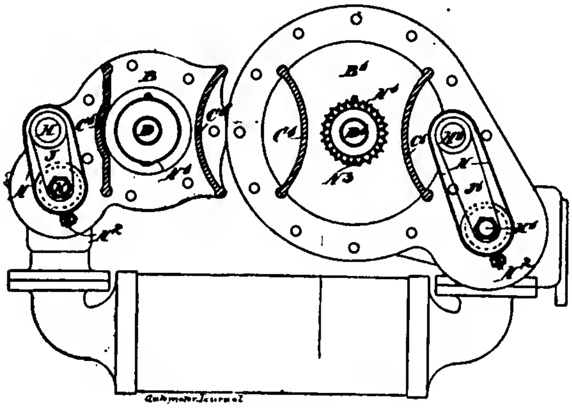

FIG. 3.—FRONT VIEW.

In order to prevent the access of dust to the piston and valve rods where they pass through the open space, C, they are covered with sheet metal covers, N, N[1], passed over the stuffing boxes and secured by means of bolts and nuts passing as shown in connection with the covers, N, or by means of an endless coiled spring, N[3], taking into a circumferential groove, N[4], of the covers as shown.

SERPOLLET'S NEW STEAM CARRIAGE.

By Sir DAVID SALOMONS, Bart.

THE latest form of M. Serpollet's carriage is a distinct advance on anything which has hitherto appeared. The design enables a light steam carriage to be made of a satisfactory character and cheap in price.

The Serpollet boiler may be classed under two heads: one where the tubes are thick and act as accumulators of heat, and the other where the metal is thin and the heat is rapidly absorbed. This latter type is common to almost all boilers which are frequently described as "waterless boilers," and it is mainly in the special construction given to the tubes in which the Serpollet system differs from the others.

In the new light carriage the boiler is of the thin tube type, very small and light in weight. Such a boiler could be sold for 30s., and offer a good profit to the manufacturer, *i.e.*, as soon as an organised factory is brought into existence for its production. The framework of the carriage itself is of aluminium. The working parts consist of three pumps and a steam-engine. The burner employed uses heavy petroleum and does not smoke.

The two new features in the whole system are :—

1. The principle employed for generating steam.
2. A revolution in steam-engine construction.

Starting with number 1 first. The burner is found capable of vaporising six litres of water for the consumption of every litre of petroleum. Therefore, if one pump is employed for forcing water into the boiler, and another for feeding petroleum to the burner, working in a ratio of six to one, both water and petroleum will be fed in the required quantities, and this is the method employed. The arrangement dispenses with air pressure in the petroleum reservoir, and many other complications. A third pump exists for the purpose of carrying the water from the condenser back to the reservoir. These three pumps work on one shaft, and the strokes of the petroleum and water injection pumps can be varied, but always bear the proportion one to the other indicated. It will, therefore, be gathered that when less steam is required, and the throw of the injection pump is diminished, the burners are at the same time fed with less petroleum. Hence from zero to maximum power the water and petroleum supplies are automatic, and in correct proportion one to the other. When the pumps are doing no work the burner is not extinguished, but is then fed by means of a pass-bye cock.

Let us now consider number 2. In the new engine all the vexations to be found in the ordinary form of steam engine, and which are present in almost every kind of motor, are absent, viz., joints and complex valve gear. The engine is made as follows :—Two cylinders are placed in a line but working opposite to one another, so that the cranks are between them and contained in a box. The whole of the working parts therefore are enclosed. The steam acts only behind each piston; it will therefore be observed that no joints under pressure exist, for the only two are those where the cylinders are joined to the crank box, and these are not under pressure. The oil contained in the crank box is splashed by the revolving crank and greases the cylinder as well as the crank.

On the top of each cylinder is a little valve actuated by a rod, and is worked to and fro through the distance of about half an inch by means of a cam. These are the two valves which admit steam into the two cylinders alternately. The cam is so made that, by shifting it, the direction of the motor is reversed. In fact the admission of steam to the cylinders is identical with the method employed for admitting gas to a gas-engine. The cut-off is about one-fifth of the stroke, and no special exhaust valve is required. It is simply the piston which uncovers the opening. It might be urged that, since on each return of the piston a certain quantity of steam is compressed, power is lost, but because the steam admitted is superheated there is no loss whatever, as a regenerative action comes about. In point of fact, these engines, for a given size of boiler, raise the power of such boiler two-fold. The water which is pumped from the condenser back into the reservoir passes through sponges, which absorb the oil which might come from the cylinder. The condenser itself is cleaned by passing a jet of steam through the tubes, which operation is effected by merely turning a tap when steam is in the boiler.

To start the carriage the usual pump lever is moved by the driver, actuating at the same time all three pumps. Two or three movements and the carriage is started, then all is automatic.

There is a total absence of the complex tubing to be found in general in motor-carriages; this in itself is a great improvement. The small carriage that I saw was the first experimental one, but its success is such that it is serving as a pattern for the construction of six others. The little carriage could be lifted from the ground by M. Serpollet and myself without any undue effort. The H.P. was nominally 3, but capable of giving double this power for short periods.

At the present time the steam-carriage suffers a disadvantage compared with gas motor-carriages, because the latter have received attention for a longer period, and organised factories exist for their construction. Even now there is no organised factory turning out light steam-carriages.

To the majority of people it would appear extraordinary that M. Serpollet's French Company should not have turned their attention in this direction, but only those behind the scenes know the true reasons, which are, that in early days, alliances were made with various companies which have rather retarded than accelerated manufacture on a large scale. In the next place, enormous orders for tramways on the Serpollet system have come in, that the attention of all those interested was completely absorbed in turning out the cars till within quite a recent date.

It is understood that very shortly the manufacture of light steam-carriages will be seriously entered upon in England, numerous experiments having been undertaken for some time past at a large and well-known English factory.

It is my own opinion that if the new light steam-carriage, which is in the form of a dog-cart, is made in any quantities, say 12 at a time in an organised factory that they could be sold for £80 apiece and perhaps less. At such a price they would be a boon to those who live in the country and require a carriage of some kind, where the present cost of a horse presses somewhat heavily upon their purses, and the price asked for oil motor-carriages is out of the question for this class of people.

Finally, the fatigue experienced when riding in oil-driven carriages is quite absent when steam is employed for motive power.

BEESTON MOTOR COMPANY.

The employés of the Beeston Motor Company (Limited) assembled for their first annual dinner last month at the King's Head Hotel, Coventry.

The chair was taken by Dr. C. W. Iliffe, who was supported by Messrs. Rowland Hill (chairman of the Company), S. Gorton (managing director), Dr. Roberts (St. Albans), A. Clay (cashier), and W. Taylor (works manager).

Dr. Roberts, in submitting the toast of "The Beeston Motor Company," said he thought he was the first medical man to have taken up motor tricycling. He was doing his utmost to get medical men all over England to take it up, because he believed it the finest thing they could possibly have to assist them in the discharge of their duties.

Mr. R. Hill, responding, thanked Dr. Roberts, who, he said, was not only the first medical man having experience of their motor cycles, but he had been good enough to assist them by giving his experience to the Press and the world in general. As the result of an interesting letter in the *Lancet* Dr. Roberts had received no less than 250 letters from the medical men of England, making inquiries as to the motor tricycle.

Mr. S. Gorton also responded, and said in this country new inventions had always been more or less subject to ridicule. When Stephenson built his first engine, "The Rocket," sometime about the year 1829, to run upon rails, he was ridiculed all over the country. But he put up with the ridicule, and it did not deter him at all. What was the result? To-day the world was covered with a network of railways. Then came the introduction of the ordinary bicycle, and that suffered the same fate, as regarded ridicule, as the railway had. Yet what was the position to-day? Why, all the world was on wheels.

Mr. Taylor, called upon for a few words, gave the workmen some sound practical advice, urging patience in mastering this new industry.

THE MOTOR-CAR CLUB.

An "omnibus meeting," promoted by the Motor-Car Club, took place on the 8th inst., the object being to demonstrate the attractions and advantages of motor omnibuses and cabs. There was a large assemblage of visitors at the Hotel Métropole, lunch being served in the Whitehall banqueting room, prior to the experimental runs. Mr. Sydney Gedge, M.P., presided, and among the company were: Lord Crawshaw, Mr. Harry J. Lawson (president of the Motor-Car Club), Sir Charles Hartopp, Col. Josiah Harris, Sir H. H. Bemrose, M.P., Mr. D. Crilly, M.P., Mr. Henniker Heaton, M.P., Mr. Geo. H. Little (The Automotor), Dr. Clarke, M.P., Mr. Guy Pim, M.P., Mr. A. Arnold, M.P., Mr. Beresford Melville, M.P., Mr. F. W. Lawrence, M.P., Mr. E. Parker, M.P., Mr. H. A. House, jun., Mr. George Iden, Mr. Thomas Robinson, Mr. J. H. Mace, Mr. E. M. C. Instone, Mr. Baron (Blackpool Motor Company), Mr. Fleming Nesbitt, &c.

The Chairman proposed "The Queen," and expressed a hope that Her Majesty would see as great a change in the matter of locomotion at the end of her reign as she did at the beginning on the development of steam traction.

In proposing "The Motor Club," the Chairman said those engaged in the manufacture of motor-cars summed up their merits by declaring they would "go anywhere and do anything." If they would do only half what was claimed for them they would certainly meet a great public want, and the advantages to the community, directly and indirectly, would be immense.

Mr. Harry J. Lawson, with whose name the toast was coupled, said:—The object of to-day's meeting is to show a number of colonists and other visitors to London what progress is being made in machine traffic, more especially the Petroleumnibus—as it has been christened by a daily paper, for which we are much obliged—but which, to abbreviate it to the first and last syllables, we will term the Pot Bus, or Favourite. The omnibus is the carriage of the people, and in this sense this occasion is interesting to the public of the whole world. If you go outside and see a bus that will carry you farther for one penny and faster for one penny than any other, that bus is going to have the public penny. It is 18 months since the Act of Parliament was passed permitting motor-cars on the road, but only about 12 months since the first British-made motor-cars appeared in the streets. Now, however, every day they are becoming more and more familiar spectacles. What I want you to see to-day is the first machine omnibus that is driven by petroleum. Further, I shall show you to-day a machine traffic cheaper than the cheapest light railway, because it has no railway at all. If the tramcars can be made to work carrying the same number of people equally well without the public nuisance of tram rails, surely it is a matter demanding the attention of the Government at this time, and especially the London County Council, who will be wasting millions of public money by purchasing a road which is superseded. Under these circumstances should we not impartially inquire what the facts really are? In Paris the Government has satisfied itself, by independent inspection, of the advantages of the motor and steam omnibus and machine traffic of all kinds, both in the Army and in the Post Office, and now decides to take the proper step by granting Government subsidies and Government help by money grants to assist manufacturers in immediately developing to the advantage of all this great industry. I want to-day to put this thing on altogether a different platform. This is no matter for private enterprise merely. Towns in England and the colonies are existing to-day without any means of machine transport; and when we look at a place like India, with lovely, flat, level roads, hundreds of miles at a stretch, I say the Government of to-day is losing an immense hold it might have upon the natives and inhabitants of that country by giving them an easy and cheap means of transport. You often hear people say these vehicles seem to work very nicely; but how is it there are not more of them on the road? Well, on this I would point out that there are 16,000 traction engines licensed in the United Kingdom, and how often do you see a traction engine? I will now give you the result of a test as to the Pet Bus. One was put on the road at Regent Circus at eight o'clock on Monday morning, and was run to Ealing. I compare it with the system of the London General Omnibus Company, which has a very efficient service of horse omnibuses, and these are the facts:—Official chartered accountants sat on our bus and measured the petroleum, and two official handicappers clocked for stoppages. The number of journeys we did was seven return journeys—that is to say, 98 miles during the day. We left off at 11 o'clock p.m. The London General kept on until 12 o'clock and did five journeys, using 14 horses including extra animals at two hills on the road, and covered altogether 70 miles. Then, I should mention that we allowed people to get on our car free, and the consequence was we had a great crowd and heavy loads to carry, but that made no difference to the engine. On these conditions the maximum takings of the London General bus would be £6 5*s.*; ours would be £8 5*s.*, and the cost per journey for petroleum would be 5½*d.*; the accountants certified that 13 gallons were used during the day, the cost being 5½*d.* per gallon. The cost of bus washing with the London General would be 6*d.*, as compared with perhaps 9*d.* in our case; but then we should have no stable grooming to pay for, and there would be no eating of food all night in our case, and no harness expenses, shoeing, or veterinary charges. Then I notice that the London General paid £53,644 in six months for horse renewals, against which all we should have to do would be to put in new brasses or new piston rings when the bearings or other parts wore out. In concluding, Mr. Lawson expressed a hope that the Press would help forward the industry, remarking that it had great power of performing a useful office to the public in doing so.

A number of vehicles of various descriptions were drawn up at the door of the hotel in Whitehall Place, and most of the company were taken on short trips along the Embankment to Westminster or Blackfriars. The vehicles included the celebrated "Lifu" No. 1, in charge of Mr. H. A. House (illustrated in our present number); a Weidknecht steam omnibus; a 10 H.P. Daimler (German make) omnibus with serrated tyres, which, by the way, are illegal; and several Panhard and Levassor, Daimler, and other voitures, most of which have already been illustrated in the pages of The Automotor. All these ran excellently and without any manifestation in the shape of noise or smell. In the newer types of oil vehicles vibration was hardly perceptible. There was no smoke and no steam. The police, who maintained excellent order, seemed very much impressed with the speed, quietness, and perfect manœuvring powers possessed by these vehicles, which were one and all most skilfully handled. If, instead of this being a motor-vehicle meet, it had been a coaching club meet, the street would have resembled a foul-smelling stable from the large quantity of fœcal matter that the horses would have ejected, and the services of the street orderly boys would have been requisitioned to clear away the offensive matter. After this motor-vehicle meet the street in front of the Whitehall Rooms was as clean as ever, save for a few drops of lubricating oil here and there; but on the cab ranks were piles of filthy horse manure, around which stood and gossiped those real old Tories, the London cabmen—impotently cursing the motor-vehicle.

NAUTICAL AUTOMOBILISM.

A Daimler Launch.

One of the purposes to which a good oil motor lends itself is the propulsion of vessels such as launches, yachts, and such small craft, up to, say, fishing trawlers. In the latter, oil motors up to 90 H.P. are most successfully applied. The Daimler Company have for some time past made a speciality of launches intended for river service and as tenders to large yachts. Their most recently acquired vessel of this description is a handsome launch, 56′ 0″ × 9′ 6″ × 4′ 9″, designed by Messrs. J. and H. Paterson, naval architects, Greenock, and built by Messrs. Paul Jones and Son, of Gourock, for the Daimler Company, who intend to follow the various yacht races and regattas round the coast, so as to demonstrate to yachtsmen and others the merits of this system of oil propulsion. Needless to say, the vessel is beautifully fitted with every appliance for safety and comfort. She is propelled by a gun-metal three-bladed propeller driven by two 10 H.P. Daimler motors coupled together, thus giving an impulse every revolution. After a most satisfactory trial trip she was taken round from Greenock to London, and the following is a log of the run supplied to us by Mr. A. H. Deaville Altree, the general manager of the Daimler Company:—

Log of the Launch "Daimler," from Greenock to London.

May 11th, 1898.—Left Greenock 12.30 p.m.; strong north-west gale and heavy sea; entered Bowling Canal 2 p.m.; passed cutter yacht "Rosette," towing through canal and bound for London. 9.30 p.m. moored at Wyndford, 26 miles from Bowling and 10 from Grangemouth, where canal ends. This waterway is 36 miles long, and has 40 locks, 16 of them being in the last 1½ miles. The cargo steamers using the canal usually take 13 hours in transit from end to end.

May 12th, 5 a.m.—On rising, discovered the decks coated with ice, and that a heavy snow had fallen on the hills during the night. Arrived in Grangemouth 9.20 a.m., and partook of a very welcome breakfast. Left Grangemouth 10.30 a.m. on the ebb tide, with fresh north-west breeze, passing under the Forth Bridge at 12 noon, and at 1.25 p.m. moored in the Yacht Basin at Granton Harbour to obtain water. Hail and snow squalls were frequent, with very strong breeze, the storm cone being hoisted, and the harbour master reported that outside the Firth a heavy north-east gale was blowing. He strongly advised us to remain in shelter till the following morning, at least.

May 13th.—Turned out 4.10 a.m. Got dinghy aboard and made everything fast, in case heavy weather should be encountered outside. Hove up anchor 6 a.m., the wind in the Firth being W.N.W., and the day fine though hazy. Outside found heavy swell rolling from the north-east, but the launch behaved grandly. 2.45 p.m. passed inside the Farne Islands, and at 7.45 p.m. moored in Blyth Harbour, 7 miles north of Shields, the day's run being 103 knots, as registered by Walker's "Harpoon" log. No water was obtainable, and our supply being extremely limited, our ablutions on the following day were naturally somewhat restricted.

May 14th.—4.45 a.m. got under way, the easterly haze and heavy swell still continuing. Passed Whitby 11 a.m., and moored in Grimsby Harbour 9.40 p.m., the day's run being 133 knots. Fresh stores were here taken aboard to cover our needs until Monday morning.

Sunday, May 15th.—Having taken the opportunity of getting rather more sleep than we had been having, we did not leave Grimsby until 8.25 a.m., and for the first time during the run had really fine weather all day, the swell having gone down to a great extent. Lowestoft Harbour was reached at 9.45 p.m., the distance run being 109 nautical miles, and we moored alongside a fishing lugger, the solitary man on board explaining to us that his mate had gone ashore for a "hurst." Perhaps this accounted for the extraordinary interest he displayed in all our proceedings, his attention being particularly absorbing while I endeavoured to straighten a small nail with a large hammer.

May 16th.—Left Lowestoft 7.25 a.m., and put into Harwich at 1.20 p.m. to unload empty cans and cases which had contained our rectified petroleum, leaving for the Thames an hour later.

When three miles off Harwich I decided to try the benefits of a (very) cold bath at the end of a bowline, and as the launch was under fore and aft canvas, the engines were reversed to stop her way. This was all right until the attempt was made to get on board, and at the same time keep clear of the propeller; but the difficulty was finally solved by the skipper and cook hauling me on board by a leg and an arm. As the skipper had just been engaged in brass work cleaning, I came out of the ordeal looking very much like a Dalmatian dog. On reaching Shoeburyness the launch was timed over the measured Admiralty nautical mile on the last of the flood, the distance being run in 5m. 56s., a shade better than 10 knots. Moored off Southend at 6.55 p.m., the day's run being 73 nautical miles.

Next morning matters were taken in a rather more leisurely manner, the trip concluding on our arrival at Grays, where our mooring berth was to be. Throughout the whole of the run no discomfort was experienced, except when the deck hand, in washing down early on the last morning, hove the greater part of a bucket of water through the open port, effectually disturbing my slumbers.

Towage on Canals.

The success attending an application of electric towing on the Burgundy Canal was such that two new applications of electricity to canal haulage, and also for barge propulsion, were made last year in the neighbourhood of Dijon on the same canal, under the superintendence of M. Gaillot, Ingénieur des Ponts et Chaussées. In the method of haulage the receptor dynamo is mounted on a tricycle, to which the name of "electric horse" has been given, and which, running on the towing path, takes its current from an air line consisting of two wires, mounted 5 metres (nearly 17 feet) above the surface. This "horse," which weighs 2 tons, and is guided by a driver mounted upon it through the front wheel, proceeds on the towing path like a traction engine; and the boats are connected with it by a rope, with automatic disengaging gear, in case the force of the stream or a gust of wind should drive a boat backwards. Speeds of from 1,990 to 4,240 metres (mean 3,319 yards) were obtained with the electric horse, towing from three to four boats, so that it is more suitable than the electric propeller for towage in rivers or very long reaches; but it requires a driver, while the propeller, with which speeds of from 2,150 to 4,240 metres (mean 3,406 yards) per hour were obtained, is worked by the bargee on board his boat. The towing path is not worn, and there is no occasion for a tow rope, which always causes difficulty when two boats cross one another. M. Maillet and M. Dufourny, Belgian Ingénieurs des Ponts et Chaussées, who watched the trials, conclude that a practical solution of the question depends upon the cost of producing the motive power; but they also consider that horse haulage on canals will soon be superseded by mechanical traction, based on the use of an automotive tricycle, working with petroleum or some other hydrocarbon, and capable of running on the tow path without requiring any fixed plant.—*Engineer.*

An important experiment is about to be made on the Western of France Railway. This Company has decided to provide passengers at the Paris terminus with electric carriages. As at the Saint-Lazare Station there is electric plant, the entire output of which is available during the greater part of the day, the Company proposes to utilise this to charge the accumulators of the cabs in question. The Company has applied to motor-car builders to provide a type of electric-car to carry four passengers and 331 lbs. of luggage, capable of running with safety 31 miles per day. The Company will take these cars for a trial of six months at a rate of pay per day to be fixed, and at the end of this time reserves the right to make a choice and purchase, at a previously fixed price, the vehicles which have taken part in the competition.

FOREIGN NOTES.

The Automobile Club de France has a membership of 1,430.

A service of steam omnibuses is to be established at Doubs, between Salens and Be ançon.

Paris is to have a Metropolitan Railway; the Company is to have a capital of 25,000,000 francs.

La Société Européeno d'Automobiles has been registered at Brussels with a capital of £22,000.

MM. De Dion and Bouton are constructing a number of steam-omnibuses for a public service between Lavaur and Grauthet. The route is about 12 miles long.

It is said that the patent rights for England in the Roser and Mosurier motor have been sold to an English company for a very large sum.

Referring to the deplorable accident at Périgueux whereby the Marquis of Montagnac lost his life, it seems that at the time of the accident he was going at a speed of 17 miles per hour.

A new motor-vehicle club is in course of formation at Nymwegen, in Holland. The chief members are Messrs. Meer, Kueppers, Wendelaar, Houwink, Aertuys, Baron Wassenaar Hegge-Zynen, and Du Moulin.

In Switzerland the speed of street vehicles is strictly limited by law. Tramcars in towns must not exceed 7 miles per hour, and in the villages 9 miles per hour. Outside the towns the speed may be 11 miles per hour, and in the open country 15 miles per hour.

La Chambre Syndicate de l'Automobile has been formed recently with an active membership limited to 30. The President is the Comte de Dion, with MM. Panhard and Jeutcaud as Vice-Presidents, and M. Thériu as Secretary.

M. Ernest Bollée, the well-known constructor, has been nominated deputy for the department of Mans. In our House of Commons there is not a single member that can be said to represent the technical branch of automobilism.

As showing the hold that automobilism has in France upon the electorate, M. Francois, the proposer of the tax upon automobiles, has been rejected by his constituents, and is now replaced in the Assembly by M. Castellane, a practical automobilist.

The Great Western Railway of France (it could not possibly be our own benighted line with a similar title) is not only using various types of oil motor-vehicles, but is considering the question of electric vehicles for its country services.

So busy are the makers of motor-vehicles that it is very difficult to obtain delivery of orders. At Mantes a Tenting oil-motor omnibus had been ordered some months ago but has not yet been delivered, and the local authorities have had a warm discussion about it.

Steps to check motor-scorching in Paris have at length been taken by the Prefect of Police, and not before it was necessary. Not only have motor-vehicles now to carry a number-plate, but the speed is to be strictly limited to 12 miles per hour. The speed is quite sufficient for all practical purposes wherever there is any traffic. Even visitors coming to Paris for a temporary stay will be required to procure an official number on passing the barrier. We resent as much as anyone anything like grandmotherly legislation, but the excessive speed that many automobilists permit themselves to indulge in constitutes not only a danger but a nuisance, which, if anything, is worse.

Folding chainless bicycles are used by the French army, weighing about 28 lbs. They are made with drop frames so that the soldiers can stand in firing position between the wheels. Tandems and triplets are also in use, their advantage being that the loss of a rider does not involve the loss of a machine.

Another serious accident has occurred in connection with the motor-vehicle races which have such a charm for our French neighbours, but happily without loss of life. It appears that during the Paris-Bordeaux race when near Agoulême, M. Mors, the well-known constructor, while proceeding on his machine at a rather rapid rate, had to swerve to the right in order to avoid a horse that had shied, in so doing he collided with a tree, with the result that M. Mors was thrown out and broke his collar-bone. He is, however, recovering.

In the "Criterium des Entraineurs," organised by our contemporary, *le Vélo*, and which was held last month just as we were going to press, there were 40 competitors; the route was from Paris to Bordeaux. The winner was M. R. de Knyff, the second place was gained by M. Charron, and the third by M. Brenil. All three rode Panhard and Levassor voitures. The fastest time, that by M. Knyff, was 15 h. 15 m. 44 s., and the distance 223 miles. In the second class, which comprised vehicles weighing less than 400 kilogrammes, the winner was M. Corre in 18 h. 30 m. 10 s.

The Préfet of Police at Paris has appointed a Commission to study the question of the speed of motor-vehicles in the streets, and MM. De Dion and Gamard have been appointed as delegates from the Automobile Club. It is rather significant that this Club has issued a circular in which automobilists are requested to moderate their speed. In this the Club is acting, we think, wisely, as that body can exercise considerable influence with its members, and it is better that voluntary action rather than legal obligation should determine this speed question.

The higher clergy in France find a motor-vehicle a convenient means for visiting their dioceses. Thus Monseigneur the Cardinal Lecot, who has taken a great interest in automobilism, is making a pastoral visitation on a motor-vehicle belonging to M. Journier. Our English bishops might, with advantage to themselves and their flocks, imitate this excellent example. Nothing in the way of travelling is more delightful than to go through the country at this time of the year on a well-appointed motor-vehicle. One arrives at the end of a journey fresh and ready for work, whereas a long railway journey or a coach journey exhausts one terribly.

The French army authorities entertain a high opinion of the value of motor-vehicles for certain military purposes. Captain Barisien, of the 4th Regiment, stationed at Grenoble, and one of the officers selected by the War Office to attend Les Poids Lourds trials last year, has lately been through a course of military manœuvres with his regiment. These took place in very difficult country, but he attended them with his 4 H.P. Peugeot, and in all the various operations the motor-vehicle was most successful, traversing a mountainous region with bad roads in a most remarkable manner. His superiors were much pleased with the results of this very searching ordeal. Beyond a few obsolete and enormously heavy traction engines the British army does not possess a single automobile vehicle.

The indignation that has been aroused in Paris through the dangerous speed at which many motor-vehicles are driven has taken some curious forms of expression. Thus a good many persons, whose lives have been risked by this reckless driving, have announced their intention of carrying revolvers, for the purpose of stopping the senseless automobilists, who, like our cycle scorchers, are so indifferent to the comfort, not to say the lives, of their fellow-creatures. While not endorsing the revolver cure, we sympathise with it to a certain extent, because a fast motor-vehicle will be out of sight and many miles away before even a telegram can be despatched to stop it. The injured party has little or no chance of identifying the person who knocked him down. Hence a good deal can be said in favour of the bullet. Such methods are, of course, foreign to our ideas of legal action, and are altogether barbarous. A better way is to trust to a careful police patrol and the infliction of adequate punishment. We suggest for a repeated offence confiscation of the vehicle, its immediate sale by the authorities, and the proceeds to go to the hospitals.

President	Sir DAVID SALOMONS, Bart.
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Semi-Official Journal of the Association	THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

SELF-PROPELLED TRAFFIC ASSOCIATION

(INCORPORATED).

LIVERPOOL CENTRE.

AT a council meeting of the Liverpool Centre, held on Friday the 10th instant, the annual general meeting of this branch was fixed to be held on Tuesday, July 12th, at 4.30 p.m., in the hall of the Chamber of Commerce, Exchange Buildings, Liverpool. The business to be transacted at this meeting will be—

(*a*) To adopt the report of the council on the second session.
(*b*) To elect members of the council to hold office for a period of two years.

A COMPLETE list of guests and full report of the speeches in connection with the banquet which took place on May 26th at the Adelphi Hotel, Liverpool, in connection with the Heavy Trials have been printed in pamphlet form, and copies may be had from the Hon. Organising Secretary, Mr. E. Shrapnell Smith, at 3*d*. each, post free.

PHOTOGRAPHS of the "Meet" of the motor-vehicles in connection with the Liverpool Heavy Trials, taken at Aughton on Tuesday morning the 24th May, can be obtained from the Hon. Organising Secretary, Mr. E. Shrapnell Smith, on the payment of 3*s*. 6*d*. per copy, including package and postage. Mr. Shrapnell Smith's address is Royal Institution, Colquitt Street, Liverpool.

TRIALS FUND.

The following is an additional list of subscriptions received :—

	£	s.	d.
Amount already acknowledged	484	18	0
The Right Hon. the Earl of Derby, K.G. ..	105	0	0
Mr. Joseph Hoult, C.C.	10	10	0
Messrs. Alfred Booth and Co.	2	2	0
Mr. John Brancber, J.P.	2	2	0
Mr. J. W. Pickering	2	2	0
Mr. Richard Bennett	1	1	0
Mr. J. Brown	1	1	0
Mr. A. W. Goodall	1	1	0
Messrs. R. Singlehurst and Co...	1	1	0
Mr. M. H. Wells	1	1	0
Mr. Chas. Wills	1	1	0
	£603	0	0

LIGHT OIL MOTORS.

By JOHN HENRY KNIGHT.

THERE are only two oil motor-cars, that is petroleum oil-motors, used for road work in England, that have come under my notice, these are the Roots and the Petter; both use the ordinary paraffin or lamp oil. All the others, the Daimlers, the Benz, the Mors, the Bollée, and De Dion tricycle, use a light oil, giving off vapour below 73° F., and by Act of Parliament called potroleum.

There are various brands of this light oil; gasoline, which is probably the lightest, has a specific gravity of ·66, it is largely used in America for carburetting air for use as a gas for lighting houses, and some 20 years ago many country houses and churches in England were so lighted. Benzoline, petrol, petroleum spirit, and the French "Essence de Petrol" are various names for this light oil, the specific gravity of which should not exceed ·70. It seems unfortunate that these petroleum-engines should ever be spoken of as oil-engines, that term being legitimately applied to the heavy oil-engine. Light petroleum has very little of an oily nature. Every one knows how benzoline is used for removing grease spots and oil stains from clothes.

There are several advantages in using petroleum spirit in motor-cars in place of the heavy lamp oil:—(1) It does not give out the disagreeable smell that oil does; (2) being less rich in carbon there is no smoke from the exhaust and altogether it is more cleanly to work; (3) the engine is more easily started, there being no vaporiser to heat up.

It has the following disadvantages:—(1) Its price is nearly three times that of oil. (2) It being more inflammable and consequently dangerous, its sale and storage are regulated by Act of Parliament. It, unlike paraffin oil, cannot be obtained in every town or village. (3) In damp weather it is difficult to get the air to absorb or take up the proper quantity owing to the air being saturated with aqueous vapour. Most owners of motor-cars must have noticed how at times the engine runs better than at others, this is often due to the dampness of the air. Heating the air, as in the Daimler, makes matters better, but it does not remove the water vapour. To do this the best way would be to pass the air through some substance that will absorb water, such as calcium chloride or even lime. Many years ago I used lime to dry the air for a gasoline gas machine. The experiment was partially successful; with a better arrangement of lime it would doubtless have answered well; the passage where the air passed the lime was too short—it should have been much longer. Of course, it would have to be shown that the gain in power would be worth the extra weight to be carried and the cost of the lime, but it seems that the experiment is worth trying.

Of carburettors the early forms using cotton wicks or wire gauze to present a large moistened surface to the air have been discarded. The automatic spray-making, on the bird-fountain principle, by which the right quantity of petroleum is sucked into the cylinder as spray, is used on the Daimler and one or two other types.

Another form, used on the Benz and on De Dion tricycles, is air impinging vertically on the surface of the petroleum. My experience has been chiefly with this form of carburettor.

In all these fast-running engines the pipes for air and petroleum vapour must be much larger than in the slow-running stationary gas-engine; the exhaust valve should be so fitted that it should be full open before the out centre is reached. I believe there are many motor-cars that could be improved by a careful resetting of the values.

Tube ignition has much to commend it; the greatest objection seems to be the danger of fire in case of an upset. Sometimes the wind will cause the lamps to be extinguished, or it will blow the flame away from the tube, which quickly cools down. I have given tube ignition and electricity a fair trial on my car, and in my opinion electricity is the best.

As regards electrical firing in two different cases that have come under my notice, the power of the engine was increased by substituting tube ignition for the electric spark, the reason being that the electrical firing was not soon enough, and an indicator card taken from either of these engines would have shown a "camel-backed" diagram due to late firing. If, however, the firing cam or contact piece is early enough to give a full diagram, electrical contact must be made when the crank is 45° from the centre; that is with a fast-running engine. Now, to start such an engine by hand would be difficult, if not dangerous, as the engine would fly back before the centre be reached. To obviate this, some cars are fitted with an arrangement to alter the position of the firing point while the engine is running; for startiug it is placed uear the centre and worked forward as the speed increases. This method was first nsed by Messrs. Priestman, of Hull, in the small oil-engines they make for marine purposes.

Some motor-vehiole owners complain of trouble with electrical ignition. The trouble may arise from several causes—to too great distance between the sparking points in the cylinder. It must be remembered that a coil which will give an inch spark at atmospheric pressure will give a very much shorter one in the compressed mixtnre; besides, for quickly firing the charge a fat or flaming spark is necessary.

Soot on the insulating plug should be wiped off; a crack in the porcelain will allow the spark to pass without going into the cylinder. It might be possible to cement this with silicate of soda, but the best way would be to pnt in a spare plug; it is needless to say that a spare plug should always be carried.

Sometimes it happens that the coil will stop working, the platinum contact points becoming rough. If they are carefully examined it will be noticed that one is pittied and the other has slight nodules raised on it, these should be rubbed down with a fine file or a piece of emery cloth; but the vibration of the car appears to assist in keeping the contact spring in vibration.

As regards the porcelain insulations, there is naturally a difficulty in keeping these tight on account of the difference in the expanding ratios of iron and porcelain, so that if compression is lost it would be one of the first places to look for leakage. The best method of searching for air leaks is to wet the suspected part with soap and water with a brush or piece of waste, the outcoming air forms soap bubbles and the leak is at once detected. It is best to use soft soap and rain water, for it is sometimes difficult to get a lather with hard water.

Lubrication of the piston is a most important point and there is no economy in attempting to save oil in this respect. In one of my early oil-engines, the first two or three days of trial the engine would only run for a short time and then would pull up—the expansion of the piston in the water-jacketed cylinder causing it to jam, and it was necessary to replace the piston in the lathe and very slightly reduce its diameter. In small motor-car engines the diameter of cylinder being so great in proportion to area, it is quite possible that something of this sort may happen, not, of course, to actually stop the engine, but the extra friction may materially reduce the power.

Another source of loss of power is leakage. If the piston and its rings are properly fitted at first the engine should run for a long time without requiring the rings to be renewed. With old oil or gas engines, when the cylinder becomes by wear slightly oval, there is difficulty in keeping the piston tight with even new rings, and the same difficulty will occur in motor-car engines, bnt many of these engines have steel liners for the cylinder bore, which cannot be expensive to renew.

Other sources of leakage are the valves, exhaust and suction, the joints of the valve castings and cylinder cover, and the igniter. The exhaust valves may possibly at times require grinding in; the suction valve should run for years without anything being done to it, but I have seen a suctiou valve that was not true with its stem, whether the valve stem had been bent or it had been thus sent out by the maker it was difficult to say, but it was a source of annoyance.

In case a joint should blow when on the road, spare asbestos flanges should always be carried. If any particular joint continually gives trouble, a good plan is to soak the asbestos card in soluble glass (silicate of soda), or in shellac varnish. In this case it is best to give the joint some time to set before using the engine. Litharge and glycerine have been recommended for petroleum joints.

Accumulators are sometimes a source of trouble. Some of those imported from the Continent have, doubtless, not been so durable as they should be; the E.P.S. cells appear to answer well. It seems to be best to partially recharge the cells every evening, that is if the car has been in use during the day. This prevents the chance of disappointment by a cell running down unexpectedly.

In conclusion, there is still a good deal to be learnt by each motor-vehicle owner; each type of engine, and almost each engine, has its own peculiarities; a good deal might be, and doubtless is, learnt by each owner talking over with others the difficulties and pointing out the good qualities he has discovered in his motor.

Everything should be kept in order and repair; a bearing left untightened may cause the bolts to snap and the crank-shaft to break. Railway locomotive drivers can tell by car how the engine is running. So should the motor-car driver; he should carefully note any change in the beat of the machinery, and by stopping in time a serious breakdown may be averted.

CORRESPONDENCE.

*** We do not hold ourselves responsible for opinions expressed by our Correspondents.*

*** The name and address of the writer (not necessarily for publication) MUST in all cases accompany letters intended for insertion or containing queries.*

*** Correspondents are particularly requested to write on one side of the paper ONLY, to place the subject of their letters as a headline at the top of the sheet, and their names and addresses at the foot. Attention to these matters saves much time and ensures the insertion of the letter.*

THE BRITISH MOTOR SYNDICATE.

To the Editor of The Automotor.

Sir,—I must contradict the information you seem to have got that the British Motor Syndicate has settled with the shareholders. They may have done so with some, and if so, and that those some have made a special settlement on terms of its being kept private from the others, I think those others have a good case, not only against the Syndicate, but against those some, and from communications I have had with others left out so far like myself, I think we will make it hot for the Syndicate yet.—Yours, &c., T. G.

County Kildare, *June 6th*, 1898.

[We refer to this matter elsewhere.—Ed.]

We have pleasure in publishing the following letter:—

THE CARRIAGE OF PETROL.

Andrew W. Barr, Esq.,
Self-Propelled Traffic Association,
30, Moorgate Street.

Sir,—Replying to your letter of the 1st inst., asking us to tell you the result of our negotiations with the railway companies for the carriage of petrol, we are glad to inform you that the railway companies have agreed that petroleum ether or petrol shall, as from the 1st inst., be carried at the third class rates if packed in hermetically sealed tins or bottles enclosed in cases, each package not exceeding 84 lbs. in weight, with a minimum charge of 5*s.* per consignment. The effect of this is that petrol (petroleum ether) can now be sent in small quantities at a reasonable charge for railway carriage instead of at the almost prohibitive rates which the railway companies for a long time were desirous of insisting upon.

This satisfactory result has been brought about after very lengthened negotiations which began in November, 1896, at the time when the Locomotives on Highways Act was passed.

As soon as that Act became law we pointed out to the railway companies that there was almost certain in the near future to spring up a good demand for petrol, the special kind of doubly distilled petroleum spirit, which had been found most suitable for the motors of auto-cars. We represented that it was essential to the development of the industry that this fuel should be carried by the railway companies in small quantities at a reasonable rate, all proper precautions having been taken to ensure its safety in transit.

Although several of the principal railway companies assured us of their sympathy, and promised to put in force as low a rate as possible, after several months' negotiations we were told that petrol or motor-car spirit had been put in the classification under the fifth class.

We at once recognised that to pay these fifth class rates on petrol would be fatal, and if nothing could be done to meet the difficulty, a serious blow would be inflicted on the rising auto-car industry. We then found, after studying the Railway Classification of Rates book, that ether could be sent at the third class rates under special conditions. Now, petrol is a kind of ether, and we at once decided to comply with the special conditions, so as to avail ourselves of the cheaper rates.

But this was not the end of our difficulties, for having gone to very considerable expense, and having spent over £500 in providing packages to comply with the special conditions, we were told it was of no use, because petrol was not ether, and therefore we had no right to describe it as such.

However, we were able to show that petrol complied with the specification given for petroleum ether in the British Pharmacopœia, which is the highest authority on such matters.

As a rejoinder to this, in January last, we were officially informed that the classification of ether was to be altered so that it should only apply to sulphuric ether.

We then said if this were carried into effect a great injustice would be done us and a serious blow would be inflicted on all persons interested in automobilism in this country. A great injustice would be done us because, on the strength of the classification, we had spent a considerable sum of money in providing the special packages necessary to comply with it, and, moreover, there were three good reasons why petroleum ether should be carried on at least as favourable terms as sulphuric ether, viz.:—(1) It was a safer article to handle. (2) It was considerably lower in price and therefore could not bear a higher rate of carriage. (3) It was already carried in much larger quantities, and the traffic was likely in the near future to be very much increased, and so the railway companies could well afford to carry it at a cheaper rather than at a dearer rate.

As the result of these representations the railway companies have admitted the justice of our contention, and have modified the classification in the way we desired. We have thus been completely successful in attaining our object. We may mention, to prevent misunderstanding, that although in January last we were officially informed that we must pay the higher rates for the carriage of petrol, viz., the fifth class rates, we have never charged our customers more than the third class rates on any petrol sent to them by the six principal railways running out of London.

As a last word, we think our best thanks are due to the railway companies for having finally taken our whole case into fair consideration and, when they know all the facts, for having decided it on its merits by amending their classification in a satisfactory manner.

We feel that in securing a reasonable rate for the carriage of petrol a step in the right direction has been made, and we thought the account of the negotiations might not be without some interest.—Yours faithfully,

(For Carless, Capel, and Leonard) Wm. J. Leonard.

Hope Chemical Works,
Hackney Wick, London, N.E.,
June 4th, 1898.

THE STORAGE OF PETROL.

To the Editor of The Automotor.

Sir,—Can you oblige me with a statement of the exact outside limit of petrol I may legally keep at my residence? It may perhaps surprise you to learn that two leading insurance offices, under each of which I hold policies, cannot be persuaded to indicate the limit for which I ask you.—I am, Sir, yours, &c., F. M. Gowan.

26, Clarendon Square, Leamington.

[The law on the subject will be found on p. 60 of The Automotor Pocket-Book. We transcribe that part which contains the information you require:—"Petroleum shall not be kept, used, or conveyed, except in tanks or cases of metal, so made and closed that no leakage, whether of liquid or vapour, can take place therefrom, and so substantially constructed as not to be liable, except under circumstances of gross negligence or extraordinary accident, to be broken or become defective or insecure in course of conveyance or use; and every air inlet in any such tank or case shall be at all times, except when the valve, if any, is required to be removed for immediate use or repair, protected by securely affixed wire gauze, the openings in which shall not be less in number than 400 to the square inch. Every such tank or case shall be clearly stamped or securely labelled with a legible metallic or enamelled label with the words, 'Mineral spirit; highly inflammable; for use with light locomotives.' The amount of petroleum to be in any one such tank or case at one time shall not exceed 20 gallons. There shall not be at the same time on or in any one light locomotive more than two of such tanks as aforesaid. Before repairs are done to any such tank or case, that tank or case shall, as far as practicable, be cleaned by the removal of all petroleum and of all dangerous vapours derived from the same." No, we are not surprised. Insurance companies move too slowly. Our British offices will commence the insurance of oil-motor plants in perhaps 10 years' time—not less. You should communicate with Messrs. Carless, Capel, and Leonard, of Hope Chemical Works, Hackney, London, E. They will advise you on such points.—Ed.]

AUTOMOBILE CLUB DE BELGIQUE—CONCOURS DE SPA, 1898.

À Monsieur le Rédacteur de l'Automotor.

Monsieur,—L'Automobile Club de Belgique a l'honneur d'attirer votre attention sur les Concours d'Automobiles qu'il organise cette année à Spa du 26 au 30 juin et le 3 juillet, concours dotés de prix nombreux et importants.

Des concours débuteront par une course Bruxelles-Spa, 25 et 26 juin en deux étapes, à laquelle seront affectés plus de dix mille francs de prix.

La course Bruxelles-Spa est destinée surtout à être une course d'amateurs; c'est pour cela que seuls sont autorisés à s'inscrire les personnes propriétaires de la voiture engagée ou les membres des Sociétés automobiles reconnues. Les concurrents pourront se faire accompagner d'ouvriers mécaniciens, mais non leur confier la conduite de la voiture. Ces mesures ont été prises dans le but de permettre aux simples particuliers propriétaires de véhicules automobiles de concourir avec quelque chance de succès.

La course Bruxelles-Spa sera suivie d'autres concours, tous dotés de prix nombreux et importants, dont vous trouverez le programme ci-contre.

La Compagnie du Nord-Français accorde à l'Automobile Club de Belgique une réduction de 50 p. c. pour le transport sur ses lignes de toutes les voitures prenant part au concours et expédiées de Paris.

Veuillez agréer, Monsieur, l'expression de notre considération distinguée.

Comte F. van der Stratem-Ponthoz, *Le Président.*
G. de Savoye, *Le Vice-Président.*
Comte F. de Villegas de Saint-Pierre,
Le Secrétaire-Général.

HUNTER'S MOTOR AND AERONAUTICS.

To the Editor of The Automotor.

Sir,—It may interest many of your readers to learn that the navigable balloon, in the car of which M. Gaudron made his first ascent from the Alexandra Palace on Whit-Monday, was fitted with a "Hunter" motor of the type recently described in your pages, having two 3-inch cylinders, and furnished with a suitable gear for driving the propellor.

This is specially worthy of note as being the first balloon ascent in England in which the motive power has been derived from a mechanical source, manual power alone having been employed in previous attempts. The weather was unfortunately wet and squally, but enough was achieved to demonstrate the suitability of the motor and the practicability of the system. When the car was being fitted at our works we had it suspended and tried, and the non-vibrating qualities of the "Hunter" motor were again proved, the occupant of the car declaring that the vibration was practically inappreciable.

As this motor was specially designed, and is intended mainly for autocar work, we are perhaps not trespassing too far in asking you to be good enough to give publicity to those items in your next issue.—We are, yours faithfully, Hunter and Co.

Eastdown Works, Lewisham, *June 1st*, 1898.

The German Motor-Vehicle Competition.—We notice some good features in the regulations which governed the German competition of motors which was held at Berlin from May 24th till the 27th. The meeting was divided into three parts, the first being the exhibition of vehicles; second, the race to Potsdam; and the third the distance run to Leipsic and back. It appeals to our mind that this is the right course to take, since the judge can easier define the good points of each make and compare with others when the criticism is restricted to a special capacity, quickness, finish, or durability. He is then not overwhelmed by a concurrence of numerous commendable and objectionable points. The subscription money was divided into two parts bearing the proportion of 40 and 60 per cent. The 40 per cent. were distributed amongst all the drivers who made the run within a certain time, whilst the 60 per cent. only were devoted as prizes. The stake for the show was £1 for the first vehicle entered by one maker, and 10*s*. for every additional one. For the race the same rate prevailed, but for the run to Leipsic £3 and 30*s*. were fixed. All these payments were trebled after May 14th, 10 days before the meeting.

LAW REPORTS.

Beeston Pneumatic Tyre Company.

An appeal by defendants in the case of Stroud *v.* Lawson and others on the 16th ult., came again before the Court of Appeal, consisting of Lord Justices A. L. Smith, Chitty, and Vaughan Williams. Plaintiff in the action, Mr. Frederick Stroud, sued the defendants, Lawson, Bradshaw, and Felley, directors of the Beeston Pneumatic Tyre Company (Limited), the Company being joined as a fourth defendant, first, on his own behalf to recover £500 damages, alleging that the defendant directors, by fraudulent conspiracy, raised the price of shares on the market, so inducing him, as one of the public, to buy shares at enhanced prices; and, secondly, claiming, on behalf of himself and all other shareholders, that a dividend of £30,000 paid by the directors was not paid out of profits of the Company, but was obtained from the British Motor Syndicate, of which the defendant Lawson was chairman, for which sum of £30,000 the defendants wrongfully issued to the British Motor Syndicate 15,000 fully-paid £2 ordinary shares, and that such payment of dividend being *ultra vires* and illegal, the defendants should account for it to the Company. Defendants applied to Mr. Justice Darling that plaintiff's statement of claim should be struck out as embarrassing, unless he elected to amend it by choosing between the two causes of action set up. Mr. Justice Darling refused to make an order, and from this refusal the defendants now appealed. Lord Justice Smith, in delivering judgment, said he held the opinion, contrary to that held by Mr. Justice Darling and the Master, that the plaintiff should be put to his election as regards the two causes of action which appeared in his statement of claim. Plaintiff sought to join a well-known common law action and what used to be a well-known action in the Chancery Division into one. They were based on separate causes of action, not arising out of the same transaction. In the first action the whole substance was fraudulent conspiracy alleged on the part of the directors; in the second action, respecting the payment of a dividend alleged to be *ultra vires*, the plaintiff had not got to prove fraud of any sort or form. In these actions were different plaintiffs, different causes of action, different matters of law raised, and different defendants, and he was therefore of opinion that this appeal should be allowed and Mr. Justice Darling's order varied. Lord Justice Chitty and Lord Justice Vaughan Williams concurred, and the appeal was allowed, with costs, the plaintiff being allowed 21 days within which to make his election.

The Great Horseless Carriage Company.

In the Court of Appeal, on the 13th inst., before Lords Justices A. L. Smith, Rigby, and Vaughan Williams, the case of the Great Horseless Carriage Company (Limited) *v.* Haigh came up on defendant's appeal from an order by Mr. Justice Darling on May 17th, giving leave to the plaintiff Company to sign final judgment under Order 14 for a sum of £425 due for calls on shares. Mr. Disturnell appeared for the appellant Haigh, and Mr. Longstaffe for the liquidator of the plaintiff Company. Mr. Disturnell, in support of the appeal, said the defence raised by Mr. Haigh in his affidavits was that he was induced to take those shares in the Great Horseless Carriage Company by fraudulent misrepresentation on the part of the directors. Had that been the whole case, counsel apprehended there would have been no liberty to defend; but in January last a resolution was passed for the voluntary winding up of the Company, and it was now said that after the Company had gone into liquidation this defendant, even under the circumstances which he had described, could not set aside the allotment made to him. But here the circumstances were altogether exceptional. So far as creditors were concerned, there were no creditors of the Company, and no assets which could be utilised for the adjustment of the rights of contributories amongst themselves, because the whole of the assets would be divided, one part going to a new Company which would allot shares to shareholders of the Great Horseless Carriage Company on a further payment, and another part going to the promoters of the Company—the people who were mainly responsible for this alleged fraud upon the public. Voluntary liquidation commenced in January last, and this action on April 27th. The reason why steps were not taken earlier to set aside the allotment was that defendant did not appreciate fully the circumstances under which the Company was floated until a large number of actions were commenced against this Company, claiming damages for fraud and leave to set aside allotments. It was decided that one of these actions should be selected and treated as a test action, and Mr. Haigh waited for the result of this test action to be known. It was down for trial in the Queen's Bench Division on July 5th next, and, there was every reason to believe, would be reached before the long vacation. Nobody expected a liquidation, because it was known that the Company was not trading and was not incurring debts. It was alleged that the whole of this liquidation was collusive, for the purpose of preventing any inquiry into the circumstances under which this Company was promoted. Mr. Longstaffe, for the respondents, supported the order appealed from, arguing that after winding-up commenced the shareholder could not escape, even had this matter been the absolute fraud that was alleged. After the resolution in January for winding-up, the appellant received notice that a list of contributories would be settled on March 16th by the liquidator. He made no objection to that, and it was not until the writ in this action was served and application to sign final judgment made that he set up this story that he had been defrauded. Lord Justice Vaughan Williams: Is it your contention that under no circumstances can a voluntary liquidation ever be got rid of and undone? Mr. Longstaffe did not suggest that, but argued that the appellant, not having taken any steps when he received notice from the liquidator that on March 16th a list of contributories would be made up, was not now entitled to be relieved from his liability. Their Lordships allowed the appeal, with costs, Lord Justice Smith remarking that when these transactions came to be tried it might be proved to be most unjust to sign final judgment against this gentleman without hearing his case, under an order of the Court by which he could be made a bankrupt.

New Motive Power Syndicate.

On June 9th and 10th Mr. Justice Bingham and a common jury had before them the case of Canning and another *v.* the New Motive Power Syndicate (Limited), the claim being for £78 16*s.*, balance of account for a report on Guattari's patent mixture for boilers. Defendants counterclaimed for damages alleged to have been done to the boilers. Mr. McCall, Q.C., Mr. Macaskie, and Mr. Howard Speucely appeared for the plaintiffs; and Mr. Tindal Atkinson, Q.C., and Mr. A. B. Shaw were for the defendants.

It was alleged by the plaintiffs, Sir Samuel Canning and Mr. T. E. Gatehouse, that the defendants, who were interested in Guattari's patent, which was a mixture of carbonic acid gas and a preparation of chloride, arranged that they should test and report upon it for a fee of 150 guineas, and half that sum was paid down, while the balance was to be handed over at the conclusion of the contract. It was held that the mixture, if put into a boiler, would increase the motive power. Steam would be more quickly generated, and there would be a considerable saving of fuel and water. Two tests took place in certain boilers with the patent mixture, and with plain water, and the result was that plaintiffs came to the conclusion that no better results were obtained from the mixture than from plain water. When that was discovered, it was alleged that Mr. Bale, one of the directors of the defendant Syndicate, objected to the way in which the tests were made, and also objected to receive the report and pay the balance of plaintiffs' fees.

Several witnesses on behalf of plaintiffs gave technical evidence as to the manner in which the tests were carried out, and tabulated statements were handed into Court showing the results.

On behalf of the defendants, Mr. Tindal Atkinson stated that the secret mixture of Guattari's was said to make the water in a boiler extremely volatile, so that it gave off steam with a much less consumption of fuel than ordinary water would require. Upon certain reports as to the utility of the patent, a Syndicate had been formed of which the defendants were members, and they subscribed some £1,500 for the purposes of carrying into effect and rendering a popular success, if possible, the invention of Mr. Guattari. Then arrangements were made with plaintiffs to test the boilers. The tests, however, made on two separate days in August last were not performed under the same atmospheric conditions, and it was alleged by defendants that they were unfair tests, and were not sufficiently prolonged, and that damage was done to the boilers through the way the tests were managed. Hence the refusal to pay the balance of account which formed the subject of the action.

Several witnesses were heard for the defence, one of whom admitted that Mr. Guattari was now on the Continent, and had declined to come over to assist the Syndicate. Another witness, Mr. John Humes, the consulting engineer to defendants, said the test was not a fair one. In answer to his Lordship, witness said that the Syndicate, which had taken over Gnattari's process, had not yet sold it, and he could not say whether it was worth anything or not.

In replying upon the case, Mr. McCall said that what the Syndicate wanted was a good report, which would have enabled them to pass off to the public the invention they had purchased from Guattari. Finding that Mr. Gatehouse and Sir Samuel Canning could not conscientiously give the Syndicate the glowing report they desired, objections were raised, and hence the appearance of the parties in Court.

His Lordship, in summing-up, said the real question the jury had to decide was whether plaintiffs did their work in a proper and conscientious manner. If a skilled person were employed to do a certain thing, he must do it with the skill which a person in his business would be expected to use. Defendants complained that plaintiffs had not exercised their skill upon the experiments in question. Now, the defendants bought Guattari's patent, and a kind of first Syndicate was formed, which raised a sum of money with the object of testing the process to see whether it was really worth anything. An experiment was made—which was not the subject of this action—with the result that Syndicate No. 2 was formed, which seemed to think that the proper thing to do was to sell the patent to the public. Before, however, it was put before the public it was thought best to get from a good firm, with a good name, a favourable report, which would in due course be printed in the prospectus. What the Syndicate wanted was a report which was favourable, for any other would have had no commercial value for them. The main point, however, was—Did the plaintiffs bring to bear, when making the tests, that skill, care, and judgment which competent men in their position ought to bring? If they did, they were entitled to balance sued for, and if not they would have to refund the sum had already been paid them.

jury at once gave a verdict for plaintiffs for the amount

Bankruptcy Court.

AT the Bankruptcy Court, on May 18th, the first meeting of creditors was held in the case of C. E. Monkhouse, described as a company promoter, of 38–39, Parliament Street, Westminster. It appears that the debtor during the last two years has been engaged in company promoting, and was interested in the Peerless Metal Company (Limited), and the Letay Motor-Engine Company. The liabilities were returned at £821, with assets nil. The debtor ascribes his insolvency to the action taken by the petitioning creditor in respect of a bill accepted on behalf of Mr. W. B. Norris, and to law costs incurred in connection therewith. He has also lost £200 or £300 by horse-racing. No offer was submitted, and the case went into bankruptcy with the Official Receiver as trustee.

IN the Chancery Division on the 11th inst., before Mr. Justice Stirling, Mr. Sarjeant applied for the appointment of a receiver in the matter of R. F. Hall and Co., cycle manufacturers, &c. Counsel stated that the Company had got into difficulties, and an action had been brought against them by Lloyd's Bank. There was £50,000 worth of material in the business, but it was in an unmerchantable state, and £4,000 would be required to make it marketable; £400 was also required to pay wages due to the workmen that day. The present application was made on behalf of debenture holders. His lordship consented to the appointment of a named gentleman as receiver, and gave leave to borrow £400.

Furious Driving.

AT Brighton, on the 30th ult., Harry Parton, of 94, Fernhead Road, Paddington, London, was summoned for driving a light locomotive on the King's Road, on May 22nd, at a speed greater than was reasonable and proper, having regard to the traffic on the highway. Defendant pleaded guilty. P.C. Fellingham said that he was on duty on the King's Road, close to Regency Square, on Sunday evening, May 22nd, when he saw the defendant driving a motor-car at a very rapid speed on the wrong side of the road. When opposite the Metropole defendant, through his reckless driving, caused a horse to take fright and run into a cab standing on the cab rank. The defendant did not stop to see what mischief had been done, but witness saw him on the following day, when he gave his name and address. Defendant stated then that at the time his motor-car was geared up to a speed of about 12 miles an hour, but, being on level ground, it would have increased to about 14 miles. A cabman said that what with the steam and the rate the defendant was coming, his cab was thrown back on the rank. His cab was not actually touched by the defendant's vehicle. Defendant said he pleaded guilty to furious driving. Mr. Carter stated that he believed defendant was an experienced man. There were two ladies in the motor-car at the time. Defendant was engaged by a gentleman for the express purpose of driving the car. The stipendiary, in fining the defendant 40*s.* and costs, or a month's imprisonment, pointed out that although 12 miles an hour was the maximum at which these light locomotives could be driven, the speed must depend on the state of the traffic, or on other circumstances.

MORE FURIOUS DRIVING.—At the Petty Sessions, Bromsgrove, on June 7th, Charles Sangster, Selly Oak, was charged with driving a motor-cycle on the Birmingham New Road, near Marlbrook, at a furious rate. Mr. Gerald Botteley, solicitor, Birmingham, defended. Police constable Price stated that defendant was driving at a "furious rate"—he thought 25 or 30 miles an hour. It was a dangerous rate. Another witness stated that he saw the motor-cycle going very fast—he thought 30 miles an hour. He was informed that the cycle was geared to 12 miles an hour, and he then said it might not have been more than that. After further evidence of an exceedingly loose nature, Mr. Botteley quoted from the Locomotives on Highways Act to the effect that no light vehicle should travel at a greater speed than 14 miles an hour; and evidence was given that the machine was geared to 12 miles an hour, and the brakes were effective. Defendant was fined £3 10*s.*, including costs.

AT the West Riding Police Court, Leeds, on the same day, Rowland Winn, a cycle engineer, of Leeds, was fined 5*s.* and costs, for riding a motor tricycle at a furious rate on the high road at Adel. A police constable estimated the speed which the machine attained when he saw it at from 17 to 20 miles an hour.

MR. PENNINGTON AND FURIOUS DRIVING.—On June 3rd, at Shifnal Police Court, Mr. Edward John Pennington (Wolverhampton), inventor, was charged with four breaches of the Light Locomotives and Highways Order, 1896, in the parishes of Shifnal, Albrighton, and Boninghal, on April 23rd. The allegations were that he was driving a motor-carriage at a dangerous speed, and that he did not pull up stationary when signalled by the driver of a vehicle. He was fined £18 15*s.* 8*d.*

At the Wolverhampton Sessions Court, on the 6th inst., the same person was summoned for driving a motor-car at a furious rate along the Wergs Road, Tettenhall, on May 9th. Defendant did not appear, and was represented by Mr. Wright, from the office of Messrs. Fowler and Langley. Superintendent Price informed the Bench that there had been a number of complaints made as to the danger resulting from the way in which the defendant drove his motor-car, and he had been summoned at Shifnal for a like offence. It had been found necessary to take proceedings, or people might be injured. Thomas Smith spoke to seeing the motor-car travelling at a speed of about 30 miles an hour; and Edward Denning, who saw the car, estimated the speed at 25 miles an hour. Witness was riding on a cycle, and tried to keep pace with it, but although he rode a mile in two and a half minutes he lost sight of defendant and his car. Another witness thought the speed was about 20 miles an hour. A plea of guilty was put in, and the Bench imposed a fine of £2 10*s.* and the costs.

Vehicles in China.—In the course of an interesting article in *Engineering*, descriptive of the industrial development that is taking place in that country, the writer says:—"The Chinese wheeled traffic is worthy of notice. Their principle of selection has resulted in the evolution of two forms of vehicle in North China, the wheelbarrow with a large narrow single central wheel, with seats on each side of the wheel on which six to eight persons, or an equivalent freight, are carried by the individual coolie, and the one-axled cart with wheels of small diameter and iron-studded tyres about $1\frac{1}{2}$ inches wide. These carts are very solidly framed, and often carry loads of several tons, drawn by a composite team of one or two bullocks, one or two donkeys, and one or two mules or Tartar ponies; generally four or five draught animals in each instance, connected together by long rope traces."

MOTOR-VEHICLE TRIALS AT BIRMINGHAM.

(BY OUR OWN CORRESPONDENT.)

The second of the annual trials of heavy automotors held in connection with the Royal Agricultural Society's Show were commenced on Monday, the 13th inst. This year the trials were held in the same neighbourhood as the Show, viz., Four Oaks Park, Sutton Coldfield, near Birmingham. Apart from the advantages of the park and the charms of the picturesque and well-wooded town-village of Sutton Coldfield, the district, though hilly, is well suited for trials of heavy motor-vehicles. I had occasion about a fortnight ago to drive all round Sutton Coldfield, Aldridge, Little Aston, and Streetly, and was much struck by the excellent condition of the roads, not merely in the immediate neighbourhood of Sutton Coldfield itself but of the district generally. As compared with the roads at Crewe last year, the vehicles had an easy time of it, and in forming my opinion on the respective merits of the competing vehicles for the transport of produce, &c., I have not forgotten to contrast these excellent roads with those near large industrial centres like Manchester and Liverpool, the roads outside the latter town being simply execrable.

It was understood that the vehicles were to be on the ground on Saturday, but when I arrived I was an easy first. By prosecuting inquiries I learned that most of the vehicles were putting up independently. A Daimler wagonette was running in Sutton and attracted a great amount of attention, but otherwise everybody, official or otherwise, seemed profoundly ignorant concerning the trials. This was rather a surprise to me, seeing that Sutton is comparatively near to that important centre of the motor-car industry—Coventry.

Fig. 2.—Messrs. Roots and Venables' Heavy Oil (High Flash) Van.

The trials attracted much more attention this year from the trade, however, the entries being far more numerous, and, what is still more important, the number of vehicles that put in an appearance was encouraging, after the grand total of unity attained last year.

Entries.

There were two classes under which vehicles might be entered, viz.:—

Fig. 1.—Daimler Petrol Van.

Class I—for vehicles carrying (not drawing) 1 ton—under which the Daimler Motor Company had a very neat and business-like van (Fig. 1). It was
4 H.P. Daimler
framing is that usua
the Company, only
speeds, rising from
hour as a *minimum*
as a *maximum*, th
speeds being four
respectively. The l
with a removable canvas covering and a tilt back. The trunk of the van, so to speak, is narrower than the head and end, being 3 feet 4½ inches wide, the ending being 4 feet 1 inch wide. The total length from the back of the front seat to the tail-board is 4 feet 10 inches. The brakes provided are three in number and powerful—a good feature—and include the usual foot-brake acting on the counter-shaft; a brake on each of the sprocket-wheels, attached to the driving-wheels, which is operated by hand; and separate screw-brakes on the two driving-wheels. In addition to these there is the familiar sprag. Seven gallons of petrol were carried, sufficient to carry the van 70 miles.

The greater part of Monday morning was spent in weighing the vehicles, &c. The first to leave was the Daimler van, which, under the skilful guidance of Mr. O. Mayer, was put round the prescribed route of over 13 miles in less than 1½ hours. The consumption of fuel was five pints of petrol. The load carried was 2,200 lbs. sand and two passengers (including driver). Total weight, 2 tons 8 cwt.

(including vehicle, load, water, oil, &c.). A lorry was entered in this class by Mr. H. P. Saunderson, of Bedford. It was driven by a petrol motor with one cylinder, and of the horizontal type. The lorry was a wooden body on a steel frame. Unfortunately, it had a breakdown in the mechanism, due to defective packing.

In Class II, for vehicles to carry 3 tons, Messrs. Roots and Venables had a van (Fig. 2) which has been built to the order of Messrs. Peek, Frean, and Co. The van is driven by a twin-cylinder Roots' oil motor, of 6 H.P., and is intended to carry a load of 1 ton. Ordinary petroleum oil, such as "Tea Rose," is used, as is the case with all the vehicles made by this firm; in fact, we believe they are the only makers of cars and other vehicles whose motors are driven by this safe fuel. Petrol and benzoline cannot be handled with the same impunity. The crank-shaft of the motor, which runs at about 500 to 520 revs. per minute, is, in the case of the slow speed, geared by means of mortice wheels and friction clutches with a counter-shaft, on the ends of which are chain wheels connecting it to the driving wheels. The quick speed is obtained by connecting the crank-shaft to the counter-shaft direct without the intervention of the mortice wheels. The balance gear is fixed at one end of the counter-shaft. The friction clutches are used for graduating the speed as desired between the maximum and about one mile an hour. There is a third friction clutch which can be put into gear for reversing. The steering is on the Ackerman principle—operated directly by a hand lever. Two brakes—one a band brake on the counter-shaft, and the other an ordinary foot brake acting on the iron tyres of the driving wheels—are under easy control of the driver. The van is painted in the well-known colours of Messrs. Peek, Frean, and Co., the upper part of the body being a rich cream, while the lower part and wheels are green.

In this class there were also two lorries, one by the Steam Carriage and Wagon Company (Thornycroft's), of Chiswick (for illustration *see* p. 330, Fig. 9), and the other by the Leyland Steam Motor Company (*see* p. 331, Fig. 10). The former took a full load and did the course in 2 h. 29 m. Full particulars of this vehicle and the Leyland will be found in the Liverpool Trials article.

The Leyland lorry did the course in 2 h. 31 m., though it was running under difficulties owing to a temporary hitch with the air-pump that maintained the pressure for the oil-burner. It did the journey down to the Show ground—a run of 110 miles—in a day and a quarter without a hitch. They were burning Russian oil, though the lighter American product is generally used. Owing to the late start the amounts of coal or oil consumed were not officially announced on Monday, and the award list will not be issued until the Monday of the Show week.

A steam buckwagon by Jesse Ellis and Co., of Maidstone, was also entered, but had unfortunately not been able to get to the ground in time. This wagon (Fig. 3) has been built for service in South Africa, Australia, &c. The body is stoutly constructed of wood bolted to a steel frame, and has a carrying capacity of 6 tons exclusive of the weight of the wagon. At the front end of the wagon is arranged the cab containing the machinery, which is placed above the floor to enable rivers to be forded without wetting the engine, boiler, &c. All the operating levers are brought together in the cab and arranged so as to be under the control of one man. The engine has been specially designed, and is a compound vertical engine with one distributing piston-valve to both cylinders and a single eccentric reversing gear. The engine will be found to possess many features of interest, especially when it is remembered that its weight is so little. The boiler, which is of ample size to supply steam to the engine, is an improved type of vertical tube boiler with exceptionally large heating surface and is designed to burn either solid or liquid fuel. The condenser is placed in the roof of the cab and is a patent atmospheric condenser provided with a fan driven from engine. Special attention has been paid to the gearing, which consists entirely of spur wheels, a chain being found unsuitable for such a heavy drive. A two-speed gear and differential motion are provided. The steering is effected by revolving a hand-wheel which actuates by means of a worm and worm-wheel two drums with chains attached, one to each side of fore-carriage. The steering wheels are attached to the fore-carriage which is provided with a ball race and phosphor-bronze balls. A hand-brake suitable for ordinary working and a powerful emergency steam brake are arranged in suitable positions. The wagon is also provided with a hauling drum and a long length of steel wire rope for use when fording rivers. Clutches are arranged for throwing the driving wheels or hauling drum in and out of gear as required. The oil and water tanks are fixed under the wagon and are of a large capacity for a long run. The maximum speed on level is 10 miles per hour.

FIG. 3.—JESSE ELLIS AND CO.'S STEAM BUCKWAGON.

The judges were Messrs. Bryan Donkin, Webb, and Prof. Unwin, accompanied by Mr. Courtnay, the engineer to the Society. The unavoidable, and in some cases wholly unexpected, delays made it very difficult to obtain anything like reliable details during the progress of the trials, but we shall be able to supplement this brief account of the trials by a more detailed description in our next issue.

NEW INVENTIONS.

Claiming particularly to apply directly or indirectly to Motor Vehicles, &c.

Compiled for "The Automotor and Horseless Vehicle Journal" by Herbert Haddan and Co., Registered Patent Agents, of 18, Buckingham Street, Strand, W.C., London.

Patents Applied For.

Abbreviations: Impts., Improvements in; Relg., Relating to.

1898.
May 2. 10,020. G. I. Whitney. Impts. relg. motor-vehicles.
" 2. 10,048. W. H. Casley and A. F. Woodman. Impts. driving gear.
" 4. 10,219. E. Gschwandler. Driving chain.
" 5. 10,281. R. Pritt. Impts. motor-cars.
" 5. 10,302. C. W. Higgs. Magnetic brake for mechanically-propelled vehicles.
" 6. 10,429. J. Harper. Impts. motor road vehicles.
" 9. 10,603. W. G. Cloke. Impts. cycles and motor-power carriages.
" 10. 10,655. R. J. Wilson and A. E. Kitsell. Water-tube boiler.
" 11. 10,722. J. W. Hunter. Impts. self-propelled vehicles.
" 11. 10,735. L. Clement. Impts. motive power.
" 16. 11,111. G. Knap. Improved autocar.
" 16. 11,127. D. H. Gill and J. Howell. Life-saving apparatus for motor and other vehicles.
" 17. 11,195. J. Bird. Preventing vibration.
" 17. 11,212. M. C. Elliott. Impts. driving gear.
" 19. 11,409. W. R. C. Ball. Frameworks for motor-vehicles.
" 19. 11,425. Hon. R. T. D. Brougham and W. C. Bersey. Impts. motor-carriages.
" 19. 11,426. Hon. R. T. D. Brougham and W. C. Bersey. Impts. electrically-propelled vehicles.
" 19. 11,429. O. Patin. Impts. electrically-propelled road vehicles.
" 20. 11,460. J. G. A. Rhodin. Impts. driving gear.
" 20. 11,527. A. Beasley and H. H. Harrison. Handles for cycles, &c.
" 23. 11,685. The Steam Carriage and Wagon Company (Limited) (J. E. Thornycroft). Impts. motor-propelled vehicles.
" 23. 11,696. H. E. S. Holt. Impts. oil and gas engines.
" 25. 11,933. H. J. Lawson and British Motor Company (Limited). Impts. relg. self-propelled vehicles.
" 26. 11,959. G. J. C. Parker. Impts. automotors.
" 26. 12,028. W. Baines (G. W. Lewis, U.S.A.). Impts. motor-driven vehicles.

Specifications Published.

The following is a List of Specifications recently published, and obtainable at the Patent Office, 25, Southampton Buildings, London, W.C., at the uniform charge of 8*d*. per copy. Owing to the enormous pressure upon our columns it has been found impossible to deal in any other form with the accumulation of patents now being taken out in connection with automobilism. As far as possible, a selection for special mention is made by the Editor from the more prominent inventions:—

Applied for during 1897.

1,212. P. Bagot, 15, Brinkburn Street, Sunderland. Motor-driven road vehicles.
2,123. M. D. Martindale, 36, Basinghall Street, E.C. Motors operated by fluid or gaseous pressure.
3,493. T. Toward and others, 26, Heaton Road, Newcastle-on-Tyne. Under-carriages.
3,706. J. Kuster, Neon, Phaleron, near Athens. Speed gear.
6,651. J. R. Hargreaves, Witchingham Hall, Norwich. Internal combustion engines.
3,025. H. Maxim, Thurlow Lodge, 377, Norwood Road, London, S.E. Cooling devices for engines.
3,370. F. W. Crossley, Openshaw, Manchester. Internal combustion motors.
3,647. C. Kenyon and J. Pogson, 126, Heaton Lane, Stockport. Tube joint for frames.
4,360. C. R. Webb, 70, Hall Road, Handsworth, Staffs. Cranks.
4,610. C. A. Embleton, 24, Gloucester Street, Middlesbrough, Yorks. Explosion motors.
4,660. H. A. Lamplugh, 61, Wellington Road, Birmingham. Motor-carriages.
4,755. H. G. Morris and P. G. Salom, 318, South 10th Street, Philadelphia, U.S.A. Electric motor-vehicles.
6,013. J. T. Marshall, Steam Plough Works, Leeds. Pistons and piston rings.
6,302. C. V. Pugh, 34, Spon Street, Coventry. Brakes.
6,435. W. J. Lloyd and W. Priest, Quadrant Cycle Co., Sheepcote Street, Birmingham. Driving gear.
7,453. H. Harford, 3, Albion Terrace, South Shields. Chain driving gear.
18,922. J. Woodley and A. Shibko, 231, Newport Road, Roath, Cardiff. Steam, gas, and petroleum engines.
567. J. A. J. T. Krieger, 168, Boulevard Malesherbes, Paris. Motor road vehicles.
3,494. A. Bagshaw and T. B. Bennett, 86, Park Lane, Aston, Birmingham. Driving chains.
4,554. A. Olivier, 2, Rue Manuel, Paris. Motor road vehicles.
5,353. H. Heatley, 110, Cannon Street, London. Brakes.
5,674. R. M. Lowne, Ravenscroft, Southend Road, Catford, London. Atmospheric engines.
5,802. Count A. de Dion, 12, Rue Ernest, Puteaux (Seine), France. Differential transmitting gear.
5,978. A. C. Capel and T. Clarkson, 186, Dalston Lane, London. Burning of liquid hydrocarbons.
6,645. E. L. Tournet, 19, Cavendish Road, Birmingham. Oil and gas engines.
6,798. L. Clement, 131, Jermyn Street, Regent Street, London, S.W. Motor-cars.
16,635. C. F. C. Lohmann, 13, Andrew Street, Northcote, Melbourne, Victoria. Rotary motor.
21,936. E. Draulette and E. Catois, 212, Rue Lafayette, Paris. Driving gear.
24,861. E. T. H. and L. Gardner, Gardner Works, Cornbrook, Manchester. Feed mechanism.
6,105. T. G. Stevens, 5, Cobham Terrace, Greenhithe, Kent. Controlling gear.
7,074. W. T. Rowden, Lonzit, Dumbartonshire. Ignition apparatus.
7,712. J. Hands, 32, Highgate Road, Sparkbrook. Chain and chain wheels.
8,331. J. Bunn and others, Herbert Street, West Bromwich. Brakes.
8,522. J. E. Thornton and J. P. Lea, Rokeby, Oldfield Road, Altrincham. Power transmitting gear.
8,819. J. E. Thornton and J. P. Lea, Rokeby, Oldfield Road, Altrincham. Method of applying power.
8,822. J. H. Wimshurst, Greylands, Foleshill, Coventry. Gas or oil engines.
11,192. P. M. Wilson, Primrose Bank, Kilcreggan, Dumbarton. Fluid-pressure engines.
14,165. C. Barnes, 22, Altham Terrace, Lincoln. Internal combustion engines.
26,006. J. H. Kirk and J. W. Jeffs, Jessamine Villa, Orchard Road, Ordington, Warwick. Junctions of frames.
28,965. A. Grossman, 205, St. Peter's Street, New Orleans, U.S.A. Controllers for motors and brakes of electric cars.
3,831. A. R. Adams, Guy's Hospital, London. Electric batteries.
7,410. T. H. Parker, Manor House, Tettenhall, near Wolverhampton. Motor-cars.
9,722. J. Roots and C. E. Venables, 100, Westminster Bridge Road. Oil motors.
11,792. S. Phillips, 215, New John Street West, Birmingham. Metallic wheel rims.
12,050. W. Fairhurst, 15, Upper Morris Street, Wigan, Lancs. Explosion engines.
19,951. L. Chambault, 34, Rue St. Marthe, Paris. Apparatus for generating and burning acetylene gas on autocars and the like.
7,250. A. W. Brightmore, Burford House, Knighton, Radnor. Steering.
7,770. W. Baines and W. Norris, 5 and 6, Great Winchester Street, E.C. Oil engines.
8,100. M. H. C. Shann, Westfield, Bromley, Kent. Internal explosion engine.
9,613. F. L. Martineau and others, Grove Cottage, Ladies Hills, Kenilworth. Autocars and motors.
9,706. J. E. A. Amiot and E. Peneau, 47, Rue du Chateau, Asnieres, France. Horseless carriages.
10,043. F. W. Lanchester, Cobley Hill, Alvechurch, Worcester. Power-propelled road vehicles.

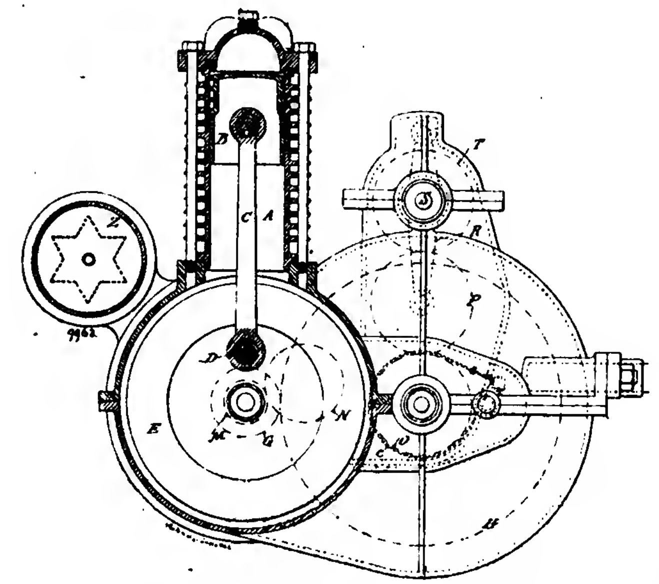
9,963. Carburetted Air or Internal Combustion Engines. A. H. L. Grivel, 6, Rue des Poissonniers, Neuilly (Seine), France. April 21st, 1897.

The piston of each of the two cylinders is coupled by means of a connecting rod to a crank, each of these cranks having a double fly wheel. The two cranks are set at an angle of 180° to each other in order to obtain one explosion at each rotation of the driving shaft.

The driving shaft carries a pinion gearing with a wheel which drives the motor-axle of the vehicle through the intermediation of a differential gear constituted by four conical pinions suitably disposed in relation to one another in a box or casing. The connection of this wheel with the differential gear is effected by the intermediation of a slightly conical ring interposed between the differential gear and the nave of the wheel; there is thus obtained a secure driving contact of these parts.

The exterior of the differential gear box is formed or turned so as to constitute the drum of the brake, and a spring-band or strap is suitably mounted so as to bear upon the drum thus formed and stop the movement of the vehicle when the driver operates the brake lever.

The operation of the escape valves is effected by cams suitably mounted upon spindles and set in motion by the driving shaft through the intermediation of gear wheels.



Upon the differential gear box is mounted a pinion which gears with a second pinion carried by an arm adapted to pivot around the spindle of a third pinion. By turning this third pinion the wheel which drives the motor-axle of the vehicle as before described is set in motion (the cone ring before described having been first put out of gear to prevent starting of the vehicle), and this wheel, gearing with the pinion on the driving shaft of the engine, starts the motor. As soon as the engine is started, the spindle of the third or starting pinion is released; the first pinion then repels the second pinion which is displaced and automatically throws the apparatus out of gear.

The invention also comprises improved means for varying the speed of the engine by producing longer or shorter intervals of time between the successive explosions in the cylinders of the engine. An insulating cylinder is provided which rotates on its spindle and carries a metallic piece upon which a spring contact constantly presses. Two other spring contacts are provided connected respectively to the poles of the induction coil which produces the igniting spark.

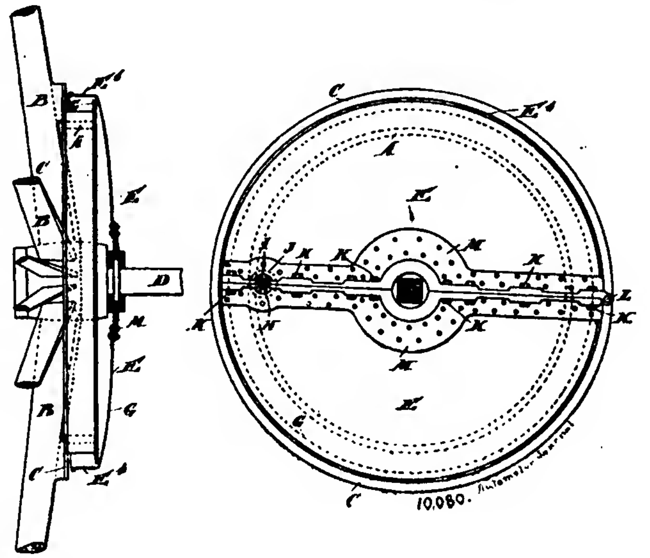
The box which carries the two last-named contacts is capable of being moved slightly on its axis by means of a suitable handle worked by the driver, its movement being guided and limited by suitable slots. According to the position of the box the spring contacts connected to the induction coil will come in contact a little sooner or a little later with the metallic piece on the insulating drum, and will thus vary the time between the successive explosions of the charge and thus modify the speed of the engine.

The carburetter is preferably placed at the back of the motor, and is rotated by means of a small belt from any suitable shaft; the carburetted air or mixture of air and vapour is led by a pipe to the chamber from which the suction valves draw the charge into the cylinders.

10,080. Driving Gear for Motor-Carriages. R. R. Symon, 20, Abchurch Lane, London, and H. A. House, Junior, East Cowes, Isle of Wight. April 22nd, 1897.

Relates to driving gear for motor-carriages, and has for its object the provision of means for preventing the entrance of dirt into the teeth of the gear.

The gearing is of the kind known as internal tooth gearing, and the internally geared wheel, A, is mounted on the inside of the spokes, B, the side of the internally geared wheel that comes next to the road wheel being closed with a disc or plate of sheet-iron or other suitable material, C, fixed to the road wheel or to the geared wheel, or, if preferred, cast with the latter, so that no dirt can enter the teeth from that side. On the stationary axle, D, of the carriage is fixed a disc or plate of sheet-iron or other suitable material, E, the periphery of which is turned up or otherwise flanged all round as



shown at E[1], thereby forming a kind of circular dish, into which the aforesaid internally geared wheel enters, so that the inside face of the latter is covered by the bottom of the dish, and its outer periphery by the turned up or flanged edge, E[1], thereof. The internally geared wheel, A, is thus enclosed at its two sides between two discs, one of which, C, rotates with it, and the other, E, remains stationary, and peripherally by the turned up or flanged edge, E[1], of the stationary disc, E; and if it were possible to preserve a close joint between the rotating and stationary parts, no dirt or dust could get into the gearing; but as that is not practically possible, a radially projecting flange, G, is formed on the inner edge of the outer periphery of the internally geared wheel, A, which flange prevents any dirt that enters between the rotating and stationary parts getting into the teeth of the gearing, and guides it round to the lower part of the flange, E[1], of the stationary dish, where a hole or holes may be provided for its escape.

The stationary disc or dish, E, E[1], is provided with an opening, H, through which the shaft, I, passes, carrying the pinion, J, that gears with the teeth of the internal wheel, A; and, if desired, this opening may be made large enough to enable the pinion itself to be passed through, the opening being, however, covered with a suitable cover-plate after the pinion is in place. The enclosing discs and other parts may be made in two or more pieces connected together by rivets or by bolts and nuts, K, or hinged as at L.

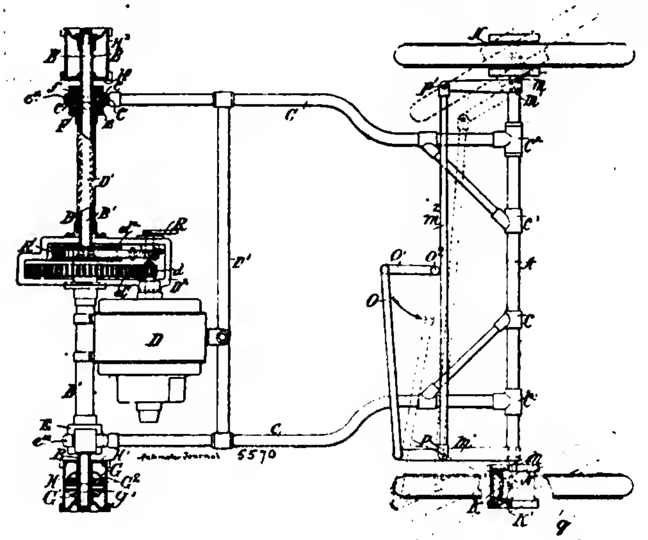
A modified form is also described.

5,570. Motor Road Vehicles. J. Y. Johnson; communicated by A. L. Riker, New York, U.S.A. March 7th, 1898.

This invention relates to the construction of motor or self-propelled vehicles, and more particularly to the running gear thereof, and consists of an approximately rectangular running gear frame in which the two axles are capable of independent vertical play while being retained in substantially parallel vertical planes by means of side-bars, the said bars being each attached to the rear axle by a universal joint, and one of the bars being secured rigidly to the front axle, while the other is secured thereto by a swivelling connection.

The rotating axle has a collar near each end, and a relatively stationary casing surrounding the axle having an enlargement at each end, ball bearings being situated within the enlargements and against the outer side of the collars, means being provided for tightening the balls up against the collars. The relatively stationary casing has a spherical seating near each end.

The driving-shaft comprises two axles located one within the other, a hub at one end of the said axles enclosing a compensating gearing, the said gearing comprising a bevel wheel secured on the inner axle, a bevel wheel on the hub, and bevel pinions, mounted to



rotate upon a support rigidly connected to the outer axle, and arranged between and gearing with the bevel wheels.

A brake drum is provided fast on the driving-shaft, the brake-lever being mounted on the casing that surrounds the driving-shaft and driving-gear, and the brake-band passed around the drum and secured to the lever.

The hubs have race-ways for ball bearings near each end, and annular ball-retainers, in combination with a cylindrical box, mounted upon the end of the axle by a vertical pivot, and an arm for turning the box, and with it the hub.

A bolt passes through the axle and the box, pivoting the latter upon the former, the said bolt having a conical shoulder near its upper end, and two sets of ball bearings, one between the said shoulder and the upper face of the axle, and the other between the lower face of the axle and the cylindrical box.

24,881. Explosion Engines. J. B. Furneaux, Victoria Works, Gateshead-on-Tyne, Durham, and E. Butler, Coatesworth Road, Gateshead-on-Tyne. November 6th, 1896.

In this engine there are two cylinders, each open at one end, arranged side by side and provided with trunk pistons connected to a pair of oppositely arranged cranks on a common shaft provided with one or more flywheels. Situated midway between the two cylinders and at or near the combustion end thereof is a casing provided with a balanced circular distributing valve and with two pairs of oppositely arranged ports that communicate with the combustion chambers of the two cylinders by suitably arranged pipes or passages. This casing with ports and connecting passages may form one casting with the two combustion chambers. The valve is arranged to be rotated once for each six revolutions of the crank-shaft by a worm fixed on the crank-shaft between the two cranks and gearing with a worm wheel fast on a shaft connected to the valve. The arrangement is such that there is an explosion or working outstroke at every third revolution of the crank-shaft, the two cranks being arranged at an angle of 180° apart.

The balanced valve is constructed with three pairs of oppositely arranged channels or portways, the first pair communicating with the supply pipe or passage for explosive mixture, the second pair communicating with the exhaust pipe and silencer, and the third pair communicating direct with the external atmosphere, it may be through one end of the valve, and serving to supply and exhaust a cooling charge of air on the fifth and sixth strokes of the cycle of working. Each cooling charge of air also has for effect to clear the combustion chamber, cylinder, and ports of all residual gases from the previous explosion.

During the rotation of the valve the series of channel or portways contained in the valve are brought into communication with the ports communicating with each cylinder alternately; the cycle of working of one cylinder being one and a half revolutions in advance of the other.

The explosive charges may conveniently be ignited by electric igniters located in the combustion chambers of the cylinders and between which electric sparks can be produced by means of a sparking coil actuated by a dry battery and controlled by a commutator attached to, and receiving motion from, the said valve or valve shaft, the arrangement being such that the charges in the two combustion chambers are ignited in an alternate manner.

The cylinders are or may be provided externally with a series of cooling rings or ribs, arranged preferably at right angles to the axes of the cylinders, for the purpose of presenting a large heat radiating surface and preventing overheating of the cylinders.

14,559. Instantaneous Steam Generators. J. Simpson, Braehead, Whins of Milton, Stirling. June 16th, 1897.

The improved steam generator is of the class in which the water supplied to it is practically flashed into steam upon contact with the heating surfaces, and the latter are composed mainly of inner and outer concentric tubes through the annular spaces between which the water passes and the steam generated flows to a receiver or the engine. The tubes are arranged horizontally or approximately so in staggered rows over a furnace which may be formed by jets of hydrocarbon vapour or by liquid fuel burners, and their ends are connected to vertical end headers or slabs forming the end walls of the combustion chamber and generator, the outer tubes being connected to the inside plates of the end headers, whilst the inner tubes passing through are connected to the outside plates thereof. The ends of the tubes may be expanded or screwed into the respective plates of the end headers or slabs, and they are retained in place by means of screwed lock nuts whose bearing faces are preferably recessed and filled in with copper wire or like packing to form a tight joint. The steam or water spaces within the end headers or slabs are made as shallow as practicable, and these spaces are divided by distance pieces which are arranged to direct the flow of the water and steam in a sinuous course through the tubes and end headers. The water or steam circulating through the annular spaces between the tubes is subjected not only to the heat applied to the surface of the external tubes, but also to heat applied to the surfaces of the inner tubes either by carrying the furnace gases through them, or by directing through them the flame or jets of a separate heating arrangement.

A number of the inner tubes of the lower and upper rows, instead of forming fire tubes, are plugged at one end and extended through the end walls at the opposite end so as to form at the lower end an inlet for the water, and at the upper end an outlet for the steam. These inlet and outlet tubes are perforated to permit of the passage of the water from the inlet pipe to the annular spaces between the tubes, and in the case of the outlet pipes for the passage of the steam from the annular steam spaces to the inner outlet tube. The water entering the feed inlet thus passes through the perforated tubes of the lower row into the surrounding water space, thence into one of the end headers or slabs, back through the annular water spaces of one or more of the rows of tubes above to the opposite end header or slab, and so on back and forth through the tube spaces and headers until the perforated tubes of the uppermost row are reached, whence the steam generated passes to the receiver or direct to the engine. The water supply may be regulated by suitably controlling the feed pump to suit the required consumption of steam.

THE AUTOMOTOR

AND

HORSELESS VEHICLE JOURNAL

A RECORD AND REVIEW OF APPLIED AUTOMATIC LOCOMOTION.

Circulates amongst Makers and Users of Motor-Cars, Cycles, etc., in the United Kingdom, the Colonies and the Continent.

VOL. II. No. 22. JULY 15TH, 1898. PRICE SIXPENCE.

CONTENTS.

THE PARIS MOTOR-CAB COMPETITION.

In our last issue we gave some of the leading features of this competition, which has been promoted by the French Automobile Club, but as we were going to press just as the trials terminated our account was necessarily meagre. We are now enabled to deal more fully with the matter, but before plunging into the very voluminous data which the officials with an assiduity that cannot be sufficiently commended have collected, and most of which has been placed at our disposal, we must cordially congratulate the Organising Committee of the Automobile Club and their distinguished colleague, M. Forestier, the various constructors of the vehicles, and all concerned, upon the brilliant success of the competition, which has done more to convince the public of the advantages and merits of automobilism for street traffic than any trials that have yet taken place either in France or Great Britain. So successful has been this competition, or rather so successfully have the vehicles come through the very severe trials, that we may say that so far, at any rate, as Paris is concerned the days of the horse-drawn vehicle are numbered.

Referring for the moment to our former report, it was decided that the competition should embrace a period of 12 days, commencing on June 1st and terminating on the 12th. The vehicles were required to traverse Paris and its environs in various directions, and to ascend the steepest gradients, the steepest being 1 in 15. Each vehicle was required to cover a distance of about 36 miles each day. The Judging Committee was required to pay particular regard to the working cost of a journey of about 36 miles as a minimum in a day of 16 hours; also comfort, ease of manipulation, frequency of replenishing the source of motive power, and the facility for repairs were points to which they had to pay special attention. The vehicles were classed as under:—

1st Class.—(*a*) Closed vehicles for two persons.
(*b*) Open vehicles for two persons, but fitted with a hood.
(*c*) Vehicles for two persons, that can be readily made open or closed.
2nd Class.—(*a*) Closed vehicles for four persons, with roof for carrying 66 lbs. of baggage.
(*b*) Open vehicles for four persons, fitted with hood.
3rd Class.—Closed vehicles for six persons, with roof for carrying 66 lbs. of baggage.

Originally 26 vehicles were entered, but only 12 actually competed; of these 11 were electric motor-vehicles, and one was a petro-motor-vehicle.

Among the vehicles entered were two, Nos. 17 and 18, by the Compagnie Générale des Voitures de Paris. These vehicles were sent over by the London Electrical Cab Company, but they did not take part in the competition. This is much to be regretted, as not only did it prevent any reliable comparison being made between the pioneer London electric cabs and the Paris ones, but also leaves us without any exact information as to the performances of the former. Why the London cabs did not compete we can only conjecture. The various petrol-motor makers, with one exception, also withdrew from the competition, as indeed they were justified in doing since it is now generally recognised that oil-motors are not the most suitable for the congested traffic of the London and Paris streets.

The depôt was at the works of MM. Clement et Cie., at Levallois, where arrangements had been made for recharging the batteries and effecting repairs.

As previously stated, there were three routes, each about 36 miles long, consisting of every variety of road, and including some very steep gradients. Each vehicle had to traverse each route three times. The total distance to be traversed was thus 335 miles; but to this must be added the extra distance due to the gradients, curves, &c. We have not thought it necessary to give these routes and gradients in profile, but have taken the actual distances covered and the times occupied.

Of the 12 competing vehicles seven completed the full course prescribed by the competition; these were Nos. 1, 3, 12, 13, 16, 23, and 25.

The Krieger Vehicles.

Excluding the only vehicle propelled by oil, viz., the No. 12, it will be seen that the remaining 11 electrical vehicles comprise three groups. In the first are the vehicles by M. Krieger, these are Nos. 1, 2, 3, and 16. In the second is No. 13, by the Compagnie Générale des Transports Automobiles, and in the third are those by M. Jeanteaud, Nos. 21, 22, 23, 24, 25, and 26. All these vehicles are alike in this respect, that they are all fitted with the Fulmen accumulator, which was fully described in our columns quite recently.* Dealing with the Krieger group we need only discuss Nos. 1, 3, and 16, as No. 2 is of a type now abandoned by M. Krieger. The other three are identical in their framing, &c., but have different bodies; thus these vehicles are interchangeable, a point of no small importance, especially as it enables a Victoria, suitable enough in fine weather, to be converted into a cab by merely shifting the body. The front wheels, which are of wood, are fitted with pneumatic tyres, but the rear ones have solid rubber tyres. The front part is double pivoted, each pivot supporting a 3-kilowatt motor, driving direct with helical gearing a spur rim on each wheel. The arrangement is extremely compact and simple and permits easy cleaning, access, and repairs. Two boxes containing the batteries are disposed in front and rear respectively and easily detachable. Each battery contains 22 Fulmen cells connected "in series," the type being marked B/17 plates, weighing 22 lbs. per cell. Each motor has a drum-wound armature enclosed within a four-pole field, of which two magnet bobbins are coarse wound (in the main current), the other two being in shunt.

No. 1 and No. 16.—Krieger.

No. 2 and No. 3.—Krieger.

No. 12.—Peugeot.

No. 13.—Cie. Gen. des Transports Automobiles.

The manœuvring of this vehicle comprises four distinct devices, viz.:—

(1) Hand-wheel steering gear.
(2) A lever "combinator" to effect the start, stop, and variation of speed.
(3) A foot-lever brake, cutting out the current when being applied (on rear wheels).
(4) A "bouton de recuperation," a button to be depressed by the driver's foot; this button excites the shunt winding and short circuits the series windings, thus braking the vehicle in a sense at whatever speed and position the combinator may be.

* *Vide* The Automotor, May, 1898.

No. 21.—JEANTEAUD.

No. 22.—JEANTEAUD.

No. 23.—JEANTEAUD.

No. 25.—JEANTEAUD.

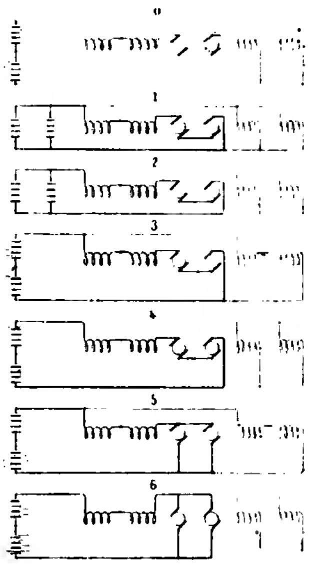
No. 24 AND No. 26.—JEANTEAUD.

No. 27.—MORGAN-SHERRIN.

For full braking the foot lever is used.

The various combinations are shown diagrammatically as under :—

KRIEGER "COMMINATOR."



THE COMPAGNIE GÉNÉRALE DES TRANSPORTS AUTOMOBILES VEHICLES.

In spite of the antiquated prejudice to the number 13, the Compagnie Générale des Transports Automobiles have not had ill luck with their No. 13 Coupé, conducted by its inventor, M. Jenatzy, but there is less originality displayed in this vehicle than in those of the other competitors; nevertheless, the vehicle behaved admirably, and so far it will hold the record as regards running with but one change of batteries. On June 10th this vehicle ran, after its ordinary 36-mile journey, another 27 miles before returning to the station. Without much attention to appearances M. Jenatzy places a box holding the batteries in front of the vehicle, which has front-steering wheels and rear-driving. These batteries consist of two groups of 22 B/21 Fulmen cells. There is one series wound motor, which revolves the intermediate shaft on which is mounted the differential box and a band brake acting both ways. M. Jenatzy has radically abandoned the recuperating method and the electric brake. The combinator is reduced to a simple handle turning round a vertical spindle and serving to interpose resistance of a varying quantity for starting and normal running. The vehicle can be made to run backwards at full speed—a doubtful advantage, we think, with a Coupé where the rear view is obstructed to the driver

Speed variations are effected by differently connecting up the batteries, which are grouped by 22, and may be coupled to slow speed (quantity), or full speed (tension), with the aid of a special commutator. For steep gradients a special mechanical speed reduction gear may be used to increase the power of the mechanism in the proportion of 100 to 67. Thus the carriage is pretty elastic in its governing and tractive power. For ordinary braking a hand brake serves, but a shoe brake may be applied to the rubbers. The handle operating this latter brake will doubtless be provided with an interruptor for the current; with the present arrangement inadvertently slackening, this brake might lead to an unpleasant experience should current be switched on.

We may mention that after the trials M. Jenatzy made a journey of no less than 92 miles with this No. 13 without recharging. This phenomenal run is, so far as we know, without precedent in the annals of electromobilism.

THE JEANTEAUD VEHICLES.

six vehicles, Nos. 21, 22, 23, 24, 25,

iron wheels with tangent spokes. and drivers. The wheels run on the efficiency of the manner in it rather original. There is one motor only, in front under the driver's seat driving the differential box, the shaft of which carries the aforesaid pivoted pins at either end, on which the wheels run. To enable the power to be transmitted when the wheels assume an inclined position, on a curve for instance, there are bevels keyed to each end of the shaft gearing into corresponding bevels on the wheels by means of interposed little bevel wheels, the axis of which latter runs in a vertical plane through the centre of the pivots. The energy is derived from a battery of 50 Fulmen accumulators, of 17 plates each, which are placed in two boxes, one in front and one in the rear. The motor has double winding which may be connected in different ways so as to vary speed For going backwards there is a special "reversing switch"; to start there is a foot lever which in its free position cuts the circuit out. Depressing this lever introduces gradually smaller resistances, and at full speed every resistance is thus cut out when the foot lever remains arrested by a latch. To manœuvre this carriage there are the following devices :—(1) A steering hand wheel; (2) a reversing switch; (3) a foot lever to start and slow down (resistance lever); (4) a combinator to effect variations in the connections; (5) a brake foot lever acting on a double direction brake; (6) a button, to brake electrically when proceeding at slow speed; and (7) a crank to operate the shoe brake on the tyres (pneumatics). The combinator of Coupé No. 21 has marks on the dial numbered from 0 to including 4, therefore indicating five distinct positions. When the indicator points to 0 the cells are in "tension" but isolated, the main windings on the field magnets, as well as the shunt windings, are in open circuit; the armature being short circuited; in this position the button connects the exciting shunt with the cells.

Mark 1 means slow speed. the batteries being "parallel" or coupled for quantity, the windings are both in circuit as also the armature, the button brake (electrical) does not act.

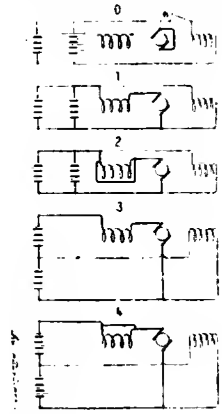
Mark 2 corresponds with a medium speed battery grouped in quantity; the main windings of the field magnets are short circuited; the shunt windings are "on current," so is the armature whilst electrical braking takes place.

Mark 3 means accelerating; batteries in "tension," everything "on current," the electrical brake does not act.

Mark 4 full speed, everything as before excepting that the main windings are short circuited, and the electrical brake again comes in play.

The combinations effected in No. 21 are as under :—

JEANTEAUD No. 21 "COMBINATOR."



Jeanteaud's (No. 24) Milord, as also Nos. 22 and 23, are similar to the No. 25 cab, which we describe below. Excepting No. 23 they showed certain defects in the accessibility of motor and batteries which in an everyday-use vehicle would be objectionable.

No. 25 cab is considered to be the best of the group. It is altogether an innovation as much from the carriage-builder's point of view as that of the engineer. To give the full benefit of the available space on a carriage to the passengers the batteries are boxed up in front like a Daimler motor. They are thus easily accessible and rest on the front shaft with their weight. The driver sits behind *à la* hansom. The weights thus being better distributed, the carriage can easily negotiate great gradients. Power is conveyed to the rear part and the driving of the rear wheels effected with chains. The motor has "drum winding," and is a two-pole one, having compound-wound fixed magnets. The batteries are in two groups of 22 each, and can be easily combined as required. The combinator shows clearly on a dial how the connections stand; whilst the combining is being effected a foot lever can be depressed, putting resistance in the main current so as to reduce the speed almost instantaneously. This resistance lever serves also for starting. The conductor has thus five parts to operate his vehicle :—(1) A steering hand wheel; (2) the combinator; (3) a foot lever actuating a hand brake; (4) the aforesaid foot lever for the starting resistance; (5) an emergency brake on the rubber tyres.

Jeanteaud's drojski, No. 26, is a small kind of carriage, the mechanism, however, is little different from his other cars.

In the combination of the cab No. 25, position No. 1 (minus) corresponds to going backwards; accumulators are "in quantity" main windings as well as the shunt, and the armature and the resistance are "on current."

No. 0 stop-braking, accumulators in tension but open, the main windings in circuit and on the armature; the shunt out of circuit the armature in circuit but reversed, the resistances in circuit for the electrical brake.

No. 1 (plus) slow speed, batteries in quantity, everything in circuit.

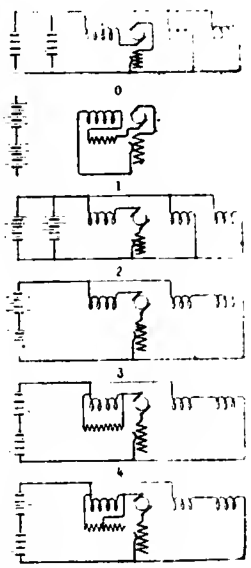
No. 2 medium speed, batteries in tension, everything in circuit except the resistance; from 1 to 2 it is impossible to go, owing to an automatic interlocker, unless a resistance be previously thrown in by means of the foot lever.

No. 3 acceleration, everything remains in its previous state except the main windings, which become shunted to two resistances, remaining in circuit, of course.

No. 4 full speed, as before, only that the main windings are shunted to one resistance, remaining in current as before.

In the vehicles Nos. 22, 23, 24, and 25 the combinations effected are thus :—

NOS. 22, 23, 24, AND 25 JEANTEAUD "COMBINATOR."



It was not to be expected that vehicles, while being tested under such severe conditions as those obtaining in this competition, would run without a certain amount of mishap, but what accidents did occur were for the most part very trivial and easily remedied—a fact which speaks for itself as testifying to the general good workmanship put into the various mechanisms. Thus, on the first day during the brake tests, No. 1 collided with a street orderly cart, and in so doing slightly damaged one of her pneumatic tyres and strained the motor. On the second day No. 2 had a hot bearing, and in some of the electric vehicles there was a little difficulty owing to faulty connections, and No. 2 had to replace a pneumatic tyre. On the third day several accidents of a minor character occurred. No. 23 had a burn out with the ammeter; No. 13 had a hot bearing, and had to stop half an hour to cool it; No. 21 had a bearing work loose, and had to return to the depôt. On the fourth day the Peugeot, No. 12, had to stop to replace a platinum ignition tube which had fractured, No. 23 developed a short circuit in the battery, and in No. 25 the controller gave out, while No. 27 had an accident with one of the pneumatic tyres. On the fifth day nothing more serious occurred than No. 21 having a burst pneumatic tyre. On the sixth day the vehicles ran admirably without a hitch. On the seventh day No. 24 was delayed through a burst tyre, as was No. 22, which also had some trouble with the rear wheels. On this day one of the London cabs put in an appearance and was allowed by the Committee to take part in the trial. On the eighth day No. 1 was delayed and damaged by a collision with a fiacre which was—as is not unusual in Paris—being driven at a reckless speed. The London electric cab, which was running remarkably well, unfortunately got one of its wheels in a tram rail and received some damage to the tyre. No. 16 had a burst pneumatic tyre, but completed the route with it. On the ninth day No. 1, while making a good run, stopped suddenly; it was eventually discovered that one of the battery connections had worked loose. On the tenth day No. 2 experienced a drop in the voltage and it was decided to return to the depôt; on arriving thither, however, it was found that the calibration of the voltmeter was faulty. A similar defect occurred with No. 22. The London cab had some trouble with the battery and had to return to the depôt. As this was the last day of the running trials all the vehicles were required to run a distance in order to exhaust their charges. On the eleventh day trials of traction and consumption were made with each vehicle, these were similar to those made on the first day. On the twelfth day, June 12th, the trials were concluded, and an excursion with the vehicles was made to Versailles, where the competitors, judges, officials, &c., dined.

In our tabular classification we have not grouped the petrol vehicles, as, although 10 were entered, only one, No. 12, actually competed. This was a neat and well-designed Peugeot; this vehicle went through its ordeal with every credit to its distinguished designer, and worthily upheld the faith that many people entertain in the suitability of petrol for ordinary town work. In its consumption tests this Peugeot came out very well; during a run of 36 miles the consumption of petrol was 3·63 gallons, or about $\frac{1}{10}$ gallon per mile. In ordinary daily work it is estimated that the consumption per day will be 4·4 gallons.

In addition to the foregoing, Messrs. Morgan and Co., of London, entered a 4-seated phaeton, officially known as No. 27, and equipped with 60 Sherrin cells, the weight of the battery being 1,980 lbs., and the total weight of the vehicle being 5,940 lbs. It, however, only ran during part of the trials, and has therefore been excluded from our analysis.

Tables Nos. 1, 2, and 3 (p. 382) give the numbers, weights, &c., of the vehicles that actually took part in the competition.

THE ACCUMULATORS.

In an accumulator destined for service in electromobiles a great specific power (watts per pound of total weight), and also great specific energy (watt hours per pound of total weight) are primordial qualities since we have to diminish the dead weight as much as possible so as to enable us to carry useful loads through long distances without recharging.

We give here the data relating to the Fulmen cells as these, as before stated, were employed by all the competitors in the competition.

The Fulmen type B/13 comprises 13 plates, of which six are positive. They are of rectangular shape, about $7\frac{1}{4}$ inches high, $4\frac{3}{4}$ inches wide, and barely $\frac{3}{16}$ inch thick. They have rectangular meshes (24 in each) in which lodges the active substance.

The following are the weights respectively of plates and their frames :—

	Positive plate. lbs.	Negative plate. lbs.
Frame	·297	·297
Active material	·749	·561
Total weight	1·046	·858

The specific figures of each element are as follows :—

Specific output, in ampères	per lb.	1·37
Useful specific power, in watts	"	2·41
Specific capacity, in ampère hours ..	"	6·60
Useful specific energy, in watt hours ..	"	11·80
Specific weight, in lbs. per kilowatt ..	..	418·0
" " " " hour	..	825·0

At the rate of 5 watts per kilo (= ·454 watts per lb.) the Fulmen

TABLE 1.—*Description and Weights of Vehicles.*

Official No.	Type of vehicle.	Seats for	Name of constructors.	Type of battery.*	Weight of battery.	Total weight of vehicle, including passengers.	Total distance, Miles.	Average speed, Miles per hour.
1	Coupé	4	Krieger ..	44 B/17	990 lbs.	3,432 lbs.	359·41	8·64
2	Victoria	3	,, ..	44 B/13	770 ,,	2,596 ,,	260·2	7·76
3	Vis-à-vis	4	,, ..	44 B/17	990 ,,	2,992 ,,	360·96	8·38
16	Roofed cab ..	4	,, ..	44 B/17	990 ,,	3,894 ,,	489·71	11·03
13	Coupé	2	C. des T. A.† ..	44 B/21	1,232 ,,	3,696 ,,	378·71	8·91
21	,, ...	3	Jeanteaud ..	50 B/17	1,144 ,,	3,828 ,,	260·21	7·58
22	,, ...	2	,, ..	44 B/17	990 ,,	3,520 ,,	148·676	6·17
23	Landaulet	4	,, ..	44 B/17	990 ,,	3,938 ,,	349·556	7·357
24	Milord	2	,, ..	44 B/15	880 ,,	3,014 ,,	37·262	5·56
25	Cab	2	,, ..	44 B/15	880 ,,	2,816 ,,	357·244	8·52
26	Droski	2	,, ..	44 B/13	770 ,,	2,310 ,,	31·06	0·97
12	Coupé	4	Peugeot‡ ..	—	—	3,014 ,,	335·234	9·45

* All Fulmen cells, Type B.
† Cie. Générale des Transports Automobiles.
‡ Petrol motor, of 5·8 B.H.P.

TABLE 2.—*Weights of Vehicles*—continued.

—	Krieger.				C.G.T.A.	Jeanteaud.					
No. of vehicle	1.	2.	3.	16.	13.	21.	22.	23.	24.	25.	26.
Number of seats	4	2	4	4	2	3	2	2	2	2	2
Weight on fore wheels .. .. lbs.	1,782	1,650	1,870	1,927	1,782	2,024	1,562	1,694	1,298	1,342	880
Weight on rear wheels .. .. ,,	1,091	880	934	1,122	1,905	1,518	1,716	1,672	1,694	1,474	1,188
Weight empty, with driver .. ,,	2,992	2,486	2,882	3,014	3,656	3,498	3,247	3,344	2,948	2,794	2,090
Useful load .. .. .. ,,	616	308	616	880	308	462	308	308	308	308	308
Weight fully loaded .. .. ,,	3,616	2,799	3,505	3,902	3,970	3,968	3,560	3,659	3,263	3,108	2,403
Weight of batteries .. .. ,,	1,010	775	1,010	1,010	1,240	1,146	1,010	1,010	890	890	775
Weight of one element .. .. ,,	22·9	17·6	22·9	22·9	28·3	22·9	22·9	22·9	20·28	20·3	17·6
Ratio of weight of batteries to total weight loaded, per cent.	27·9	27·7	28·8	25·8	31·3	28·9	28·3	27·6	27·3	28·7	32·3

TABLE 3.—*Principal Dimensions and Characteristics of Vehicles.*

No. of vehicle	1.	2.	3.	16.	13.	21.	23.	25.	26.
Hub	bronze	bronze	bronze	bronze	bronze	iron	iron	iron	iron
Bearings	smooth	smooth	smooth	smooth	smooth	balls	smooth	smooth	smooth
Diameter of fore axles .. ins.	1·653	1·653	1·653	1·653	1·653	1·496	1·496	1·417	1·57
,, rear ,, .. ,,	1·496	1·496	1·496	1·496	1·653	1·496	1·496	1·417	1·969
Number and material of spokes ..	wood, 12	wood, 16	wood, 12	wood, 12	wood, 12	steel, 36 ('236" dia.)	wood	wood	wood
Width of rim .. .. ins.	1·377	2·56	1·377	1·377	2·56	2·36	3·15	1·77	2·56
Diameter of fore wheels .. ,,	33·46	33·46	33·46	33·46	31·5	37·0	35·43	33·46	31·5
,, rear ,, .. ,,	41·34	41·34	41·34	41·34	39·37	44·9	43·3	41·33	39·37
,, pneumatic tyres ,,	3·54	2·36	2·75	2·75	3·54	2·36	2·75	2·75	2·75
Wheel-base, length.. .. ,,	66·93	66·93	66·93	66·93	74·8	76·7	78·74	74·8	59·05
,, breadth .. ,,	57·08	57·08	57·08	57·08	57·48	53·15	53·15	51·18	45·27
Length of vehicle over all.. ,,	116·5	116·5	116·5	129·9	110·2	118·1	118·1	125·9	—
Breadth ,, ,, .. ,,	68·9	68·9	68·9	68·9	74·8	64·9	64·9	64·9	51·2
Height of deck from ground ,,	25·2	21·6	25·6	25·2	—	23·6	23·6	18·5	25·6
,, roof ,, ,,	78·7	—	—	78·7	74·8	74·8	74·8	—	—

cell will store more than 25 watt hours per kilo (= 11·4 watt hours per lb.). These figures suffice to enable one to calculate the necessary battery power and weight to run a motor-vehicle of a given weight, distance, speed, &c., on a given gradient.

Doubling the rate of discharge to 4·54 watts means lowering the specific energy to 9 watt hours per lb.

The surface of each plate is 27·1 square inches, the total surface presented being 325·5 square inches for the six positive plates. The celluloid casing and the distance pieces between the two plates adjoining, weigh 1 32 lbs. Each element thus weighs 16·53 lbs., and is considered to have a normal rate of discharge of 21 ampères, corresponding to a continuous discharge for 5 hours, which gives a current density of 1 ampère per 15·5 square inches, or ·0645 ampère per square inch. The discharge may, however, be as high as 50 and even 100 ampères for a short time. With the normal rate the D.P. is 1·9 volts per element and the capacity 105 A.H.'s. Each element has thus an available energy of 200 W.H.'s.

The following table gives the particulars of the Fulmen cells :—

	Number of plates in each cell.				
Each cell or element	9	11	13	17	21
Length .. .. .. ins.	3·149	3·74	4·37	5·51	7·08
Width or breadth .. „	4·33	4·33	4·33	4·33	4·33
Height over all	9·84	9·84	9·84	9·84	9·84
Capacity in ampère hours for normal discharge of five hours	70	85	105	140	175
Energy in watt hours.. ..	133	160	200	266	333
Weight.. .. .. lbs.	11·6	14·3	16·9	30·8	39·7

In order to form an accurate idea of the performances, we must know the amount of energy supplied to each vehicle; this is given in Table 4 (p. 384).

Generally the observations as to speed, consumption, &c., were made over a range embracing at least four speeds. Although the data so obtained is exceedingly valuable, we have confined our attention to two speeds for each vehicle, viz., those most likely to be used in actual work. The results obtained are tabulated in Table 5.

Special trials were made of the capabilities of the vehicles to ascend gradients, and the well-known Mont Valerien was selected for this test; the results obtained are given in Table 6 (p. 384).

The final tests were the brake tests. The importance of good brakes on vehicles in cities such as Paris, in which there is a rapid street traffic and many steep gradients, cannot be overestimated. As will be seen, those brake tests were of a very complete character; the results are given in Table 7 (p. 384).

It will, we think, be admitted that these trials are of an exceedingly interesting and valuable nature, because the data supplied has been so very voluminous. With the aid of these tables, those intending to start cab services in any town in which there is an abundant supply of current will have no difficulty in selecting the most suitable type of vehicle, motor, and cell. The last is perhaps the most important. So far, the Fulmen cells have given very remarkable results as regards endurance, and this latter, we need hardly remind our readers, is the crux of the whole problem, as upon a low cost of maintenance hangs the whole question of electric cabs in preference to other motor-vehicles.

THE AWARDS.

The jury assembled on the 18th ult. at the Automobile Club to consider their report and to make the awards. M. Forestier presided. The sum available for prizes was 3,000 francs, of which 2,000 were subscribed by the Compagnie Générale des Petites Voitures, and 1,000 francs by the Chambre Syndicate des Entrepreneurs des Voitures. After considering their report the jury recommended the following distribution :—

In the first category, for two-seated cabs :—First prize, 1,000 francs: Jeanteaud No. 25; second prize, 600 francs: Jenatzy No. 13.

In the second category, for four-seated vehicles with roof for luggage :—First prize, 1,000 francs, Krieger No. 16.

The balance of 400 francs was awarded to those conductors who had exhibited special skill in the conduct of their vehicles. They were :—100 francs to M. Démény, conductor of No. 16; 100 francs

TABLE 5.—*Consumption Data.*

No. of vehicle	1.		2.		3.		18.		13.	
Speed in miles per hour	9·58	16·37	2·93	8·49	7·31	12·65	12·34	15·93	5·27	10·42
D.P. in volts	88	86	47	90	88	88	90	87	45	87·5
Current in ampères...	25	44	9·5	15·5	18·5	29	24·4	38·15	25·4	25·5
Power in watts	2,024	3,784	447	1,385	1,450	2,552	2,190	3,430	1,143	2,230
Watts / Total weight in watts per ton	1,253	2,306	352	1,100	912	1,605	1,237	1,937	636	1,238
Energy expended / Distance traversed in watt hours per car mile	211	231	153	164	198	200	186	215	217	214
Specific energy in watt hours per ton mile of total weight	130	140	120	130	126	127	105	121·6	120·5	119
Specific energy in watt hours per ton mile of useful load	758	828	1,092	1,160	708	721	466	333	1,550	1,530
Total weight ... ... lbs.	3,816		2,799		3,505		3,902		3,985	
Useful load ... ... lbs.	816		308		818		880		309	
Useful load / Total weight per cent.	17		11		17·6		22·6		7·8	

No. of vehicle	21.		22.		23.		24.		25.		26.	
Speed in miles per hour	4·96	12·427	7·595	9·796	9·39	10·2	7·13	10·01	5·85	10·51	8·03	10·85
D.P. in volts	52	103	88	88	87	87	89·8	89·8	44	88	86	80
Current in ampères...	21	31	20·8	25	24	26	16·7	24·2	12·4	16·6	13	20
Power in watts	1,102	3,187	1,830	2,200	2,090	2,280	1,500	2,178	544	1,460	1,118	1,600
Watts / Total weight in watts per ton	613	1,774	1,131	1,360	1,260	1,380	1,014	1,470	386	1,033	1,025	1,467
Energy expended / Distance traversed in watt hours per car mile	222	257	229	223	223	221	210	218	112	140	140	148
Specific energy in watt hours per ton mile of total weight	123	143	148	140	134	142	142	147	80	98·5	128	136
Specific energy in watt hours per ton mile of useful load	1,580	1,222	1,703	1,567	1,588	1,568	1,726	2,500	800	992	985	1,053
Total weight ... ... lbs.	3,968		3,556		3,659		3,263		3,109		2,403	
Useful load ... ... lbs.	463		309		309		309		309		309	
Useful load / Total weight per cent.	11·7		8·64		8·4		9·4		10		12·8	

TABLE 4.—*Amount of Energy in Kilowatts taken each day from the Charging Station by each Vehicle during the Trials.*

No. of vehicle	1.	2.	3.	16.	13.	21.	22.	23.	24.	25.	26.
June 2	9·87	3·38	10·42	10·70	13·52	16·12	0 00	14·53	11·26	10·65	0·00
„ 3	9·73	7·82	10·26	12·50	13 91	0·00	15·28	12·92	3·09	11·67	8·08
„ 4	10·82	10·93	11·08	11·00	13·91	1·39	0·27	13·37	1·25	10·58	8·53
„ 5	10·18	10·87	10·54	10·56	13 18	14·41	0 00	12·21	13·02	9·25	8·29
„ 6	11·00	9·40	10·75	10·77	12·61	15·00	3·12	10·98	12·28	10·13	8·32
„ 7	9·00	9·52	11·51	10·71	13·11	12·68	12·41	10·49	11·91	9·60	9·39
„ 8	13·49	10 01	15·50	11·70	13·18	13·55	1·14	11·60	1·15	9·01	5·64
„ 9	10·53	10·59	10·43	11·31	12·69	14·27	12·15	11·22	0·00	9·70	0·27
„ 10	13·91	7·48	13·05	11·56	13·18	16·80	13·99	12·98	3·93	12·57	9·37
Total	98·53	80·00	103·54	100·81	119·29	102·25	58·35	110·30	57·89	93·16	57·89
Kilowatt hours per day	10·95	..	11·50	11·20	13·25	..	..	12·25	..	10·35	..
Watt hours per car mile	294	..	308	300	355	..	..	330	..	277	..
Watt hours per ton mile	177	..	200	161	120	..	..	200	..	200	..

TABLE 6.—*Consumption of Energy on Gradient of Mont Valerien (June 11th)—Gradient 82·3 Millièmes.*

No. of vehicle	1.		2.	3.	16.	13.	21.	22.	23.	24.	25.	26.
Speed, m.p.h.	4·06	4·4	3·58	4·59	3·72	4·9	6·73	5·02	4·96	4·74	6·14	5·27
D.P. volts	85	85	84·5	85	87	80	95	85	85	80·6	82	72
Ampères	52·85	59·8	64·7	53·6	60·7	74·2	74	67	68·7	55	57·2	48·7
Watts	4,490	5,080	5,470	4,560	5,280	5,940	7,025	5,695	5,840	4,440	4,680	3,500
$\frac{\text{Watts}}{\text{Total weight}}$ in watts per ton	2,770	3,100	4,300	2,865	2,980	3,300	3,900	3,525	3,520	3,000	3,321	3,210

TABLE 7.—*Brake Tests, June 11th.*

No. of vehicle	1.	2.	3.	16.	13.	21.	22.	23.	24.	25.	26.
ON UP GRADE—											
Time required to traverse 25 metres = 82·02 feet before the signal flag, in seconds	12·8	12·4	12·2	11·4	9·0	8·0	11·0	9·2	11·4	8·7	10·4
Least speed, in m.p.h.	4·34	4·46	4·59	4·9	6·2	6·82	5·02	6·07	4·9	6·38	5·33
Distance run beyond the flag, in feet ..	3·34	9·51	6·3	9·58	7·65	10·17	5·57	7·87	6·89	8·20	7·87
Recoil after stopping, in inches ..	slight	continuous	continuous	slight	4	18	40	slight	41	slight	12
ON DOWN GRADE—											
Time required to traverse 66 metres = 216·5 feet, between the two marks before the signal flag, in seconds ..	21·0	19·8	16·2	19·6	16·6	17·4	13·6	17·6	16·8	11·8	23·0
Least speed, in m.p.h.	6·4	7·2	9·1	7·3	8·6	8·4	10·8.	8·4	8·7	12·46	6·5
Distance run beyond the flag before complete stop, in feet	12·6	35·8	44·1	17·6	14·1	23·2	27·4	39·4	26·6	34·4	7·54

to M. Pascal Bailly, conductor of No. 21; 100 francs to M. Creux, conductor of the Peugeot No. 12; and 100 francs to M. Alary, conductor of No. 20.

The Committee expressed their regret that under the conditions of the competition they were unable to recommend the Peugeot No. 12 in consequence of its consumption being too high. In other respects they express a high appreciation of the vehicle for its regular running and its good working.

The Petroleum Flash Point in Holland.—The Dutch Minister of Commerce has appointed a Commission to inquire into and report upon the advisability of regulating by law the "carriage, storage, sale, and employment" of petroleum in Holland. The Commission consists of six members, of whom two are officials in the Department of Commerce, two University professors, one a member of a firm of public warehouse proprietors, and one a lawyer and member of Parliament. The last-named, Mr. M. J. Pynappel, of Amsterdam, is Chairman of the Commission. The two professors appointed are Professor C. A. Lobry de Bruyn, of Amsterdam University, and Professor Hoogewereff, of the Polytechnical School, Delft. The former, a celebrated chemist, has taken an active part for some years in the agitation to get the standard of flash point raised on the Continent.

ON DIFFERENTIAL GEAR.

ALTHOUGH the "jack-in-the-box" forms an integral part of the mechanism of the great majority of motor-vehicles, its action seems to be but little understood either by mechanics or users. As we constantly receive letters asking for information on this subject, we propose in the present article to discuss the salient features of this beautiful piece of mechanism. The differential gear is an example of an epicyclic train, which is any system of toothed gearing, the axes of which revolve around a common centre. This gear is a modification of the well-known sun and planet motion. As constructed in its usual form it consists (*see* Fig. 1) of a pair of bevel wheels placed on either side of a carrier, the two wheels they engage with on either side being secured on independent but concentric axles, the latter forming the shaft or driving axle of the vehicle. Referring to the drawings, the carrier, B B′, consists of two dished casings having

that is, certain of their teeth engage with teeth on Q Q and the whole rotates. Observe that in this case P and P do *not* rotate.

Suppose now that the wheel, Q, is fixed. As C is rotated, the wheel, P, rolls around Q and turns Q′, that is, Q′ makes two revs. for each one of C. When a vehicle is following a straight course the bevel wheels, P and P′, act, as before stated, as keys, and the wheels, Q and Q′, rotate at the same speed as C. When turning a curve, as is well known, the outer wheel has to follow a path of much larger radius than the inner one, that is, the outer wheel in order to pass over a certain path in the same time as the inner wheel revolves faster, that is, the bevel wheel geared to that outer wheel will be rotating faster than the bevel wheel geared to the inner driving wheel—that is, there will be a *difference* (*sic*) between their speeds; this difference causes the wheels, P and P′, to turn about their axles, and the speed at which they turn will be that due to the difference of the speeds of the two wheels, Q and Q′. Hence the term "differential gear."

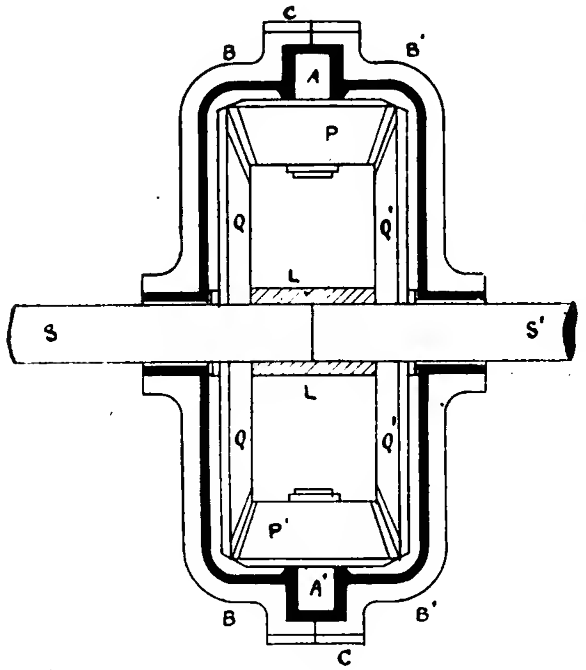


Fig 1

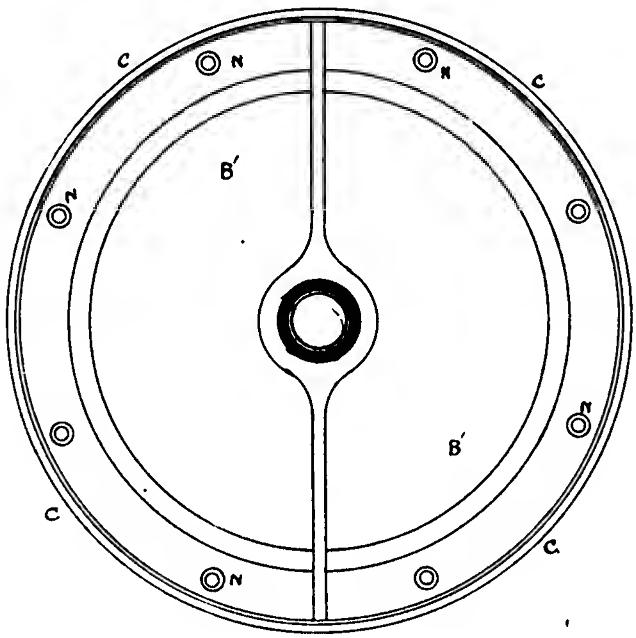


Fig 2

Differential Gear for Motor Vehicles

G.H.L del

bosses at two diametrical points in which are keyed two stalks, A A′, on these latter are mounted the bevel wheels, P P′, which are free to revolve. In the centre of each casing is a boss through which, suitably bushed, pass the shafts, S and S′; to these latter are rigidly keyed the two mitre wheels, Q and Q′. The two ends of the shafts which abut inside the casing are enclosed in the sleeve, L L, so as to afford additional support, and this sleeve also acts as a distance piece. It is, of course, not an essential fitting. The parts having been assembled the two parts of the casing, B and B′, are bolted together (*see* Fig. 2) by nuts and bolts, N N, &c. On the periphery of this casing teeth are cut, C C, or the surface may be left smooth for belt driving. On the outer extremities of the shafts, S and S′, are the chain sprocket wheels, which transmit the motion to the driving wheels. It is thus understood that the power from the motor is transmitted by teeth or belt gearing to the pulley, C C, which revolves at a speed and power varying directly with those of the motor. So far we have a positive transmission.

This power is distributed equally to the two metre wheels, Q and Q, and through them to the sprocket wheels. In this case the small bevel wheels, P and P, act merely as keys or feathers,

It should be observed that it is not necessary to have the two wheels, P and P′, one would suffice, but two and even three are used in order to ensure proper distribution of stress. Neither is it necessary that any particular ratio should exist between the diameter of P and Q. The present generally accepted design is based entirely upon mechanical considerations.

A study of the theory epicyclic gears will prove an intellectual pleasure of no mean order, and we can recommend it. A few models should be employed, so that the various motions can be observed. It is not a bad test of the knowledge of a motor-vehicle engineer to ask him to explain the differential gear. Before concluding, we must refer to an article on the subject which appeared lately in *La France Automobile*, in which the writer tried to demonstrate the evidently erroneous contention that the wheels, P P′, would turn round on their axles, A A′, on a straight course, when the two drivers (car wheels) happen to run on a track, greatly differing in the state of surface, from one side to the other.

It is clear that, even if it were imaginable that one wheel runs on a rail, whilst the other hammers over fresh macadam as long as the carriage steers a straight course the bevels, P P′, can *not* rotate;

provided that the wheel on the rail does not slide and become dragged along.

It must be remembered that, under such conditions as stated, a straight course can only be run by counteracting the difference in adhesion of track by the steering gear properly handled, otherwise the carriage would tend to run round, the resistance being greater on the inner side than on the outer. So long as the resistance to traction is uniform for both paths traversed by the wheels the drivers will revolve at equal velocities, in which case the bevels, P P′, will not revolve on their axes.

G. H. L.

ELECTRICAL TRACTION COEFFICIENTS, WEIGHTS OF ACCUMULATORS, &c.

M. Hospitalier in the course of a series of articles on the above data contributed to our excellent contemporary, *La Locomotion Automobile*, says :—

As will have been seen from previous notes, while awaiting better, we can dispose of accumulators of which the specific power is five watts per kilogramme and the specific energy 25 watts per hour per kilogramme. These figures serve as a basis of our subsequent calculations, and, in order to determine the power of the motor and the weight of the accumulators to be carried, one must understand the traction coefficient. This traction coefficient is extremely variable, according to the nature of the ground, its maintenance in repair, speed of the vehicle, direction of the wind, system of running, nature of tyres, &c.

For an automobile limiting its actual work to a town service, it is necessary to take its maximum speed on the level at 18 kilometres per hour, that is to say, 5 metres per second, and suppose that running sometimes on a wooden pavement, which gives a very feeble traction coefficient, sometimes on an ordinary muddy pavement, which furnishes a high traction coefficient, the vehicle working during the whole journey with a medium coefficient of 2·5 per cent., or 25 kilogrammes per ton. On inclined planes the coefficient is increased, but by reducing the speed on the one hand and by forcing the normal duty of the accumulators on the other, the strain can be counterbalanced and kept within the limits indicated, as in the descents the expense is less, sometimes nil.

In order to bring out the calculations for a vehicle, of which the total weight (in working order) is 1 ton, it will suffice to multiply the quantities we are about to establish by the total weight of the vehicle in tons, so as to determine the corresponding value of a vehicle of a given total weight.

With a traction coefficient of 2·5 per cent. and a speed of 5 metres per second it is necessary to supply the vehicle with an effective power to the peripheries of the wheels as follows :—

$25 \times 5 = 125$ kilogrammetres per second (per ton), or 12·5 poncelets, or about 1,250 watts.

Electric motors could be easily built now of which the output between a full and a half charge would be about 80 per cent. With a loss of 10 per cent. in the transmission between a quick angular speed and the wheels of an angular speed relatively weak, the output would be—

$$0{\cdot}8 \times 0{\cdot}9 = 0{\cdot}72 \text{ per cent.}$$

The electric power actually furnished to the motor by the accumulators will then be—

$$\frac{1{\cdot}250}{0{\cdot}7} = 1{\cdot}800 \text{ watts (per ton).}$$

In order not to exceed the rule of 5 watts per kilogramme it is necessary to put on a total weight of 1 ton—

$$\frac{1{\cdot}800}{5} = 360 \text{ kilogrammes of accumulators, or 36 per cent.}$$

With a less weight the rule is strained and the battery overworked. With a greater weight the journey is prolonged without re-charging, but the disposable weight is reduced for a four-wheeler motor, transmission, and passengers.

Practically, the proportion of the accumulator weights to the total weights of an electromobile is always comprised normally between 30 to 40 per cent. It has been demonstrated elsewhere that there is no advantage in putting on a vehicle heavier accumulator weights than 50 per cent. of the total weight, as, if that is done, the utilisation of the battery would have to be reduced. What road could be travelled over under these conditions? It is easy to ascertain that from what is already known.

If, at a speed of 18 kilometres per hour, 1,800 watts is expended, the expenditure in one hour would be 18 watts per hour in running 18 kilometres, or, practically, 100 watts per hour per ton kilometre.

In the experiments made by Messrs. Morris and Salmon, of Chicago, the real expenditure varied between 84 and 92 watts per hour per ton kilometre, but Chicago is a flat country, and the experiments were made under evidently favourable conditions.

The accumulators, including 25 watts per hour per kilogramme, representing five hours' run, could, under a special hypothesis, furnish current for a total distance, without recharging, of 18·5 = 90 kilometres.

If the stoppages, bad working, descents, &c., are taken into account, these figures can be reduced by 30 to 35 per cent., and it can then be summed up by saying that the actual accumulators permit us, without forcing their normal rates, to communicate a speed of 18 kilometres per hour on the flat, and to make it run 60 kilometres without recharging, on condition that the weight of the accumulators represent 36 per cent. of the total weight of the carriage, and that the vehicle remains on the same level at the end of the journey, without performing extravagant gymnastics on inclined planes and broken up roads.

The fact must not be lost sight of that the raising of a ton to 100 metres height represents 100,000 kilogrammetres, which correspond with 143,000 kilogrammetres at the terminals of the accumulators, and these 143,000, equivalent to 400 watts per hour, that is, 100 watts per hour per ton kilometre, reduces the run to 4 kilometres. The increasing of the traction coefficient, resulting through the bad state of the roads and climatic conditions, has also an enormous importance, difficult to figure out, and it is not astonishing if these many causes (to which must be added the inefficiency of a conductor who lets the brake press on the wheels, or manipulates the connections badly, which wastes the energy uselessly) lead, above all at the beginning, to impede the anticipated runs. The conductor of an automotor requires a certain amount of practice before he becomes an expert.

EXPLOSION OF A TUBE IN A STEAM TRAMCAR BOILER.

The following is an excerpt from the official report of an inquiry held by the officers of the Board of Trade under the Boiler Explosions Acts, 1882 and 1890, to determine the cause of the explosion of a Field tube in a tramway engine boiler at Prettywood, Lancashire, on February 15th last.

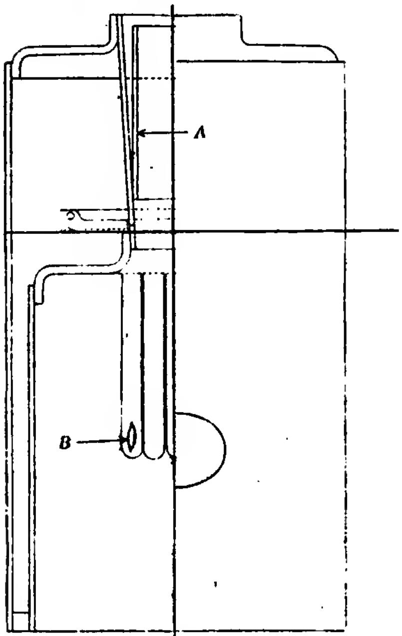
The boiler was made by Messrs. Green and Sons, of Smithfield Ironworks, Leeds, about 1884, for the Bury, Rochdale, and Oldham Tramways Company. It is of the cylindrical vertical type. The shell is 6 feet high and 3 feet 6 inches in diameter. It is made of two steel plates, ½ inch thick, the vertical seams of which are of the lap description, and double riveted with ¾-inch rivets spaced about 2¼ inches apart. The crown is flat, and formed of one steel plate, ⅝ inch thick, flanged to suit the shell and uptake, and connected to them respectively by a single row of rivets.

The firebox is about 3 feet 8 inches high and 3 feet in diameter. The cylindrical portion is made of one wrought-iron plate, $\frac{7}{16}$ inch thick, the vertical seam being welded. The lower end is attached to the shell by a single row of rivets, with a distance ring of wrought-iron between, 2½ inches by 2 inches in section, giving a water space of 2 inches at the bottom. The crown of the firebox is flat, and formed of one wrought-iron plate, ¾ inch thick, and is flanged to fit the top of the cylindrical part of the firebox and the bottom of the uptake in the usual manner.

The uptake is made of one wrought-iron plate, ½ inch thick; its vertical seam is welded, and it is attached to the shell and firebox crowns by single rows of rivets. A wrought-iron parallel tube (marked A on the sketch) is placed inside the uptake, and the space between this tube and the uptake is filled with fireclay, to prevent over-heating of the uptake.

There are 79 Field tubes, 2¼ inches diameter, by about $\frac{3}{32}$ inch thick, fitted in the crown of the firebox. Sixty-four of these are about 24 inches long, and the remaining 15 in the way of the fire-door are about 17 inches long. A pipe about $1\frac{1}{4}$ inches diameter and 1 inch shorter than the tube, is placed inside each tube, for circulating purposes. These inner pipes have conical-shaped pieces at their upper ends, with three ribs, which rest on the open ends of the tubes, and keep the inner tubes central with the outer tubes, a space being thus left for the circulation of the water in the tubes. A circular scale pan is placed round the bottom of the uptake on the water side for preventing priming and collecting impurities contained in the water.

FIG. 1.



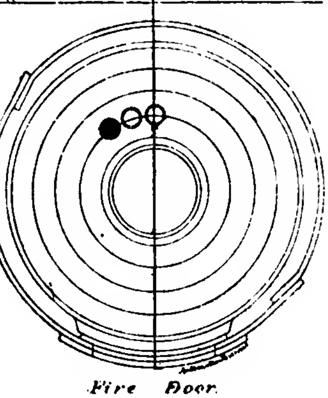
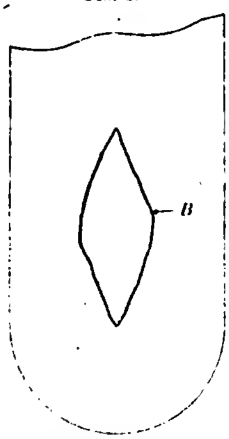


FIG. 3.

FIG. 2.



Full size view of end of tube, and fracture

The boiler was fitted with the following mountings :—

One steam-pressure gauge, graduated to 200 lbs.
Two safety valves, $2\frac{1}{2}$ inches diameter, loaded by direct springs to 140 lbs. per square inch.
Two glass water gauges.
One steam stop-valve.
One governor steam valve.
One car-brake steam cock.
Two feed check valves.
Two injectors.
One blower cock.
One blow-off cock.
One filling plug.

During its life the boiler had been frequently examined and repaired. It was partially re-tubed in 1887, 1888, and 1889, and in 1891 it was tested to 200 lbs. per square inch. In 1892 the boiler was again tested by water pressure to 200 lbs. ; two new stays were also fitted to the right-hand side of the firebox, and 58 tubes were renewed. In 1893 the boiler was again tested twice by water pressure, in January to 230 lbs., and in November to 220 lbs. A patch and four stays were also fitted to the right-hand side of the firebox, and 32 tubes were renewed. In 1894 42 tubes were renewed. In 1895 the boiler was twice tested by water pressure, in February to 230 lbs., and in October to 250 lbs. ; the patch fitted in 1893 was replaced by a larger one, and 45 tubes were renewed. In 1896 the boiler was tested by water pressure to 230 lbs. in October, and 31 tubes were renewed during the year. In July, 1897, it was tested to 250 lbs., and 36 new tubes put in. It was neither insured nor inspected by any company. It was cleaned out about every 12 days.

The explosion occurred at about 6 p.m. on February 15th, while the car was proceeding from Heywood to Bury. Fortunately no one was killed, but the driver was injured in leaping from the vehicle. The tube that exploded was one of the "Field" tubes, at the point marked B (*see* Figs. 1 and 2). The aperture was about 2 inches by $\frac{3}{4}$ inch. The steam and water escaped through it with such violence as to extinguish the fires.

The explosion was caused by the wasting and deterioration of the material composing the tube, through frequent overheating, to about $\frac{3}{32}$ of an inch, or half its original thickness, thus rendering it unable to withstand the ordinary working pressure. The scale where the fracture took place was about $\frac{1}{16}$ of an inch thick, but 6 inches higher up the scale was about $\frac{1}{4}$ inch thick. The pressure just prior to the explosion was about 135 lbs. per square inch. In his general remarks the inspector, Mr. Jas. Wishart, says :—

"The boiler is about 14 years old, and is known on the Company's books as No. 29, but no record of repairs or renewal of tubes appears to have been kept until about three years after it became the property of the Tramway Company. Since 1891 the boiler does not appear to have been completely re-tubed, but the number of new tubes fitted each year varied from 31 to 58, or an average of about 35 per annum. This shows that the number of new tubes put in since the boiler was re-tubed in 1889 would have been sufficient to have completely re-tubed it a little over three times. The average life of a tube would, therefore, appear to be about two years and two months. The tube that failed in this case was put in in May, 1896, and has consequently been in use for only one year and nine months, or five months less than the average lifetime of a tube. The position of the tube in the boiler and the quality of the material of which it was made would, no doubt, very largely affect its lasting properties, so also would the attention it received by cleaning. The Company's locomotive foreman stated that occasionally new tubes have to be removed owing to some inherent defect that had developed after the tube had been in the boiler only for a short time. The Company's servants appear to have exercised a reasonable amount of care in their examinations, as most of the tubes taken out were observed to be defective owing to slight leakage or bulging, but others had been removed on suspicion of being worn out. Compared with the number that the firm have voluntarily removed from time to time, those that have given way and become subject to inquiries under the Boilers Explosions Acts are fortunately very few. A thorough examination of the boiler was made in July, 1897, when it was tested by water pressure to 250 lbs. per square inch, and since then it has been subjected to the usual periodical cleaning and examination every 10 or 12 days.

"The man who drove the engine on the day the tube gave way was not one of the regular drivers; he was only employed on relieving duty."

In his comment on the above the Engineer-in-Chief of the Board of Trade, Mr. P. Samson, M.I.M.E., &c., remarks :—

"This is another explosion resulting from the wasting of the lower portion of a Field tube until it was no longer able to withstand the ordinary working pressure.

"It seems the interior of the tube was coated with scale ranging in thickness from $\frac{1}{16}$ inch to $\frac{1}{4}$ inch. This resulted in the end of the tube being frequently overheated, and the wasting of the material above described was brought about in that way.

"Such tubes are difficult to clean or to examine, and although this firm appears to have had considerable experience with tubes of this type and to have in force a system of periodically examining them, there still seems to be room for improvement in dealing with them."

AUTOMOBILE ASSOCIATION (LIMITED).

A new Company, under the title of the Automobile Association (Limited), has opened premises at 1 Princes Road, Holland Park Avenue, London, W., where it will in a few weeks have on view a large variety of automobile carriages. We understand that this Association has secured some of the very best examples recently exhibited at the Paris Exhibition, and that it will be able to suit the requirements of every automobilist by the varied selection which it will be able to provide. The vehicles will have a seating capacity ranging from one to 12 people, and from 1¾ to 8 H.P., the prices ranging between 70 and 700 guineas. The directors will also, in about a fortnight's time, have a new motor-cycle ready, constructed after the Hille patents, one of the special features being a greatly improved carburettor. One of these tricycles won the first prize at the Berlin-Leipzig race, and the makers state that it will travel at 20 miles per hour, and take hills up to 15 per cent. at a speed of 7½ miles, with a 1¾ H.P. We hope to give our readers more detailed particulars in one of our forthcoming issues of the various novelties which this Company is introducing.

THE WEIDKNECHT AND BOURDON STEAM OMNIBUS.

Among the vehicles assembled under the auspices of the Motor-Car Club in London on the 8th ult., when Mr. H. J. Lawson gave his interesting demonstration of the possibilities of the motor-omnibus, the Weidknecht Omnibus (*see* Fig. 1) attracted considerable attention by reason of its size and appearance. Riding on the top of an omnibus in the fine weather is a cheap and by no means unenjoyable way of obeying the doctor's injunctions to "take carriage exercise." Our buses have emblazoned inside them the legend, "Constructed to carry 26 passengers, 12 inside and 14 out." The Weidknecht can carry, or rather has accommodation for, only 16 passengers, and these have to be carried inside. On the other hand, it can carry in addition 1,100 lbs. of baggage on the roof, this gives an average of 70 lbs. for each passenger; it would thus make an excellent railway station omnibus. This vehicle weighs 4·7 tons (light), which is 1·7 tons above the limit allowed by the Locomotives on Highways Act. It is also too wide, being 7 feet 10 inches between axle centres. It is thus not legally suitable for traffic in this country. For our own

Fig. 1.

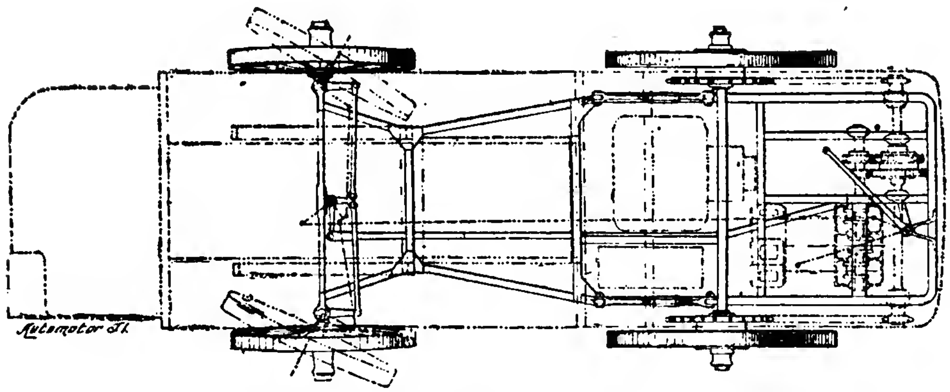


Fig. 2.

part we think that on the weight of the Weidknecht a much more elegant and commodious vehicle could have been designed.

As, however, it is a completed machine, and such vehicles are

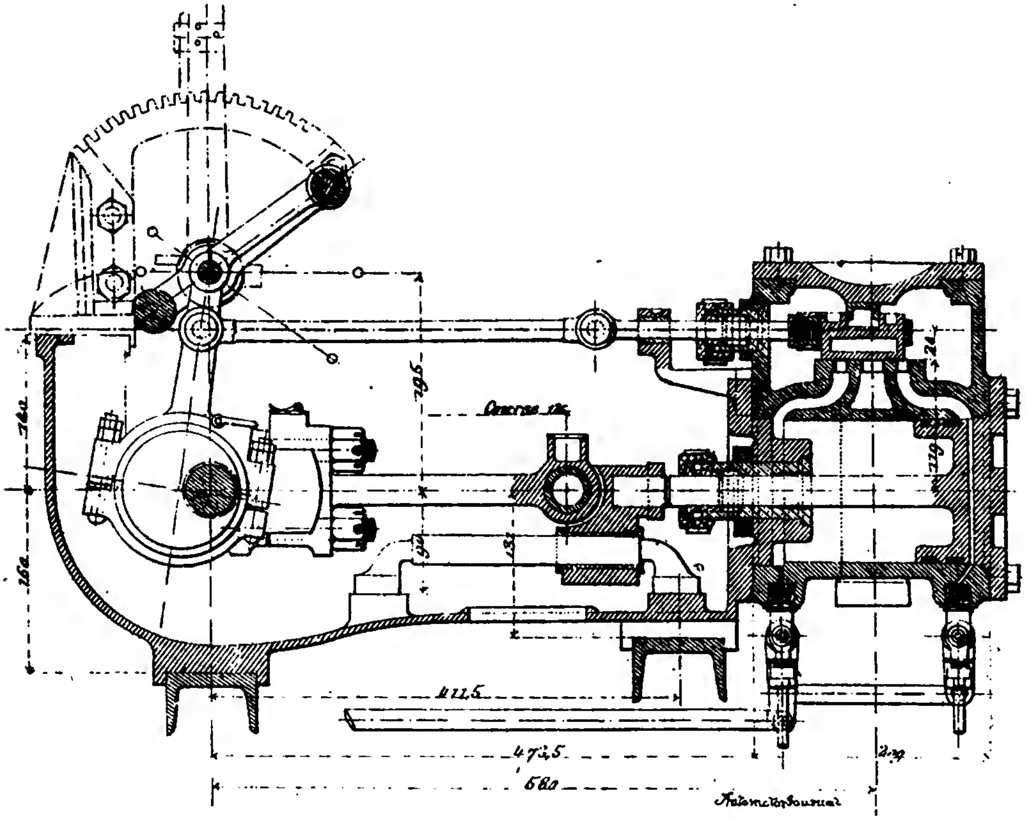


FIG. 3.

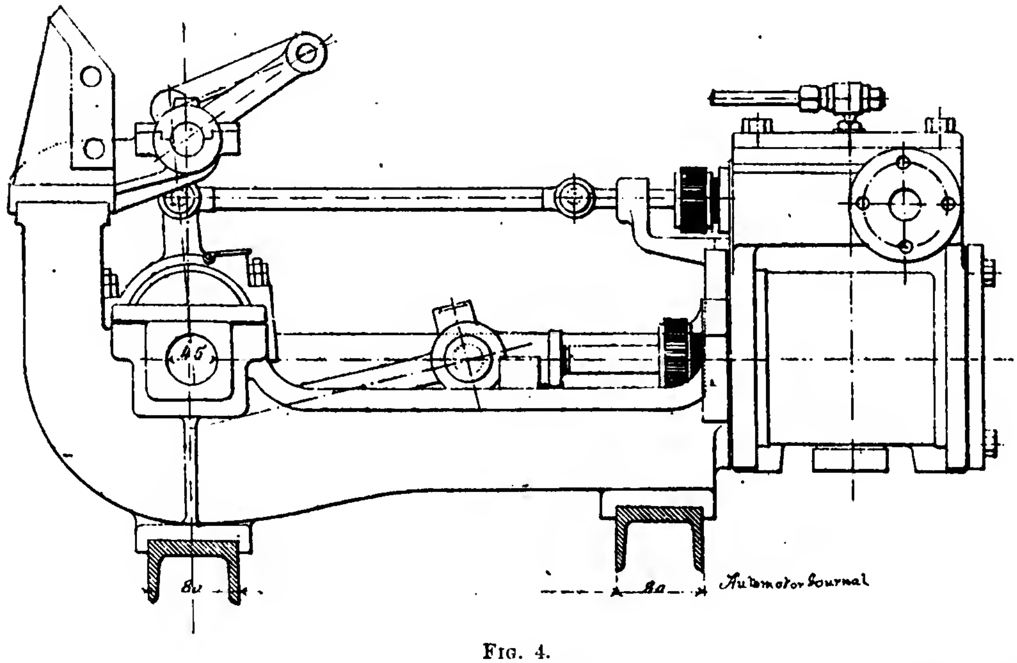


FIG. 4.

worked continually, economically, and profitably in France, and as we have been asked to describe it we accordingly do so. This vehicle represents the latest type of omnibus built by M. Weidknecht. It will be remembered that this gentleman entered one at Les Poids Lourds competition at Versailles of last year, and known officially as No. 4,* but owing to a breakdown it had to retire. The present omnibus differs in some respects from No. 4, chiefly in that it carries no passengers on the roof. The type and arrangement of the machinery are, however, the same as in the former. The framing (*see* Fig. 2) consists of two channel girders which, instead of being parallel throughout their length, are bent inwards at their rear ends, upon which is mounted, through ordinary plate springs, the rear axle which constitutes the steering axle. On the fore part of these girders is a platform upon which is carried the boiler, machinery, coal bunkers, feed tanks, &c., all this weight being carried on the fore axle by means of springs, &c. On this fore axle, too, are the driving wheels. The body of the vehicle is mounted upon springs, much in the same way as in an ordinary wagon, but underneath the fore part of the body and on each side are two compensating springs. The object sought to be attained in having the driving wheels in front and directly under the mechanism, and in supporting the body by an elaborate arrangement of springs, is said to be the maintenance of an invariable weight on the drivers, whether any load is being carried or no. Whether this is effected or no we have no means of saying. The idea is, however, good, and the design original. The total length of the vehicle is 18·04 feet, of which 7·56 feet are occupied by the front platform. A roof extends over the whole vehicle and upon this is carried the baggage, 1,100 lbs.

The boiler has previously been illustrated and described in THE AUTOMOTOR.† It is of the vertical internal firebox type, having 87 inclined water-tubes, each 1·18 inches in external diameter. The grate area is 3 square feet, and the heating surface 64 square feet. The boiler will evaporate 572 lbs. of water per hour, and the normal consumpt is 10·7 lbs. of coke and 7 gallons of water per mile.

The chimney projects through the roof, and is fitted with a silencer which effectually prevents the noise due to the exhaust. The feed is either by

* *Vide* THE AUTOMOTOR, August and September, 1897.

† May, 1898.

a Sellar's injector or by a pump driven off the intermediate shaft.

The motor (*see* Figs. 3, 4, 5, 6, and 7) consists of two horizontal high-pressure engines, each cylinder being 4·92 inches by 4·92 inches stroke (*see* Figs. 3, 4, and 5). The steam distribution is effected by a "Soims" valve gear, which permits a varying cut-off of from 10 to 83 per cent. of the stroke. At the normal speed the engines run at 350 revs. per minute, and give off 19·7 H.P. The motor shaft gears with an intermediate shaft, upon which is mounted a differential gear. On each shaft are two pinions, operated by levers and clutches in the ordinary way, the two speeds obtained being 4·6 and 9·3 miles per hour. On the extremities of the intermediate shaft are the chain pinions, which by means of chain transmit the motion to the drivers; these are 4 feet 7 inches diameter, and are mounted on bronze-bushed axles. The steering is effected, as before said, by the rear wheels; these are mounted on pivoted axles, and are joined by Ackermann's gear to a central rod, which is cogged at its fore end and gears into a vertical spindle having a steering wheel at its upper extremity.

Fig. 5.

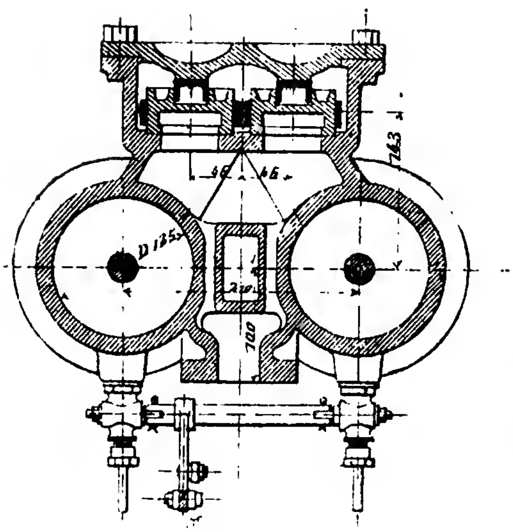


Fig. 6.

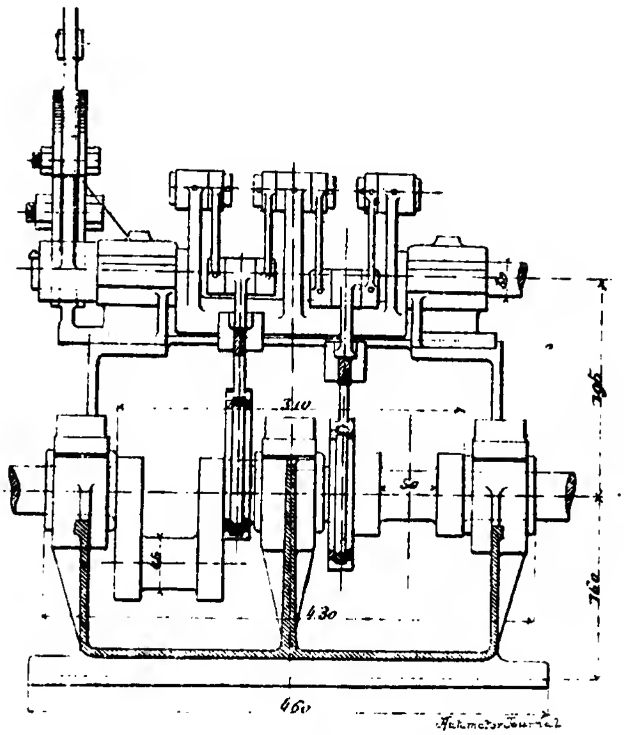


Fig. 7.

There are two brakes—a Lemoine coiled-wire brake and an ordinary shoe brake worked by a screwed lever. The tyres on the drivers are 3·74 inches wide. The following are the weights :—

Weight, empty	10,560 lbs.	
„ of water in boiler	286 „	
„ „ in feed tank ..	616 „	
„ fuel	132 „	
„ staff and sundries ..	286 „	
Useful load	3,520 „	
Total weight on drivers	7,700 „	
„ „ rear wheels ..	7,700 „	
„ „ in working order ..	15,400 „	= 6·87 tons.

THE PARIS EXHIBITION, 1900.

THE Royal Commission of the Paris Exhibition, 1900, have now issued the official particulars and classifications for exhibitors. Forms of application are also ready, which can be had upon application to the Secretary, Colonel Herbert Jekyll, C.M.G., St. Stephen's House, Westminster. The grouping and classification has been very carefully drawn up.

Motor vehicles are included in Group 6 (civil engineering, transportation), Class 30 (carriages and wheelwrights' work, vehicles other than those used on railways), which includes "private and state carriages, sledges, sedan chairs, public carriages, ambulance vans, carriages for invalids and children, carts for all purposes, vans and drays, vehicles propelled by mechanical means, cycles, parts of carriages, materials and inventions connected with carriage building, wheelwrights' work and cycle manufacture."

Under Class 32 are tramways, including "various types of permanent way used on different kinds of roads; points and crossings, turntables, turning loops and triangles; implements used for track laying, cleaning, &c. Cars drawn by animals; locomotives and automobile carriages; rolling stock for tramways propelled by mechanical means; brake gear; plant used for storing power (hot water, compressed air, electricity, &c.)."

The special committee appointed for these groups comprise:—Sir Thomas Sutherland, G.C.M.G., M.P., chairman; Lord Kelvin, G.C.V.O.; Lord Claud J. Hamilton; Lord Pirbright; Right Hon. William L. Jackson, M.P.; Sir Edward H. Carbutt, Bart.; Sir James Kitson, Bart.; Sir John Wolfe-Barry, K.C.B.; Sir Courtenay E. Boyle, K.C.B.; Sir William H. White, K.C.B.; William H. Preece, Esq., C.B.; Henry Cosmo Orme Bonsor, Esq., M.P.; William Crawford, Esq.; William D. Cruddas, Esq., M.P.; Francis C. Danson, Esq.; James Staats Forbes, Esq.; Joseph Holman, Esq.; Thomas H. Ismay, Esq.; Wyndham S. Portal, Esq.; Paul Rottenburg, Esq.; William D. Stephens, Esq.

PNEUMATIC v. IRON TYRES.

IN a paper read before the Société des Ingénieurs Civil, by Mr. Michelin, this gentleman gives the results of some carefully conducted experiments made by him to determine the relative qualities of pneumatic and iron tyres.

Mr. Michelin used for his registering apparatus a dynametric spring, formed by two articulated plates at one end of the apparatus; one fixed to the vehicle and the other to the whiffletree. With this was used an automatic registering device.

The first experiments were made with iron and pneumatic tyres of the following diameters and weights:—

Kind.	Diameter of Wheels. Front.	Back.	Weight of Wheels. Front.	Back.	Weight of Empty Vehicle.
	ft.	ft.	lbs.	lbs.	lbs.
Iron tyres ..	3·02	3·67	127·6	158·4	1269·4
Pneumatic tyres	2·95	3·93	85·8	123·2	1192·4

To the weight of the empty vehicle the weight of the driver must be added; and to make this feature comparable the same driver was used in both cases. These experiments were made over various soils, over different lengths of road, with varying loads, and at different speeds. The results of the trials are summed up in the following table:—

Experiments in Snow.

	Iron Tyres.	Pneumatic Tyres.
	lbs.	lbs.
Carriage at a walk, empty	34·89	25·23
Carriage at a walk, load of 330 lbs. ..	39·22	27·96
Carriage at a trot, load of 330 lbs. ..	65·12	33·59
Carriage at a trot, load of 660 lbs. ..	68·57	39·51

Experiments in Mud.

Carriage at a walk, empty	35·20	23·10
Carriage at a walk, load of 330 lbs. ..	38·06	27·34
Carriage at a trot, load of 330 lbs. ..	43·01	28·53
Carriage at a trot, load of 660 lbs. ..	50·73	31·15

Mean of Trials upon Macadam; Dry, New, Dusty, and Well-paved with Grades varying from 1·2 to 5·8 per cent.

Carriage at a walk, empty	38·32	30·91
Carriage at a trot, empty	44·90	35·09
Carriage at a walk, load of 660 lbs. ..	45·65	35·51
Carriage at a trot, load of 660 lbs. ..	65·31	36·08

These figures show that under all the conditions given the use of the pneumatic tyre diminishes the tractive effort; and this economy is greater upon a bad than upon a good road, and it also increases with the speed and the load.

Some experiments were made to compare the relative effect of iron tyres and pneumatic tyres with varying air pressure and with plain rubber. The results were as follows:—

At a trot, load 660 lbs.	44·22	44·75	43·91	56·52

Vehicle.	Iron Tyres.	Pneumatic. Air Pressure. 6·6 lbs.	9·9 lbs.	Plain Rubber.
At a walk, empty ..	33·64	36·03	34·34	37·62
At a trot, empty ..	46·64	33·99	41·69	44·15
At a walk, load 660 lbs.	44·22	44·75	43·91	56·52
At a trot, load 660 lbs.	64·20	45·14	50·64	63·96
Average	47·17	39·97	42·65	50·31

From this table it would seem that the full rubber tyre, while better than iron at a trot, is not so good at a walk. But Mr. Michelin adds that if the surface is muddy, or covered with snow, so as to remove all elements of elasticity, the full rubber tyre gives better results than an iron tyre. But the full rubber is always inferior in this respect to the pneumatic tyre; and for the latter it would appear that the pressure of inflation should not exceed 6·6 lbs. The general mean of the experiments of Mr. Michelin in traction give the following relative values:—

Pneumatic tyres	100·0
Full rubber tyres	129·8
Iron tyres	132·7

THE AUTOMOBILE ENGINEERS' DISCUSSION CLUB.

A MEETING was held at the "Coach and Horses," Clapham Road, on July 6th, of a number of gentlemen interested in engineering and other applied sciences, to discuss the advisability of forming a local club or society for the discussion of matters of interest and interchange of ideas and experiences, especially in connection with motor-vehicle construction.

Among those present were Mr. R. Fullerton Bell, R.N., Mr. C. M. Linley, M.C.E.I., Mr. Trigwell, M.C.E.I., and Mr. Preston Davies.

At this meeting it was decided that the Club should be formed, and a future meeting was arranged for July 20th, when the rules will be decided upon and a committee appointed.

The Hon. Sec. (*pro tem.*) is Mr. Arthur Power, 31, Kenwyn Road, Clapham, who will be pleased to receive any applications for membership.

DOINGS OF PUBLIC COMPANIES.

Electrical Power Storage Company.

The report of the directors of the Electrical Power Storage Company (Limited) for the year ended May 31st last, presented at the general meeting held on 14th inst., states that the net profit for the year is £4,389, which, with a balance of £242 from last year, amounts to £4,631, out of which the directors recommend the payment of a dividend of 5 per cent. on the ordinary share capital, which will absorb £4,275, leaving £356 to be carried forward. Provision has been made for the maintenance of buildings, plant, tools, &c., at a cost of £2,610. A considerable portion of the area obtained during last year for the extension of the Millwall works has now been built upon, and the shops fitted with newest types of machinery. The increased facilities thus obtained have enabled the Company to keep pace with the growing demands for its manufactures. The Company is now producing nearly all standard British and Continental types of secondary batteries, provided with Planté formed or pasted plates. The directors are pleased to announce that during the year a Royal Warrant has been issued appointing the Company storage battery makers to Her Majesty the Queen. Owing to ill health, Mr. Frank King, who has been manager of the present Company since its formation, has tendered his resignation, and has been elected to a seat at the board.

British Hydraulic Jointing Company.

The following circular letter has been issued to the shareholders:—

"Dear Sir or Madam,—

"Mr. Hooley not being in a position to complete his contracts, the directors of the British Hydraulic Jointing Company have resolved not to adopt the contracts for the flotation of the Company, and to return in full the subscriptions of the shareholders. Formal notice convening a meeting of the shareholders of the British Hydraulic Jointing Company (Limited), for the purpose of winding up the Company, is sent herewith.

"The directors of the Hydraulic Joint Syndicate (Limited) have, however, arranged for the necessary working capital to carry on the business, and all the rights in connection with the patents in Great Britain and all foreign countries will be worked by the latter; and the directors of the British Company have been offered, and have unanimously accepted, seats at the board of the Syndicate, which will now consist of the following gentlemen:—The Right Hon. the Earl of Crawford (chairman), Lord Ashburton, Mr. W. Bromley Davenport, M.P., Lieut.-General Sir J. Bevan Edwards, M.P., Viscount Hood, Mr. Walter H. Maudslay, Sir James Pender, Bart., M.P. The capital of the Syndicate already issued is £400,000, and it is proposed to increase the capital by the addition of £50,000 ordinary shares, to rank *pari passu* with the shares already issued. £25,000 of these shares have already been taken up at par; the balance will be held in reserve for issue by the directors when required.

"Yours faithfully,

"Thos. W. Mills, *Secretary*.

"18, Regent Street, London, S.W.,

"*June 24th*, 1898."

An extraordinary general meeting of the British Hydraulic Jointing Company (Limited) was held on the 5th instant, in accordance with the above notice, at the Cannon Street Hotel, under the presidency of the Earl of Crawford, when a resolution for winding up the Company voluntarily was unanimously carried.

Hydraulic Joint Syndicate.

An extraordinary general meeting of the shareholders of the Hydraulic Joint Syndicate (Limited) was held on the 5th instant, at the Cannon Street Hotel, for the purpose of increasing the capital to £450,000 by the creation of 50,000 new ordinary shares of £1 each. The Earl of Crawford presided.

The Chairman said that the history of the British Hydraulic Jointing Company, which was floated by the Syndicate, commenced on January 4th of this year. The board sent out a circular informing the shareholders of the Syndicate that the engineer had made a certificate to the effect that the compressor was in a practically finished condition and ready to be placed before the public. The difficulties in bringing out the Company were very great indeed, and one of those difficulties was the magnitude of the capital demanded and the impossibility of showing on the prospectus an adequate return. The directors absolutely declined to pledge themselves to put down in figures what dividends were likely to be paid by the Company. Finally, the directors called a meeting of the shareholders of the Syndicate, when it was decided that the capital of the British Company should be reduced from £2,000,000 to £1,200,000. The vendor's profits were reduced, and the return to the Syndicate was also reduced to £800,000. An extra inducement was also given to the new Company by the addition of the French and Belgian patents. The new arrangement was carried out with the consent of Mr. Hooley, who was singularly liberal to the shareholders of the Syndicate, for he was to receive only £25,000 of any cash payments to the Syndicate for himself. Mr. Hooley was willing to accept an arrangement that his entire cash profits should come last. The Company was registered, and the prospectus and underwriting completed. The directors insisted that the working capital of £100,000 should be arranged for. The response to the prospectus by the public was remarkably small, something over £22,000 being applied for by the public, and out of that amount £2,200 or £2,300 was withdrawn between the date of issue and May 26th. After the deductions the applications for shares amounted to, roughly, £18,000, and the underwriter was called upon to provide £82,000 to make up the working capital. Having the full complement of working capital, the directors considered they were justified in going to allotment. The Chairman then went over the history of the Syndicate. He said that the Syndicate from the commencement had been in the curious position of having no working capital. The directors had to consider that if they returned the money of the new Company to the shareholders, then the Syndicate shareholders might have a very serious bone to pick because the new Company had the working capital, and, again, it would have been a severe blow to acknowledge the failure of bringing out the new Company, with the result that, in all probability, the Syndicate would have to go into liquidation, and a most valuable patent would have been lost to the proprietors. The only thing they had to look forward to was the *modus vivendi*, which was found by the means of an interview which the solicitor of the Company had with Mr. Hill, the underwriter. Mr. Hill naturally did not very much like having to put his hand into his pocket for £82,000 for a thing he knew nothing about. At a meeting held on June 10th, Mr. Hill handed the directors a letter, which stated that, in consideration of the Syndicate agreeing to take the necessary steps for increasing its ordinary share capital and allotting to him 25,000 of the new shares, he agreed to take the same on condition that the British Hydraulic Jointing Company (Limited) went into liquidation, with the object of returning in full the money found by himself and the other shareholders. He further agreed to pay the expenses of liquidation up to £300. The Chairman said that that placed them in this position: the money was returned to the shareholders of the British Company, and enabled the Syndicate—the mother Company—to have a certain amount of capital in order to prosecute legitimate work. The Chairman then moved the resolution for increasing the capital of the Company.

Mr. Walter H. Maudslay seconded the motion, which was carried unanimously.

The Earl of Crawford, Viscount Hood, and Lord Ashburton were re-elected directors of the Syndicate, and the following gentlemen were also elected on the board:—Mr. W. H. Maudslay; Lieut.-General Sir J. Bevan Edwards, M.P.; Sir James Pender, Bart., M.P.; and Mr. W. Bromley Davenport, M.P.

The Chairman stated that Lord Ashburton wished him to say that the directors did not desire to take fees until the Syndicate was in a paying condition.

Lu-Mi-Num Manufacturing Company.

The liquidators of the Lu-Mi-Num Manufacturing Company (Limited) last month called an extraordinary meeting of the shareholders at the offices in London, to consider a resolution formally approving of the reconstruction of the Company on a basis which provides that the contributors agree to surrender their shares to the aggregate number of 118,000, and accept in exchange 30,000 new ordinary and preference shares credited with 15*s*. paid.

The New Rossleigh Cycle and Motor Company (Limited).

MR. P. C. MARTIN, chairman, presided at the statutory meeting of the above Company, which was held in Edinburgh on June 27th. He congratulated the shareholders on the continued prosperity of the Company, indicating that the business had increased about 50 per cent. last year. He added that the Company was keeping the subject of motors and motor-cars close before it, and he was certain this would shortly develop into a huge business of a most profitable kind, and one that would be a very valuable adjunct to the cycle trade. Mr. T. M. Sleigh, one of the managing directors, said great success had attended the opening of new depôts in Glasgow and the West of Scotland. Mr. Sime, C.A., moved that stock be taken at October 15th, and a balance-sheet made up and submitted to the shareholders in November, which was seconded and unanimously agreed to. This concluded the business.

New Issue.

THE London Steam Omnibus Company (Limited), with a share capital of £420,000, in £10 shares, of which 2,000 are founders' shares, has been formed to put upon the streets of London and other large towns steam and other motor-buses, chars-à-banc, and cars. According to the prospectus, it is also proposed to run lines of steam buses on a daily service from London to other towns, and from town to town. This Company will have a license from the British Motor Company for the sole right (within a radius of 20 miles round the General Post Office, London) to work the De Dion and Bouton system of steam buses, and will also be entitled to use throughout this country and Ireland the systems of motor-bus as used by Panhard and Levassor and Daimler. An agreement has been entered into with the British Motor Company (Limited), the vendor, by which the vendor grants these licenses, receiving in consideration £210,000 in cash or fully-paid ordinary and founders' shares, the proportion being one founders' for every 20 ordinary shares. Subscribers of 20 shares will have the right of securing one founders' share at par. No dividend will be payable on the vendors' shares until the business has earned a net profit of more than 6 per cent. upon the capital subscribed and paid up. The vendors' shares are then entitled to dividends until they have received 6 per cent., when all the shares are entitled to rank equally for dividend. After the Company has paid a dividend of 6 per cent. upon its entire issued capital, the distinction between the two classes of shares will thereafter cease. The founders' shares take one-third of the remaining profits in each year after 8 per cent. has been paid upon the ordinary shares, and after making a due allowance for reserve.

New Companies Registered.

[Under this heading we give a full list of new Companies registered which take power to make, deal, or become interested in any manner in automotor vehicles.]

Cam Gear Syndicate (Limited).—Registered by W. T. Hick 2, Church Court, Clements' Lane, E.C. Capital £12,000, in £1 shares. Object, to enter into an agreement with D. E. Radclyffe, A. H. Smith, T. W. Kent, W. Bromley, W. H. D. Tyler, and T. H. North, and to manufacture, sell, and deal in cycles, motors, motor-cars, tools, engines, &c.

Egdell Cycle and Engineering Company (Limited).—Registered by E. E. Clark, 61, King William Street, E.C. Capital £2,500, in £1 shares. Object, to carry on the business of cycle, motor-car manufacturers, engineers, &c. Registered office, 59, Holborn Viaduct, E.C.

Humburto Patent Cycle and Engineering Company (Limited).—Capital £100. Objects, the acquiring of a cycle and motor-car making and engineering business at Nottingham, at present carried on by a private individual.

London Steam Omnibus Company (Limited).—Registered by Ashurst and Co., 17, Throgmorton Avenue, E.C. Capital £420,000, in £10 shares. Object, to adopt and carry into effect an agreement, expressed to be made between the British Motor Company (Limited) of the first part, and this Company of the other part, and to construct, maintain, and work omnibuses, vans, carriages, launches, steamboats, and other vehicles or means of conveyance, whether for use by land or water, and the like, appropriate for the carriage and transport of passengers and goods, whether propelled by animal traction or by steam, oil, electricity, or any other motive power, and to obtain any necessary licenses for the same, whether under the Hackney Carriage Act or otherwise; also as electricians, mechanical engineers, &c., &c.

Lu-Mi-Num Cycle Company (Limited).—Registered by Sugden and Harford, 10, Ironmonger Lane, E.C. Capital £50,000, in £1 shares (10,000 are preference). Object, to enter into an agreement between the Lu-mi-num Manufacturing Company (Limited) of the one part, and William E. Watson (for the Company) of the other part, to manufacture and deal in bicycles, autocars, and motors of every description, and the various parts thereof, and to carry on the business of mechanical engineers. Registered office, 75, Queen Victoria Street, E.C.

Reavell and Co. (Limited).—Registered by Nunn and Popham, 140, Leadenhall Street, E.C. Capital £50,000, in £10 shares (600 are deferred). Object, to acquire from the Scott Engine Syndicate (Limited), Norwich, certain patent rights in relation to the Scott high-speed constant thrust compound engine, to acquire Reavell's patent air compressor, to enter into agreements with (1) the Scott Engine Syndicate (Limited); (2) William Reavell and Co.; (3) Charles Gaskell; and (4) William Reavell, and to carry on the business of engine builders, mechanical engineers, &c. The first directors are William Reavell, Charles Gaskell, and William H. Scott.

Roland Elastic Wheel Syndicate (Limited).—Registered by E. E. Clark, 61, King William Street, E.C. Capital £12,000, in £1 shares. Object, to acquire certain patents, and to manufacture and deal in cycles, motors, &c. Registered office, 20, Bucklersbury, E.C.

H.R.H. THE PRINCE OF WALES AND AUTOMOBILISM.

THE Prince of Wales, on June 25th, had his first ride in an up-to-date petrol motor-car, and appears to have been well pleased with his experience. The ride was between Warwick and Compton Verney. The cars used were sent over from Coventry by the Daimler Motor Company. The Prince, accompanied by the Countess of Warwick, Lady Randolph Churchill, and the Duke of Marlborough, occupied the first car, a Rougemont wagonette, fitted with a 4 H.P. Daimler motor, and driven by Mr. J. S. Critchley. The second car contained the Earl of Warwick and General Sir Stanley Clarke, the Prince's equerry; this car was driven by Mr. Meyer. In the third car were the Hon. J. Churchill, the Hon. Richard Molyneux, and Mr. Ronald Moncrieff, with Mr. Drake as driver. A fourth car contained Mr. Altree of the Daimler Company. Outside the castle and at various points along the route, where people had gathered, His Royal Highness was loudly cheered. The run to Compton Verney took an hour and ten minutes. At Compton Verney the Prince and party were the guests of Mr. Orr Ewing at the fine mansion, which is the property of Lord Willoughby de Broke. The stay was a short one, just sufficient for refreshments, and to view the hounds which were drawn up on the lawn. The party returned by a different route to Tachbrook House, where they lunched with Mr. and Mrs. Low, before returning to Warwick. The Prince expressed their pleasure at the journey and the manner in which the hills were mounted; he particularly noticed and commended the absence of vibration. The other members of the party also expressed their delight with the journey and the smooth running of the cars. There was only one incidental stoppage on the way, and that but slight, when the Prince's car in mounting a very steep hill on the return journey was pulled up by the heavy state of the road. A little assistance from the onlookers, who were quite enthusiastic to have the honour of pushing the Prince's car, quickly overcame the difficulty, and the car proceeded merrily on its way. Previous to the trip to Compton Verney the Prince, accompanied by the Countess of Warwick, was driven round the grounds of Warwick Castle by Mr. Critchley in a special car, driven by a four-cylinder engine, and geared to its top speed, 26 miles an hour. The Prince was taken several times round the grounds, but owing to the many turns the speed could not be kept so great as under other circumstances, although at 26 miles the Prince was doubtless fully impressed with the possibilities of automobilism. The rapid travelling appeared to very much please His Royal Highness.

A PETROLEUM AUTOMOTOR FIRE-ENGINE.

Steam fire-engines as used up to the present time have not enabled firemen to compete with fires either effectually or rapidly, although the volume of the jet is infinitely more considerable than that of the hand fire-engines. Unfortunately, too, owing to the crude methods employed, the working of a steam-engine requires time—practically not less than 15 to 18 minutes—to obtain a full head of steam. Harnessing the horses, &c., also takes a considerable time, and one must reckon on half an hour at least between the time the alarm was given and the engine is ready to work—at least, this is the London experience.

With a petroleum automotor fire-engine (the first idea of which is said to be due to M. Leon Porteu, Lieutenant of the Rennes firemen) the numerous inconveniences of the steam engine drawn by horses are considerably minimised. M. Porteu's first patent is now some years old, but, thanks to his energy and perseverance, he has at length succeeded in constructing a petroleum automotor fire-engine which is likely to have a big future before it. All the details of the engine (which we illustrate) have been worked out by Messrs. Th. Cambier and Co., with the help of M. Leon Porteu.

This engine is composed of a frame in steel sections, mounted as usual on wheels, with this difference—that the front axle is a director, as with nearly all the automotor carriages. Behind the driver's seat is the motor, with four cylinders of Cambier and Co.'s make placed longitudinally. The main shaft drives, by means of mitre and bevel wheels, an intermediate shaft, on which is mounted gear, sprocket wheels, &c. This intermediate shaft also gears with the pump shaft. The water for cooling the motor cylinders is carried in a tank, and when the pumps are running a connection from the pump pressure chamber easily replenishes the former. The power developed by the motor is 30 B.H.P.; this projects a stream of water, the volume of which is about 400 to 500 gallons per minute under a pressure of 150 lbs. per square inch. For igniting the charges in the motor-cylinders, and also for giving a powerful light on the scene of operations, a small storage battery is carried which, when charged, suffices for an eight hours' expedition.

It is easy to see the great advantages of petroleum automotor fire-engines. If kept in perfect condition they can be set in motion in a few seconds after the alarm has been given. The starting occupying but a minute or so, the arrival on the scene of the fire can be effected 15 minutes sooner than the most rapid steam-engine. The run can be made at an average speed of 9 to 10 miles per hour. Immediately on arrival at the scene of the fire the vehicle is brought to a standstill, and the motor, which has not been stopped, sets the pump in motion, and, as soon as the hoses are unrolled and connected with the water pipes, the pumping engine can give out its greatest duty. This sort of engine, as tested by trials, can attack a fire 20 minutes quicker than an ordinary steam-engine well kept and well worked. This difference in time can in almost every case prevent an extension of the fire, and, thanks to the Porteu system, considerable disasters can be avoided in future. We commend this notice to the London County Council Fire Brigade as it is simply not true to state publicly that there are no efficient automotor fire-engines, and make this statement an excuse for the *laissez faire* policy of the Council in the matter of fire prevention.

This fire-engine will be brought over by Messrs. Cambier and Co.'s sole agent for Great Britain, viz., Mr. Frentzel, and will be on view in about three weeks' time.

A French Petroleum Motor Fire-Engine.

Automobilism in France.—The past few weeks have been crowded with events connected with automobilism. There have been the Brussels-Spa Competition, the Paris-Amsterdam Race, the Exhibition of Vehicles in Paris, the Paris Cab Competition, to mention the principal events. We have found it impossible to deal with so many items, owing to the importance of other matters, but as, with the exception of the Paris Cab Competition, the events referred to do not possess any great technical interest, we in our present issue have not attempted to discuss them.

!" Cuando escribe, refiérese Al "The Automotor and Horseless Vehicle Journal."

President	Sir DAVID SALOMONS, Bart.
Secretary	ANDREW W. BARR, Esq.
President of the Liverpool Centre	The EARL OF DERBY, K.G., G.C.B.
Hon. Local Secretary	E. SHRAPNELL SMITH, Esq.
Semi-Official Journal of the Association	THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

SELF-PROPELLED TRAFFIC ASSOCIATION

(INCORPORATED).

LIVERPOOL AND DISTRICT CENTRE.

Second Session, 1897-98.

THE annual general, tenth, and last ordinary meeting of the session was held in the board room of the Incorporated Chamber of Commerce, Exchange Buildings, Liverpool, on Tuesday afternoon, July 12th, 1898, Mr. Alfred L. Jones, J.P., Vice-President, in the chair, when the following annual report of the Council was presented :—

At the close of the second session the Council beg to present the following report.

The additions to the roll have been 30. Ten names have been removed from the register, of which four are due to removals beyond the limits of the area embraced by the Centre, four are due to resignation, and two to death. At the present date the number of members is 64, compared with 44 at the close of the first session.

Messrs. H. Percy Boulnois and Everard R. Calthrop, who removed to London during the session, have been elected members of the General Council. The Council desire to place on record their appreciation of the valuable services rendered by these two gentlemen during their term of office on the Council of the Liverpool Centre.

Jurisdiction.—The Liverpool and District Centre has been defined as including the counties of Lancashire and Cheshire with North Wales. Members of the Association who are resident outside the boundaries of the Centre may be attached thereto by permission of the General Council. The contemplated amalgamation or fusion between the Association and the Automobile Club of Great Britain will in no way prejudice the Liverpool Centre.

Finances.—The arrangement referred to in the report of the first session, whereby it was proposed that the Centre should control its own finances and contribute a fixed percentage of its income to the Head Centre, has been duly completed. It has been agreed that this Centre shall pay to London 10 per cent. of the amount of the subscriptions received from the members on the local register. A statement of accounts to June 30th, 1898, has been duly audited by the London Secretary, Mr. Andrew W. Barr, P.S.A.A.

Arrangements with Foreign Clubs.—Members have, through the courtesy of the respective committees, the advantages of honorary visiting membership of the Automobile Clubs of France and Belgium. Official cards may be obtained from Mr. Andrew W. Barr, London.

Library.—A nucleus has been formed, and the Council hope that as the membership increases it will be possible to devote an adequate sum to the purchase of works connected with the history and present position of self-propelled traffic.

Models and Specimens.—The Centre is indebted to Messrs. Ibbotson Brothers and Co. (Limited) and Messrs. Samuel Fox and Co. (Limited), Sheffield, for the collection of springs used to illustrate Mr. Joseph Bedford's paper on "Steel Springs"; also to the Chloride Electrical Storage Syndicate, the Electrical Power Storage Company (Limited), the Elieson Lamina Accumulator Company (Limited), and the Lithanode Electrical Storage Company for the collection of accumulator plates used to illustrate the paper by Mr. J. T. Niblett.

The Session and Meetings.—A deputation of the Council represented the Centre at "Les Poids Lourds," which were held under the auspices of the Automobile Club de France from August 5th to 12th, 1897, in the neighbourhood of Versailles. These trials were the first held for heavy loads, the minimum being one ton of goods. A report was drawn up, in which the proceedings during the competition, the points of the various vehicles and of the Serpollet tramway system were described. This was published on September 16th, 1897, and was widely circulated. The session was opened on November 26th, 1897, by Mr. W. Worby Beaumont, M. Inst. C.E., M. Inst. Mech. E., M. Inst. E.E., who was entertained at luncheon at the Exchange Station Hotel by Mr. Alfred L. Jones, J.P. (Vice-President), who also invited the members of the Council and a number of leading citizens to meet him. In the evening Mr. Worby Beaumont delivered an inaugural address entitled "Self-Propelled Vehicles, 1896-97," in the course of which the progress made during the previous 12 months was reviewed. It was remarked, in opening, that the attack which had been made on the problem of the mechanical propulsion of common road-vehicles had materially lessened its problematic character, and that the benefits to be derived from the changes to be wrought in our road and street transport methods were being gradually appreciated. The vehicles that took part in the trials at Versailles, also a number of experimental and other English vehicles, were described at length, various illustrations being projected upon the screen. It was considered that the motor goods-van for loads up to 20 cwt. was a workable and economical machine, and that improvements would soon enable heavier loads to be carried. Finally, it was pointed out that heavy loads per axle were to be avoided, more particularly in view of traffic upon macadam roads in wet weather, and the conclusion was arrived at that loads considerably less than 10 tons per vehicle were desirable, or that a form of vehicle with six or eight wheels, all dirigible, must be designed. The President, the Right Hon. the Earl of Derby, K.G., was unable to be present on account of the sad death of Lady Lathom, and his place was taken by Mr. Alfred Holt, M. Inst. C.E., Vice-President. Subsequent meetings were held, at which papers upon the several subjects enumerated in the following summary were read and discussed :—

December 14th, 1897.—Mr. W. Hugh Woodcock, M. Inst. C.E.: "Roller Bearings."

January 25th, 1898.—Mr. Geo. Herbert Little (technical editor of THE AUTOMOTOR): "Some Points in the Design of Automobile Vehicles intended for Heavy Traffic."

February 22nd, 1898.—Messrs. D. H. Simpson and W. L. Bodman: "An Account of our Trials and Experiments, with the Conclusions drawn therefrom."

March 1st, 1898.—Discussion upon Messrs. Simpson and Bodman's paper.

March 15th, 1898.—Mr. Joseph Bedford: "Steel Springs."

March 29th, 1898.—Mr. J. T. Niblett, M. Inst. E.E.: "Recent Improvements in Accumulators and their Application to Traction on Common Roads."

April 14th, 1898.—Mr. E. Shrapnell Smith (Hon. Local Secretary): "The Arrangements for the May Trials."

July 5th, 1898.—Nomination of Council and Officers.

July 12th, 1898.—Annual General Meeting.

The paper announced to be read by Mr. Henry S. Fearon, Assoc. M. Inst. C.E., on "Leather Tyres," was unavoidably postponed to next session.

The average attendance during the session equalled 38 at each meeting.

Proceedings.—The proceedings of the Centre have been fully reported in the semi-official journal of the Association (THE AUTOMOTOR). The engineering Press generally have summarised most of the papers.

Trials of Motor-vehicles for Heavy Traffic.—The session was brought to a successful termination by the competition held from May 24th to 27th, 1898. The chief object of the trials was "to arrive at a type of heavy motor-wagon suitable for trade requirements in Liverpool and neighbourhood, which shall be capable of economically taking the place of horse haulage and of competing with the existing railway rates, in the transport of heavy loads of goods over considerable distances." Awards amounting to £225 were offered to be made at the discretion of the judges. The conditions of the trials were published on November 16th, 1897, thus giving only six months for intending competitors to build. It must, however, be borne in mind that a number of firms had already been engaged upon experimental vehicles for upwards of 12 months, so that the objection of short notice is not so important as might appear. Out of ten entries by six firms only four vehicles were presented for trial. These carried loads of from 2 to 5 tons, and covered the prescribed courses of 35 miles each, with results of a very encouraging character. The competing firms were:—

The Liquid Fuel Engineering Company (Limited), East Cowes, Isle of Wight.

The Steam Carriage and Wagon Company (Limited), Chiswick.

The Lancashire Steam Motor Company, Leyland.

The trials were attended by a large number of engineers, merchants, shipowners, and others interested, from all parts of the country. The Automobile Clubs of France and Belgium, the Secretary of State for War and the Postmaster-General, and the Corporations of Hull, Liverpool, Manchester, and Wolverhampton, sent official delegates. Representatives of *The Times* and *Daily Telegraph*, of all the technical journals, and of the local press, followed the competition. The report of the judges is now in course of preparation. During the continuance of the trials entertainments were provided for our foreign and other visitors.

A dinner took place at the Adelphi Hotel on the evening of Thursday, May 26th, 1898, when about 140 members and friends were present, including Sir David Salomons, Bart, who presided, the Right Hon. the Lord Mayor of Liverpool (Alderman John Houlding); Mr. Alfred L. Jones and Mr. Alfred Holt, Vice-Presidents of the Liverpool Centre; Mr. R. W. Wallace, Q.C., Chairman of the Automobile Club of Great Britain; M. Pierre Giffard, Membre du Comité de l'Automobile Club de France; M. François Thy (Bourgomestre de Pecq); F. C. Danson, President Liverpool Chamber of Commerce; W. A. Darbishire, Penyhryn, Carnarvon; Charles H. Darbishire; Richard M. Greaves; John I. Thornycroft, Chiswick Mall, W.; John E. Thornycroft; Herbert Niblett; Boverton Redwood, Church End, Finchley, N.; J. E. Thornton, Altrincham, Cheshire; J. P. Lea; Alfred J. Ling, Bollington, near Macclesfield; H. A. House, jun., and Mrs. House, East Cowes; R. F. Bosthwick, Glasgow; H. E. Lytle; S. Geoghegan, Dublin; Francis E. Baron, Blackpool; Julius Harvey, London; Colonel W. Walker, J.P., Liverpool; John Wilson, C.C., Liverpool; Arthur Musker, Bootle; W. Churchward Dean, Swindon; Thomas Dean; Prof. H. S. Hele-Shaw, Liverpool; Anthony G. Lyster, Liverpool; Geo. H. Cox, Birkenhead; J. Walwyn White, Widnes; P. Souvestre, La Société Anonym de Traction "Automobile"; Charles T. Crowden, Leamington; M. C. Bannistor, Liverpool; Henry H. West, Liverpool; S. B. Cottrell, Liverpool; J. A. Brodie, Liverpool; G. F. Ransome, Liverpool; Jas. A. Bradshaw, Liverpool; Cyril T. Thring, Dublin; William Hucks, Camden Town, N.W.; F. A. Robinson, Mansfield; Stanley Spooner (THE AUTOMOTOR); Henry Burton, Newport; A. H. Ashworth, Torton; Henry Spurrier, Leyland; Henry Spurrier, jun., Leyland; A. M. Macleod, Sidcup; J. H. Deakin, Windermere; John Harvey, Manchester; Jesse Ellis, Maidstone; Boverton Redwood, jun., London; T. H. Toulmin; William Philipson, Newcastle-on-Tyne; Thomas Toward, Newcastle-on-Tyne; H. S. Holt; Barras Reed, Newcastle-on-Tyne; J. H. Mace; James Leslie, Belfast; Wilfred le P. Webb, Catorham; G. T. Harrap, London; George Iden; J. Sydney Critchley; J. K. Starley; W. J. Davey; John Rogerson; Alfred Rogers; Sydney Lawson; Cecil E. Hawley; E. H. Gregson; W. B. Wood; J. T. Nicholson; Arthur G. Bean; J. T. Dawes; John Stirling, Hamilton, N.B.; Henry Sturmey; R. C. F. Annet, Sefton Park; Richard Barrett, Liverpool; John Blyth, Liverpool; Miles Kirk Burton, Liverpool; Charles Birchall, Liverpool; R. W. Brown, Liverpool; A. W. Barr, London; James Berry, Prescot; C. Harcourt, Town Clerk, Liverpool; D. Cunningham, Derby; Captain Leonard Dunning, Liverpool; W. Dean, Swindon; John H. Falk, London; Captain H. F. Gaynor, R.E., Chatham; Richard James, G.P.O., Liverpool; Lieut. Henry M. Liardet, R.N., Harbour Master; R. R. Lloyd, London; Thomas Parker; Norman C. Lange, Birkenhead; Edward George Mason, Mayor of Birkenhead; Dr. J. McMurray, Mayor of Bootle; G. B. Proctor, Liverpool; Charles Sandback Parker, Liverpool; C. R. Rowlandson, Manchester; E. A. Rosenheim, Liverpool; W. J. Stewart, Southport; A. T. Squary, Revenue Buildings, W.; Paris Singer, London; Edward Verspreeuven, Belgium Consul, Liverpool; Alderman Waring, Mayor of Widnes; Berkeley D. Wise, Belfast; Seymour B. Tritton; J. Percival Davies; Wm. Aston; C. H. W. Biggs (*The Contract Journal*); Wm. Bayliss; T. H. Barker (Secretary Chamber of Commerce); R. Edgar Boulton; J. Brown, Belfast; F. J. Burrell, Thetford; J. W. Catchpole (*Electricity*); C. A. Charlewood; W. G. Chadburn, Mansfield; G. J. Churchward, Great Western Railway, Swindon; C. Cordingley; A. R. Ellison; H. Fowler, Horwich; W. H. Fowler (*Mechanical Engineer*); H. M. Giles; Captain C. Graham (*Journal of Commerce*); C. H. Grinling (*Times and Transport*); L. H. Huddart; W. G. Hay; Captain J. A. L. E. Johnstone, R.E.; A. Lodge; J. H. Lowery; M. André Mechelin; Chas. Manners, Mansfield; Percy Marks (*The Road*); H. E. Sherwin-Holt; E. Shrapnell Smith, Hon. Organising Secretary; Lieut.-Colonel H. W. Smith-Rewse, R.E.; F. Salisbury, Postmaster of Liverpool; J. R. Taylor; L. R. Thomas, Great Western Railway, Swindon; C. T. Thring, Dublin; R. F. Vallance, Mansfield; W. Wetherell (*Daily Telegraph*); R. G. West; E. A. Mitchell; Chas. Stewart; D. E. Phipson, Birmingham; G. R. Dunell (*Engineering*); A. J. King.

The following is the complete list of subscribers to the Trials Fund:—

	£	s.	d.
The Right Hon. the Earl of Derby, K.G.	105	0	0
Mr. Alfred L. Jones, J.P. (Messrs. Elder, Dempster, and Co.)	105	0	0
Sir David Salomons, Bart.	105	0	0
Mr. Alfred Holt	52	10	0
The Liverpool Cotton Association	25	0	0
THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL	10	10	0
Mr. Maunsell C. Bannister	10	10	0
Mr. W. Worby Beaumont	10	10	0
Mr. John A. Brodie	10	10	0
Mr. Everard R. Calthrop	10	10	0
Mr. A. Bromley Holmes	10	10	0
Mr. Joseph Hoult, C.C.	10	10	0
Mr. Anthony G. Lyster	10	10	0
Mr. Arthur Musker	10	10	0
Mr. Henry H. West	10	10	0
The Autocar	5	5	0
Mr. S. B. Cottrell	5	5	0
Mr. Danson Cunningham	5	5	0
Mr. W. A. Darbishire	5	5	0
Mr. E. Shrapnell Smith	5	5	0
Mr. J. K. Starley	5	5	0
Messrs. Alfred Booth and Co.	2	2	0
Mr. Jas. A. Bradshaw	2	2	0
Mr. John Brancker, J.P.	2	2	0
Messrs. B. Burton and Son	2	2	0
Mr. Geo. H. Cox	2	2	0
The Right Hon. Lord John Hay, G.C.B.	2	2	0
Colonel A. Hill Holme, J.P.	2	2	0
Mr. J. W. Pickering	2	2	0
Mr. Geo. Fredk. Ransome	2	2	0
Mr. W. Rowlandson, C.C.	2	2	0
Mr. John Simpson	2	2	0
Mr. J. Barkeley Smith, J.P.	2	2	0
Mr. J. E. Thornton	2	2	0
Mr. R. J. Urquhart	2	2	0
Mr. George A. Wilson	2	2	0
Messrs. Andrews, Bell, and Co.	1	1	0
Mr. Richard Bennett	1	1	0
Mr. J. Brown	1	1	0
Mr. A. W. Goodall	1	1	0
Messrs. Jas. Guthrie and Co.	1	1	0
Mr. E. Roscoe Harpin	1	1	0
Mr. W. F. Lawrence, M.P.	1	1	0
Mr. James Leslie	1	1	0
Mr. A. Ludeck	1	1	0
Messrs. Simpson, Roberts, and Co.	1	1	0
Messrs. R. Singlehurst and Co.	1	1	0
Mr. Edmund Townsend	1	1	0
Mr. M. H. Wells	1	1	0
Mr. J. Walwyn White	1	1	0
Mr. Charles Wills	1	1	0
Mr. John Wilson, C.C.	1	1	0
Entry Fees	35	14	0
Total	£613	0	0

The best thanks of the Association are due to the following gentlemen, firms, and Corporations, for their valued assistance:—

The Members of the Trials Sub-Committee who drew up the conditions and rules of the competition:—Messrs. Alfred Holt, Jno. A. Brodie, Everard R. Calthrop, S. B. Cottrell, Henry H. West, and E. Shrapnell Smith (Hon. Sec.).

Judges: Sir David Salomons, Bart.; Prof. Boverton Redwood, F.R.S.E., F.I.C.; Professor H. S. Hele-Shaw, LL.D., M. Inst. C.E., M. Inst. Mech. E.; Mr. S. B. Cottrell, M. Inst. C.E., M. Inst. Mech. E.; Mr. Henry H. West, M. Inst. C.E., M. Inst. N.A., M. Inst. Mech. E.

Observers: Messrs. Francis E. Baron, Henry Fowler, W. G. Hay, and J. Walwyn White (senior observers in charge); Messrs. Wm. Bayliss, R. Edgar Boulton, C. A. Charlewood, A. R. Ellison, Humphrey N. Giles, L. H. Huddart, J. C. W. Humfrey, Norman C. Lange, A. M. Lodge, J. H. Lowery, H. Owens, E. A. Rosenheim, J. Reginald Taylor, and Charles Stewart.

The Mersey Docks and Harbour Board, for the use of their Prince's Dock Yard and their tender, the "Vigilant."

Mr. John Thomas Wood, M. Inst. C.E., for preparation of plans and profiles of the routes.

Messrs. Hooper and Simmons, for storage accommodation for the light carriages.

Messrs. Ismay, Imrie, and Co., for permission to see the R.M.S. "Majestic."

Messrs. Hy. Pooley and Sons (Limited), Liverpool, for loan of weighing machines.

Mr. J. Sydney Critchley, M. Inst. Mech. E. (Works Manager, the Daimler Motor Company), for courteous and unremitting attention in connection with the service of light carriages.

The thanks of the Council have been duly communicated to the respective parties.

FURTHER COMPETITION, SEPTEMBER, 1899.

The results of the recent trials being regarded as highly satisfactory for a beginning, it has been decided to organise another series of trials of motor-vehicles for heavy traffic to take place in the month of September of next year.

The routes selected are the two main roads between Liverpool and Manchester. The conditions will be issued shortly.

LOCOMOTIVES ON HIGHWAYS ACT, 1896.

The following resolution was unanimously adopted by the Council at a meeting held shortly after the recent trials:—

Resolved—"That the Liverpool Council of the Association is of opinion that the existing maximum of 3 tons tare imposed by the Locomotives on Highways Act, 1896, very seriously hampers and in many cases prohibits the construction of vehicles of the types required for the heavy traffic of this district, and a recommendation is hereby made to the General Council that the whole forces of the Association shall be immediately directed towards the obtaining of an amendment to the Act whereby (*a*) *all restrictions upon weight shall be removed;* or, if it be deemed inexpedient to remove all limitations, (*b*) a limit upon the total moving weight, or upon the weight per axle, shall be substituted for the present limit of 3 tons tare; or, if it be considered imperative to retain a limit upon the tare (*c*) the tare permissible shall be increased to at least 4 tons."

It is hoped that joint action will be taken shortly to give effect to one of these clauses.

OBITUARY.

The Council have to regret the deaths of two members, viz., Mr. George Kendall, Messrs. C. S. Wilson and Co., Liverpool, and Mr. Edmund Rothwell, Assoc. M. Inst. C. E., Engineer and Managing Director of the Bury, Rochdale, and Oldham Tramways Company (Limited), Rochdale.

The CHAIRMAN (Mr. Alfred L. Jones, J.P.), said: Gentlemen,—In submitting for your approval the annual report of the Council, I am sorry that our president, Lord Derby, is not with us to-day, but we are glad to know he takes the very keenest interest in the operations of this Society, and is a firm believer in the possibilities which we endeavour to promote. I am pleased to see that our trials, as the report will show, have been far more successful than the first efforts of railway making in this country. I believe that time is the only thing required to enable us to have self-propelled vehicles for moderately heavy weights, say, up to 10 tons, to travel at one-fourth the present cost of railway rates. It will be evident to anyone that any machine of the kind, which can be brought to work, will have such a saving effect that the railway companies will have no chance, because the cost of unloading from cart to railway wagon, and from railway wagon to cart again, is so great that a direct wagon taking goods from the ships' side will be able to do it, as I have said, at one-fourth the cost of the present railway rates. There can be no question that the railway companies, by the attitude they have taken up, absolutely promoted the Manchester Ship Canal. This question of cheap carriage is of vital interest to Liverpool, and of far more direct importance than the most burning political question now discussed by the country. Our members of Parliament should be instructed by their constituents to protect us from the railway companies, and in the meantime we can proceed with better and cheaper methods of traction created by the conditions imposed upon us by the railways. One matter which is a great injustice to Liverpool latterly has been the reduction given to London and Southampton of 25 per cent. off the rate previously charged, whereas no reduction has been given to Liverpool. As I have frequently said, if Liverpool had cheap railway rates from Lancashire, she would have a far greater proportion of the West Indian, the Cape, and other trades. It is outrageous to suppose that Liverpool should be placed at the disadvantage of goods being taken away to the south coast, 200 miles by land, when Lancashire has a shipping port close at hand like Liverpool. We are now preparing for the 1899 trials, and in those trials we hope to offer a much larger premium; and here I would like to take the opportunity of thanking the subscribers for the very liberal support that this Association has received. The amount subscribed for our trials of 1898 amounted to £613, and next year we hope to double that amount, thus making the 1899 motor-car trials of Liverpool more or less a national question. We hope also that we shall have a commercial solution of this problem to submit, and that is, that we shall propose to combine with these trials the offer of a syndicate to provide cargo for distances up to, say, 30 miles, so that makers of vehicles may see there is real sound business in the scheme. I have no doubt in 1899 we shall receive from the Liverpool Corporation and from the Dock Board that support which they ought to give. Cheap carriage to Liverpool trade means life. Where would Liverpool be without her docks and shipping? Our authorities should keep a watchful eye on these facts. As regards the use of the roads, practically the whole of the traffic is already conveyed by the roads along the docks. Now, if the traffic can be carried along these roads, it will be just as easy to carry it to any place within 30 miles of Liverpool. Another matter which is very important, and which will be an element of great advantage in the future is, that the time saved by the self-propelled wagon will be greatly in its favour. For instance, a wagon can leave Liverpool at night and be at the factory door in Manchester at six o'clock the next morning. These are days of rapid progress, and I think it is much to the credit of Liverpool that she has taken a prominent place in the efforts to develop cheap carrying.

Mr. ANTHONY G. LYSTER said: I have very great pleasure in seconding the proposal of the adoption and circulation of the report, and think the local Association is very greatly to be congratulated upon having achieved so much within so short a period after its formation. The view which it has taken of automobilism has been that of applying it to the direct needs of the vast commerce with which our port deals, and in regarding it in this way the Association has probably taken the most practical step towards its useful spread for general commercial purposes, as there are few of the world's trades which are not more or less in touch with the great centre of Liverpool, and do not look to it for a lead in some form or another. As our Vice-President has said, the whole gist of the transactions of the Association during its short term of life lies in the recent trials of automotor wagons for dealing with heavy traffic. Other important duties it has undoubtedly performed, which must all bear fruit in directing public attention to this modern development and spreading information with regard to it; but the all-important function which it has performed has been to attempt to demonstrate, by practical experiment, the possibilities of the transport of goods from Liverpool to the manufacturing districts by more economical and simple means than at present exist. Mr. Jones has dealt with the commercial aspects of that experiment, and inasmuch as its pressing need has been a matter of universal talk in business circles for many years past, I need not, I think, dwell any longer upon that view of the question. I should like, however, to say a few words from a more technical point of view, and try and set before you how, in my judgment, the chance at present stands for the introduction of the automotor wagon for this purpose. In doing this I do not wish in any way to attempt to forestall the report of the judges on the trials—which, from the information at their disposal and the very careful consideration which they will no doubt bring to bear upon them, will deal much more technically with the matter than I am able—but merely to give you my general impressions after reading the account of the trials as given by the Press. In the first place, it occurs to me that it has been demonstrated beyond all possibilities of doubt that an automotor wagon can take a reasonably heavy load for a distance of 35 miles along such main roads as exist in our neighbourhood, and up such inclines of varying grades as present themselves on these roads at speeds which meet all practical requirements. Secondly, that they can be manœuvred with quite as great if not greater facility than, say, a lorry with a pair of horses. Thirdly, there is the all-important question of the cost at which this can be done. At the present time, to take a ton of goods from a dock shed in Liverpool, transfer it to the railway depôt, there to place it upon a railway wagon, to transfer it by rail to Manchester, to unload it there, place it upon a lorry, and convey it to a warehouse, will on the average probably cost about 10s. According to the results of the recent trials, and allowing ample margin on many accounts which must still remain matters of estimate, a ton of goods can be transferred from the shed in Liverpool to the warehouse in Manchester for from 3s. to 4s., say for two-fifths of the cost of the existing railway and cartage rates. This seems to me a most important result, and inasmuch as the time of transit would probably be less than half of what is on the average taken by the railway, it appears to me proved beyond all possibility of doubt that the two most important elements of time and money are both enormously economised by the adoption of the automotor wagon system. Perhaps the only other question in connection with this means of traffic which requires consideration is that of the roads. As regards this I am not prepared to say at the moment what is the best provision to be made for meeting the extra wear and tear, and who should be at the expense of making that provision, but I feel sure that both of these questions are capable of simple solution, and that even should the expense be borne directly by the traffic, it would only be a fraction of the cost of transport. I pass over the question of minor breakdowns, which are inseparable from first essays of this character, as they are all to be traced to a want of practical experience in details, and can all, in my judgment, be simply and readily rectified. These results, which I believe are correct, and which anybody can practically verify for himself by careful consideration of the published accounts of the trials, seem to me of enormous importance to the trade of this port, and the more so when we consider that this is practically the first experiment which has been made in this direction, and that without doubt as time goes on, and as experience is gained, and the present restrictions in regard to load to be carried removed, very great economies will be effected. I think, in conclusion, that these few remarks, coupled with those which have preceeded them, will form ample justification for the recommendation which the vice-president and myself have the honour to bring before you, and I am sure that not only will the Association be ready to accept that recommendation, but they will also be prepared to congratulate themselves and the Council upon having secured such important results in so short a space of time.

Mr. A. HOLT said he wished to define his position in the Society. The object of the Association was the scientific investigation of self-propelled vehicular and locomotive road traffic, and for that purpose he still remained a member, and would give such services as he could with that object.

The resolution, "That the report of the Council of the Liverpool Centre of this Association be adopted and circulated," was then put and carried unanimously.

The next resolution was: "That the best thanks of the Liverpool Centre of the Association be given to the retiring Council and officers for their services during the past session," moved by Mr. F. C. DANSON (President Liverpool Chamber of Commerce), and seconded by Mr. J. WALWYN WHITE, who said that when they thought of the difficulties which surrounded the work of these gentlemen—to arrange for trials, &c., that were without precedent—they would realise the arduous nature of the work to be done. He wished to call special attention to the great amount of work done by one alone—their able hon. secretary.

The CHAIRMAN said that the work had been a pleasure to them. Personally he felt that there were very great possibilities for the motor in Liverpool. With regard to Mr. Holt, of course they did not want his position misunderstood—nor did they want their position misunderstood. The Society was formed to investigate and to try and find out the possibilities of some new motor power which would be cheaper than the present means of carriage. They thought they had so far succeeded fairly well. The trials were very creditable, and showed clearly that there were great possibilities in the future. Having succeeded so far, they were greatly encouraged to go on, and they thought the 1899 trials would show a development that would surprise a great many people.

The next resolution—"That the best thanks of the Liverpool Centre of the Association be given to the Rules Sub-Committee, the Judges, the Observers, the Mersey Docks and Harbour Board, Mr. John Thos. Wood, and others for their valued assistance in connection with the trials of motor heavy traffic"—was moved by Mr. GEO. H. COX, and seconded by Mr. A. BROMLEY HOLMES (City Electrical Engineer), and carried unanimously.

Messrs. Lloyd and Walker, Chartered Accountants, 5, Castle Street, Liverpool, were unanimously elected as Hon Auditors.

A vote of thanks to the Chairman closed the proceedings.

The Right Hon. the Earl of Derby, K.G., has been again elected as President, Messrs. Alfred Holt, Alfred Jones, and John A. Brodie as Vice-Presidents, Mr. Lawrence Jones as Hon. Solicitor, and Mr. E. Shrapnell Smith as Hon. Secretary, and when the ballot papers for the election of Council to hold office till May, 1900, were unsealed the following were declared duly elected:—Messrs. M. C. Bannister, S. B. Cottrell, Geo. H. Cox, Prof. H. S. Hele-Shaw, Mr. A. Bromley Holmes, the Right Hon. John Houlding (Lord Mayor), Messrs. Anthony G. Lyster, Arthur Musker, Coard S. Pain, Henry H. West, John Wilson, and John Thos. Wood.

CERTAIN questions having arisen as to the method of balloting for the election of members to the Council of the Liverpool Centre, we are requested by Mr. E. Shrapnell Smith, Hon. Local Sec., to give the following outline of the arrangements, in order to make it quite clear that the secrecy of the ballot was in no way sacrificed:—The marked lists were enclosed by the members in envelopes, and the envelopes were signed, as a guarantee that the ballot sheets were sent in by duly qualified members. These envelopes were opened at the Annual General Meeting, and, after the sheets had been taken out by the scrutineers, thrown indiscriminately into the waste-paper basket. The votes were then counted quite independently of any signatures.

THE SELF-PROPELLED TRAFFIC ASSOCIATION AND THE AUTOMOBILE CLUB OF GREAT BRITAIN.

A SPECIAL general meeting of the members of the Self-Propelled Traffic Association was held on the 4th inst. at Cannon Street Hotel, to consider a proposal for amalgamation or fusion with the Automobile Club of Great Britain. Amongst those present were Sir David Salomons, Bart., Professor Boverton Redwood, F.I.C., F.R.S.E., Messrs. W. Worby Beaumont, J. J. Vickers, Walter Hancock, Henry A. Naismith, Stanley Spooner, Julius Harvey, Andrew W. Barr (Secretary), &c. Sir David Salomons, who presided, explained that the new organisation would not merely be a club, but what was called in France a Society of Encouragement. If the proposed fusion were agreed to, the members of this Association would be asked to fill up a form of application for membership of the Automobile Club. These applications would be submitted to a joint committee of both bodies, and he did not suppose that many, if any, of them would be rejected. The amalgamated body would have a club-house in London for the use of its town and country members, and all the benefits this Association enjoyed from its official connection with the French and Belgian clubs would be granted to the Automobile Club. He concluded by moving a resolution authorising the council to take the necessary steps to carry the proposed amalgamation into effect. Mr. Boverton Redwood, in seconding the resolution, expressed satisfaction that the friction which had existed between the two bodies had at last been removed, and said he considered that the amalgamation would be of mutual advantage. The resolution was agreed to unanimously.

AN extraordinary general meeting of members of the Automobile Club of Great Britain was held on Monday, July 11th, at the premises of the Club, 4, Whitehall Court, London, S.W., for the purpose of passing a resolution for the amalgamation of the Self-Propelled Traffic Association with the Automobile Club, the official title of the Club then to be "The Automobile Club of Great Britain and Ireland, with which is incorporated the Self-Propelled Traffic Association."

Roger W. Wallace, Esq., Q.C. (Chairman), presided, and amongst those present were the Hon. Evelyn Ellis (Vice-Chairman), Messrs.

Frederick R. Simms (Vice-Chairman), Frank Butler (Hon. Treasurer), C. Harrington Moore (Hon. Secretary), the Right Hon. the Earl of Galloway, K.T., Capt. the Hon. Cecil Duncombe, J.P., Messrs. W. Worby Beaumont, E. H. G. Brewster, Capt. A. B. Cunningham, Messrs. Robert Gray, H. E. Sherwin Holt, John Henry Knight, Col John W. Lee, Messrs. Patrick J. McManus, Richard Muirhead, Arthur Paget, Boverton Redwood, Arthur J. Walter, Bertram Blount, Harrington Edwards, Louis D'Egville, Berger Graham, E. M. C. Instone, Julius Harvey, Shaw Kennedy, E. Ledger, E. Lefehure, J. McManus, Frank Purchase, Lyons Sampson, Stanley Spooner, F. W. Wolf, C. Johnson (Secretary), &c. The object of the amalgamation and the negotiations leading up to the present resolution were briefly explained by the chairman, and after a short discussion the proposition was unanimously agre d to.

THE "RICHARD" MOTOR-VEHICLE.

The accompanying illustration shows the latest type of "Richard" vehicle which is being introduced by the Southern Motor-Car and Cycle Company, of Brixton Road, London, S.W. As will be seen, the vehicle is elegant and graceful in appearance and eminently suitable for use by professional men such as doctors. The mechanism is of the Benz type, but much improved in many details, one of which is the handle for starting the engine at the rear of the carriage, thus dispensing with the crude and rather dirty method of starting by turning the fly-wheel. The lower framework is of iron hung on springs, the wheels being of the cycle kind and fitted with pneumatic tyres. There is also a convenient attachment for preventing the chains, in the event of the latter stretching, from slipping off. All the various changes in speed, starting, stopping, &c., are effected by one handle in place of the usual two. The regulation brakes are fitted and, with the steering gear, are controlled by levers close to the driver. The vehicle is characterised by very high class workmanship and careful finish.

At Last!—The Metropolitan Railway Company have at length made a trial of liquid fuel for locomotives, having fitted a locomotive specially for the purpose on the system adopted on the Great Eastern Railway. The experiment was in every way a success, the smell of the oil not being noticeable. The first engine fitted with this plant was put in regular service on the 4th inst. There is no doubt that the passengers on the Underground Railway will speedily notice the absence of the suffocating fumes which they have experienced since the compulsory use of other than steam coal, which has been unavoidable since the Welsh miners have been on strike. The oil used is ordinary burning oil. This use of liquid fuel might have been tried at least 10 years ago, but our railway directors are too hopelessly wedded to obsolete methods.

SOME AMERICAN ELECTRIC MOTOR-VEHICLES.

Notwithstanding the generally bad state of roads and streets in the United States and Canada (we leave out Mexico, because roads in that country are merely mule-tracks sprinkled with boulders of the glacial epoch), electric traction makes commendable headway, and there are probably more types of motor-vehicles of all kinds employed by business houses in the United States than is the case in this country.

Fig. 1.

Owing to the almost universal use of electricity as a source of light and power in nearly every small town, and the consequent facilities for recharging electric traction, whether for railroads or street vehicles, is superseding every other system. For street vehicles the objection is, of course, the weight of the batteries, and

Fig. 2.

this is accentuated in most towns and cities by the bad condition of the streets. This objection is, however, more than counterbalanced by the cheapness of and the facility for obtaining current.

In the accompanying illustrations we show two typical American vehicles, designed and built by the Fischer Equipment Company, of Chicago. Fig. 1 is a light goods van. This is made in two sizes, the smaller having two 2 H.P. motors, and the other two 3 H.P. motors. In its general appearance this vehicle is light and elegant; there is a pleasing absence of obtrusive mechanism. The batteries

2 K 3

are carried in the bottom of the body, below the floor. The controlling switch and its accessories are in the boot, while the steering bar and reversing lever are placed conveniently to the driver's hand. The total weight of the vehicle (light) is 2,600 lbs. Fig. 2 is an electricab. The design of this vehicle will hardly, we think, commend itself in the matter of elegance. A hansom cab drawn by a horse is a graceful combination, but placed in front of and attached to another body and without the horse, as in this design, it produces an incongruous effect. This vehicle has two 3 H.P. motors. The batteries are arranged in eight trays, and are inserted in the cab from the rear end, making their own connections automatically as they are placed into position In the rear of the cab is a framework, which, when closed, forms a panel effect, and when laid down is held in position by two heavy straps, making a platform on which trunks and baggage may be carried, thus making the vehicle, at any rate from a utilitarian point of view, complete. The rear wheels are 38 inches diameter, and the fore wheels 34 inches diameter. The speeds are 3, 6, and 12 miles per hour.

The following are the leading particulars of these vehicles, for which we are obliged to our contemporary the *Carriage Monthly* :—

—	Delivery Van.	Cab.
Weight of vehicle only	650 lbs.	950 lbs.
„ batteries	800 „	1,000 „
„ two motors	180 „	230 „
Complete weight of vehicle	2,600 „	2,600 „
Load capacity	700 „	1,100 „
Total load propelled	3,230 „	3,280 „
Normal H.P. of each motor	1 ·16	1 ·67
Maximum H.P. of each motor	2 ·32	3 ·34
Speed of motor, R. P. M.	1,000	1,000
No. of motor	V 2	V 3
Weight of battery cells	1,007 lbs.	1,009 lbs.
Number of battery cells	40	40
Maximum speed of vehicle, miles per hour	12	12
Time of running .. .. (hours)	3 ·5	3
Average mileage capacity	36	30
Diameter of rear wheel	36 ins.	33 ins.
„ front wheel..	32 „	34 „
„ wheel gear	19¼ „	21 „
„ motor gear	2¼ „	3 „
„ hard rubber tyre	1¼ „	1¾ „
„ pneumatic tyre .. .	3 „	3½ „
Size of axle	1¼ „	1¾ „
Width of batteries in vehicle	27 „	27 „
Length „ „	40 „	52 „
Height „ „	11 „	11 „

HORSE AND MOTOR-VEHICLE ACCIDENTS.

Frightened Horses.—A shocking fatal carriage accident happened at Rugby on Friday, the 1st inst. Mr. Rose, of Rugby, a well-known horse dealer, was driving a pair of horses in a phaeton on Hillmorton Road, Rugby, when, being frightened, they dashed into the town. The vehicle overturned and he was pitched through a plate glass window and sustained such shocking injuries and cuts to the head that he died shortly afterwards. A little girl named Gamble, aged 10 years, a labourer's daughter, who was on the pavement, was killed instantly by one of the horses falling upon her, and her sister narrowly escaped. The groom, who was riding with Mr. Rose, also received serious injuries and was taken to the hospital.

Accident to an Actress.—Whilst driving through Grosvenor Square, on the 1st inst., Mrs. Pinero, wife of the well-known play-writer, met with a severe accident. She was driving a high-stepping horse, which stumbled, throwing her head first on to the horse's back and cutting her face on a sharp piece of harness. The horse was stopped by an onlooker and Mrs. Pinero was conveyed home in a cab.

THE AUTOMOBILISTS' SPEED TABLE.

COMPUTED BY G. H. LITTLE. (*Copyright.*)

1 statute mile = 1,760 yards.

Miles per hour.	Yards per minute.	Yards per second.	Time in seconds for 100 yards.
1	29·33	·49	204·57
2	58·66	·98	102·28
3	88·00	1·47	68·19
4	117·33	1·95	51·14
5	146·66	2·44	40·91
6	176·00	2·93	34·09
7	205·33	3·42	29·22
8	234·66	3·91	25·57
9	264·00	4·40	22·73
10	293·33	4·89	20·46
11	322·66	5·37	18·60
12	352·00	5·87	17·05
13	381·33	6·35	15·74
14	410·66	6·84	14·61
15	440·00	7·33	13·64
16	469·33	7·82	12·78
17	498·66	8·31	12·03
18	528·00	8·80	11·36
19	557·33	9·28	10·77
20	586·66	9·78	10·23
21	616·00	10·26	9·74
22	645·33	10·75	9·30
23	674·66	11·24	8·75
24	704·00	11·73	8·52
25	733·33	12·22	8·18

A GAS MOTOR BATH-CHAIR.

AN interesting trial with a coal-gas driven motor bath-chair recently took place in Birmingham, the inventor being Mr. W. H. Dunkley, of Birmingham, and the trial being held in the presence of a number of interested spectators. In shape the vehicle somewhat resembles a bath-chair, affording seating accommodation for one person. The extent and capacity of the car is, however, a matter which is regulated merely by the particular purpose for which any vehicle may be required. The body of the vehicle carries apparatus for compressing ordinary coal gas into a steel cylinder, and from this storage a regulated supply is admitted to the engine, which by means of a gearing drives the car. It is claimed that 30 cubic feet of coal gas will afford 1 H.P. for an hour, so that the cost of propulsion with gas at about 2*s* 6*d*. 1,000 cubic feet is not extraordinarily high. The car worked very well, the smell of exhausted gas and the vibration being apparently slight.

Motor-Car Exhibition.—We would again remind our readers of the Engineering, Machinery, and Motor-Car Exhibition, which will be held at the Agricultural Hall, Islington, from Monday, August 22nd, to Saturday, September 3rd, of this year. The Exhibition, as before, will be under the management of Mr. Charles Cordingley, and those wishing to book spaces can obtain plans, specifications, &c., from Messrs. Cordingley and Co., 39 and 40, Shoe Lane, London, E.C.

The Motor-Vehicle Industry.—As showing the confidence that the leading manufacturers of motor-vehicles feel in the future of the new industry, we may mention that both Messrs. Thornycroft (the Steam Carriage and Wagon Company), of Chiswick, and the "Lifu" Company, of Cowes, are selecting sites in the Midlands for the erection of large manufacturing works. Both firms at present have their hands full of orders, and find their present premises too small and not well adapted for motor-vehicle building.

THE MANSFIELD STEAM MOTOR-VEHICLE SERVICE.

As stated by us in a recent issue, a Company has been formed at Mansfield for the purpose of establishing a much-needed comunication with outlying towns by means of motor-vehicles. As the result of careful inquiries, and having regard to the great success that attended the use of the "Lifu" motor-vehicles in other districts, an order was placed with the Liquid Fuel Company, of London and Cowes, for a char-à-banc, an illustration of which accompanies be visited regularly. At present the car runs between Mansfield, Mansfield Woodhouse, Warsop, Sutton, Hucknall, Huthwaite, and Nottingham Road, Mansfield. On Wednesday afternoon, the 6th inst., the car, well laden, made an excursion round the Dukeries, returning in the evening without mishap of any kind.

In response to a request for an account of the performance of this vehicle, Mr. F. A. Robinson writes:—"From Friday, the 1st, to Saturday, the 9th inst., inclusive, we ran 434 miles, and carried 2,558 passengers. On Saturday last we ran the time table enclosed, 78 miles, and during the afternoon for 48 miles we had our trailing-car behind, which carries same number of passengers as char-à-banc (22), and only finished 50 minutes behind time, owing to the heavy traffic.

The Mansfield Char-à-banc "Pioneer" (Symon-House System).

this description. The new vehicle is appropriately named the Pioneer. As will be seen, it is a passenger vehicle, but the framing, motor, &c., is on the now well-known and well-tested Symon-House system, and which has frequently been described in our columns. The service was inaugurated on July 1st, when the car made its initial business journey, which was to and from Mansfield Woodhouse, the conveyance being full both ways. On Friday, the 1st, the car ran 26 miles, on Saturday 62, on Monday 60, on Tuesday 44, and on Wednesday 50. On Friday it carried 168 passengers, Saturday 454, Monday 303, and Tuesday 251. It was then found necessary to issue a revised time table. The first one issued scarcely allowed sufficient time for the various journeys. The car has run faultlessly and punctually, and the managing director, Mr. F. A. Robinson, informs us that the takings have exceeded expectations, and those interested in the enterprise will have no reason for regret financially.

When the second car arrives, Shirebrook and New Houghton will

We carried 600 of the above passengers between 1.50 p.m. and midnight on Saturday, which I think is a record in motor work."

The above results are highly satisfactory, and reflect the greatest credit upon Mr. Robinson and Mr. House, jun. Such a useful object-lesson as this cannot fail to greatly stimulate the use of these motor-vehicles, and no doubt many other towns will emulate the enterprise of the Mansfield people.

The well-known tourist agents, Messrs. Cook, have availed themselves of the facilities offered by good motor-vehicles to inaugurate a series of tours to various parts of France. They have secured the Pauline, made by MM. De Dion et Bouton, which took part in Les Poids Lourds last year, and are now running weekly excursions with it from Paris. The first excursion started on the 11th inst.

NOTICES.

Contributions and articles likely to prove of interest to our readers will receive due attention, but in all cases the name and address of the writer must be given, not necessarily for publication.

All matter intended for publication should reach us not later than the 10th of each month, and be addressed to THE EDITOR OF "THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL," 62, *St. Martin's Lane, London, W.C. Stamped envelope must be sent if the manuscript is required to be returned. The Journal is published the middle of each month.*

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Manchester: JOHN HEYWOOD, Deansgate.

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When any difficulty is experienced in procuring the Journal from local newsvendors, intending subscribers can obtain each issue direct from the Publishing Office, by forwarding remittance of 7s. for 12 months' subscription, post free (or at the rate of 7d. per copy).

Most of the back numbers can still be obtained at 6d. per copy, or 7d. per copy post free.

INDEX TO VOL. I

Is Published Free with the October Number.

NOTICE.—A few copies of Volume I, bound complete, can still be supplied at One Guinea net, in consequence of our having purchased some of the numbers out of print, enabling us to make up some more complete sets.

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The Automotor and Horseless Vehicle Journal.

A RECORD AND REVIEW OF APPLIED AUTOMATIC LOCOMOTION.

JULY 15TH, 1898.

DIARY OF FORTHCOMING EVENTS.

Notices to be included under this heading should reach the Office not later than the 12th of each month.

[*For particulars of the programme of the Automobile Club of Great Britain, see p.* 415].

1898.	
June 25 and 26	Brussels to Spa Race. Organised by the Automobile Club of Belgium.
July 3 to 11 ..	Race from Paris to Amsterdam, under the auspices of the Automobile Club of France.
July 17 to Aug. 1	Lille (France) Motor-Vehicle Exhibition.
July 30 and 31	Automobile Race, Lille to Boulogne.
August 22 to Sept. 3	Engineering, Machinery, and Motor-Car Exhibition. Royal Agricultural Hall, Islington.
Nov. 18 to 26..	Stanley Show of Cycles, Motor-Carriages, &c. Royal Agricultural Hall, Islington.
1899	Race from Paris to St. Petersburg, under the auspices of the Automobile Club of France.
„	Motor-Car Exhibition at Tunbridge Wells.
„	Heavy Motor-Vehicle Competition at Liverpool.
„ October..	Concour des Poids Lourds at Versailles.
1900	Paris International Exhibition — Great Display of Automotor-Vehicles and Allied Trades.

ANSWERS TO CORRESPONDENTS.

A. B. C. (Melbourne).—You had better apply to Mr. Hunter direct. His address is Lewisham, S.E.

J. F. (Coventry).—There is all the difference in the world; in the ordinary wood wheels the spokes are in compression, in the cycle wheels they are in tension.

G. JONES.—We have returned your sketch. We do not think much of your design.

AMATEUR (Manchester).—You do not state your proposition quite correctly. You must express the resistance of the vehicle to traction in lbs. per ton. On ordinary macadam roads this may be taken as 60 lbs. per ton weight of vehicle. We then have—

$$\text{H.P.} = \left(R + \frac{2240}{16}\right)\frac{Wv}{375}.$$

Putting $W = 1$ ton, and $v = 16$ miles per hour, we get $\left(60 + \frac{2240}{16}\right)\frac{16}{375} = 8{\cdot}53.$

To this we must add about 25 per cent., to allow for loss in transmission, and the actual I.H. will be 10·66.

W. S. (Leeds).—(*a*) POCKET-BOOK sent by same post. (*b*) We can supply covers for binding Vol. I at 1*s.* 9*d.*, post free. (*c*) We thank you for your expressions of appreciation and all the new subscribers you have obtained for us, and we wish you every success with your new motor. Your experience with the "intelligent horse" is not exceptional, but what could poor mankind do hitherto when they had nothing else to take its place? Things will now be different, as your own case very clearly proves.

CAR (Kilmaurs).—(*a*) The only English firm which we believe has made the Serpollet boiler is Bernard Samuelson and Co. (Limited), of Banbury. (*b*) The address of the owners of the British patent is the L. R. Syndicate (Limited), 27, Lombard Street, E.C.

CONSTANT READER (Glasgow).—See our reply above to "Car." As to price, &c., you must ascertain from the makers.

R. M. S. (Fleet).—Your only plan is to write to the private address, but the patent rights having been parted with for Great Britain, a vehicle could hardly be supplied direct to you as suggested.

PETROL.—The idea of using milk as an extinguisher for ignited petrol is quite too absurd for discussion. Sand is the most efficient extinguisher. In America and in Russia one always sees heaps of sand near the tanks, but we have never seen a drove of cows.

THE PROGRESS OF AUTOMOBILISM: THE FUSION OF INTERESTS.

JUDGING from the numerous trials and competitions that have taken place so far and which are projected for the near future, there is no doubt that automobilism is making progress, and this opinion is confirmed in every direction. In another column we publish the report of the Liverpool Branch of the S.P.T.A. It will be noticed that it is a record of good work attempted and good progress made in disseminating amongst a somewhat at first sceptical public a knowledge of automobilism. Automobilism is civilisation, and civilisation means the comforts and necessaries of life for all, and those engaged in promoting automobilism are doing more practical work in bettering the conditions of living than all the politicians in the country. Automobilism, unlike those ignoble avocations connected with horses, is an intellectual pursuit, and hence does not, like a shallow and gossipy magazine, a blood-stained drama, or a music-hall banality, appeal to the majority of people and touch them in their tenderest and most susceptible feelings. This explains why the membership of the S.P.T.A. is not large nor its funds superabundant.

The Association nevertheless will have both—a large membership and a large banking account—within a very few years, provided that in these early days its councils are animated by a broad spirit of catholicism and its doings characterised by tact and gentle courtesy, and, let us add, by a careful avoidance of hero worship on the one hand and of a jealous exclusiveness on the other. "In the scientific investigation of self-propelled vehicular and locomotive road traffic" there is work for many minds, and ample scope for the expenditure of much money by those who are, let us trust, hampered not unpleasantly by a superfluity of that commodity—not a few of whom write or can affix the initials M.S.P.T.A. to their names. These remarks will, we think, be not altogether uncalled for by those familiar with the progress of automobilism during the past two years.

We observe with pleasure that the report contains evidence that the principles we have alluded to are likely to be followed by the Association. At present, as is well known, there are three distinct schools of thought in automobilism in this country: the purely scientific and technical, the social, and the financial. Let us be plain. Few people follow a movement from what Huxley terms ethical motives. The majority of us are animated largely by purely cosmical considerations. We are actuated by, let us hope, a spirit of enlightened Hedonism, and from the ethical point of view there is not much difference between the man who works for fame and the man who works for dollars, because each works for an advantage to himself or his *gens*. If while seeking either fame or lucre we can, as is often the case, indulge in our altruistic leanings by all means let us do so, only we need not proclaim the fact on the housetops, nor need we adopt a spirit of pharisaical exclusiveness. We then say that, providing their hands are clean, everyone concerned in automobilism may range themselves under the banner of the S.P.T.A.

Referring to the report, it will be seen that some such line of thought has been operating, and the result is a "contemplated amalgamation or fusion between the Association and the Automobile Club of Great Britain," which it is carefully and naively explained "will in no way prejudice the Liverpool Centre." We should hope not. That this fusion or working agreement will operate to the good of the cause, we make no doubt whatever.

It is, then, with pleasure that we are enabled to announce that this fusion will take the form of an amalgamation between the S.P.T.A., on the one hand, and the Automobile Club, on the other; the two bodies will thus unite under the title of "The Automobile Club of Great Britain and Ireland, with which is incorporated the Self Propelled Traffic Association." We should further explain that the distinctive functions of each body will be maintained, that is to say, the S.P.T.A. section will, as its charter indicates, study the scientific investigation of automobilism in relation to its commercial application, leaving to the younger section the business of popularising the movement, as has so well been done by the Automobile Club hitherto. It must be remembered that the great business of automobilists at present is of an educational nature. We have to educate the public, and this is better effected by ocular demonstration, such as the sight of motor-vehicles running in and around London, than by any other means.

It need not be feared in any quarter that the functions of the Liverpool branch of the S.P.T.A. will in any way be curtailed. This branch of the Association has worthily undertaken special work in relation to automobilism, and, indeed, occupies a position somewhat analogous to that of the various learned societies. We cannot imagine the Royal Institution, for example, as a place where one would seek to pass a few frivolous hours, or where one would endeavour to float a company. Let us, then, look to the S.P.T.A. to supply us with the technical information relating to the practical application of automobilism. The work of popularising the movement and the inauguration of new schemes will more fittingly be undertaken by the great central body in London. For certain purposes a combination of all forces is desirable; thus the whole forces of the united Association will be directed to obtaining an amendment of the Locomotives on Highways Act, whereby all restrictions upon weight shall be removed, as is indicated in the report of the Liverpool branch. We cordially endorse this recommendation. Most automobilists are voters, and not a few are influential ones. A concerted effort, and the intimation gently imparted to would-be County Councillors and members of Parliament that *their* cosmical considerations would be advanced by an amendment of the Act on the lines suggested, would produce the desired result within a single Session. Very few seats in Town or County Councils or in the House of Commons are nowadays what used to be termed "safe." A healthy disbelief in the profession of faith of these representatives is permeating the public, and between the "independent judgment" of the man with a safe seat and the complaisant acquiescence of the man with a less secure one there is a great difference, which should at once be taken advantage of. No doubt the new organisation will look to this and kindred matters. In conclusion, the Association ought to be a power in the land, and it will be the fault of its members if it is not.

TRACTIONAL FORCE.

ONE of the most important points about any motor is the amount of work it absorbs in overcoming internal friction. This work, of course, represents so much loss, and it forms a large proportion of the difference between the indicated and brake-power of a motor. In motor-vehicles, owing to the roughness of the roads, the power can seldom be applied to the wheels directly, but through a mass of gearing, which means a large number of sliding surfaces which are frequently under considerable pressure. We then have considerable power absorbed by the differential gear, dirty or badly worn chain transmission gear. It is, therefore, certain that in motor-vehicles the loss due to these causes must be very great. It was with a view to obtaining some information as to the gross loss in motor-vehicles, that is, the difference between the indicated and the brake-power, that we recommended that brake tests should be carried out at the Liverpool trials. Another test that might have been made at Liverpool was the determination of the element of tractional force for each vehicle. We cannot but regret that these tests were not made, as without them the trials must be considered as incomplete. At the Birmingham trials this latter test was made by Professor Unwin, and in due time the information will be published, and it should prove exceedingly valuable and interesting. The test in question is not difficult to carry out. It consists in letting a vehicle descend an incline freely under the action of gravity only, and in virtue of its kinetic energy ascending another.

Two gradients of known length and inclination are selected, and the vehicle allowed to descend and ascend freely.

Let—

W be the weight of the vehicle in lbs.
d the distance it runs freely in feet.
h the vertical height through which it falls.
a the angle of grade
T the tractive force in lbs. exerted.
R the frictional resistance.
μ the coefficient of friction.

Then—

$$T = Wh \text{ (foot lbs.)}$$

$$R = \frac{Wh}{d} \text{ (lbs.)}$$

$$\mu = \frac{h}{d}$$

This experiment should be made for the same vehicle under varying conditions of grade, load, and mechanism, and the results plotted on a curve. The information so obtained would be of the very greatest service to designers and would, if intelligently applied, greatly facilitate the adoption of automobilism in many quarters.

THE FLASH POINT OF PETROLEUM.

By GEO. HERBERT LITTLE, C.E., Author of "The Marine Transport of Petroleum," "The Transport of Petroleum in Bulk in Tropical Waters," &c.

THE principle enunciated in the aphorism that "the safety of the public is the supreme law" is the basis of all true legislation. While the wise application of this principle has effected an enormous improvement in our general social well-being, attempts are made from time to time to inaugurate legislation supposed and intended to benefit a section of the public, but at the expense of the public at large. This abuse of a sound principle is at all times to be deprecated, but when, as has not infrequently been the case in recent years, important commercial interests are thereby affected to the benefit of the foreign competitor, and with no particular advantage to the class for which the legislation was undertaken, it becomes the duty of everyone to carefully examine all such fresh proposals for what we may term philanthropic legislation, in order to see that neither the interests of the State nor of any section composing it are prejudiced. Everyone familiar with the industrial legislation of the last 20 years must know that the benefits, real or supposed, that have accrued to the class legislated for have been accompanied in most instances by a transference of a certain volume of trade from our hands to those of our foreign competitors. Take, for instance, the Load-line Act. This was the outcome of a purely hysterical agitation. Its object, laudable enough, could have been accomplished by other than legislative means. Yet its effect has been to give a tremendous impetus to the commercial marine of foreign States at the expense of our own foreign carrying trade. Much of our excellent factory legislation has operated in the same way, as the Lancashire cotton-spinning industry has found out. In their zeal to promote what, in the cant of the day, they love to term "legislation of a remedial and beneficial character for our toiling masses" all political parties vie with each other, and to this end cheerfully precipitate grave commercial consequences which no one can foresee.

"What if my house be troubled with a rat and I be pleased to give ten thousand ducats to have it baned?" said Shylock, with irrefutable logic; similarly not a few of our legislators say, in effect, What if our State be troubled with some form of industrial evil and we be pleased to sacrifice commercial advantages to have it removed?—only in this case the logic is not apparent. Nevertheless we do so, and it is a very grave question whether we are wise in so doing, especially in view of the growing fierceness of foreign competition, hostile tariffs, and the like.

It will be news to many to learn that our trade is shrinking, but such is the fact. According to a recent official report on the trade and industries of Great Britain made to the Foreign Office, it appears, as the result of very careful inquiry, that our position has "retrograded in relation to the other great nations. . . . . In nearly every important department of industry our proportional share has much diminished." *

In view of these conclusions we are now asked to impose a burden upon the great petroleum industry of this country, not, be it observed, for the benefit of the public at large, but entirely in the supposed interests of that section known—to employ the usual jargon—as the "toiling masses," and the ostensible reason for this is that much loss of life occurs, chiefly among the labouring class, from the use of burning oil having a low flash point.

That such a loss of life does occur is an undoubted fact, but in the explosions, fires, &c., occasioning the deplorable loss of life, there are four factors nearly always associated; they are:—

(*a*) The use of a petroleum having a low flash point.
(*b*) The use of a lamp of wholly improper and unsafe construction.
(*c*) Improper use of the lamp, *i.e.*, badly-fitting wick, turning wick into the oil when the former is alight; blowing down chimney, &c.
(*d*) General intense ignorance of the properties of petroleum and the principles of combustion on part of users.

It is of little use to describe the history of the agitation which, originating from a few newspapers of the baser sort and carefully fostered by them since, resulted in the appointment, some two years ago, of a Committee of the House of Commons to inquire into the whole question of the use of petroleum. Neither is it of much use to discuss the very voluminous and, for the most part, unreliable evidence that was given. Some scientific evidence was produced to show that the flash point should be raised, but this evidence was of a purely academic nature, and none has been produced to prove that lamp accidents occur *only because* low flash oil is used.

Of course, as a general rule, all articles of consumption should be rendered innoxious, and inasmuch as raising the flash point makes the oil safer to handle, much can be said in favour of doing so. On the other hand, we have the great fact that low flash oil is used in thousands of homes with perfect safety, and the other fact that it is only dangerous when used with a total disregard of the dictates of ordinary common-sense. Hence the question of raising the flash point *because* a low flash oil is dangerous is really a very open one upon its merits, and only to be decided in the affirmative on other grounds. The Committee have, after much deliberation and by a very narrow majority, decided to recommend the House of Commons to raise the flash point from 73° F. to 100° F. (18 C. to 30 C.). Whether the House will consent to do so remains to be seen, but if it does, will the ostensible object in view be effected, and will the general trade of the country in petroleum be prejudiced in any way? We reply to the former, No; and to the latter, Yes. To assume that these lamp accidents would be prevented by raising the flash point to 100° F. is not only a wholly unwarranted conclusion *per se*, because unsupported by evidence, but is also to put an encouragement upon carelessness and ignorance. But the great effect of raising the flash point as proposed would be far more reaching and extensive; it would mean a generally enhanced price of burning oil to the consumer and the exclusion of a most useful class of mineral oil much used in industries for other purposes than for lighting.

Thus the cost of using petroleum as liquid fuel by automobilists and others would be quite prohibitive, and the same remark applies to its use in oil motors. Users would be compelled to employ a high flash test and expensive oil when a cheaper and practically as safe an oil would be just as, indeed more, efficient. Ordinary petroleum burning oil, as now sold with the 73° flash point, would have to be classed as a mineral spirit, which it is not, and this would mean endless worry, trouble, and expense with the local authority as regards license and storage.

The present large trade in distributing a cheap and, if properly used, a safe and reliable illuminant would be curtailed and crippled; this would mean diminished employment, and so would react upon the very classes for whose benefit the alteration is to be made.

At present we obtain the bulk of our lamp-oil from the United States, and this is a fairly cheap article of commerce—it might be cheaper. American crude oil yields about 75 per cent. of burning oil. Russian oil yields not more than 30 per cent., and although this latter is more homogeneous and has a higher flash point than the former, yet it is not so suitable as the former, either as an illuminant or as a source of energy in oil motors. The effect of raising the flash point would increase the Russian production and exportation, and, therefore, the Russian revenue. Now, Russia excludes our metal ware and our coal, and has announced its intention of forbidding Russian subjects to purchase ships, &c., built in Great Britain. Why, then, should we go out of our way to take more of her products than we can help? It has been stated that Russian oil of 103° F. flash point can be placed on the home market at the same price as that now charged for American 73°. No doubt it will till such time as we legalise the 103° F. test. An "arrangement" or "working agreement" would then be entered into between the powerful oil interests of New York on one hand and those of Paris and Vienna on the other to divide or exploit the market, and maintain a standard price which would have to be higher than that now charged for 73° test oil. In other words, we should not greatly, if at all, lessen lamp accidents, but we should pay more for our oil.

Much, too, has been said about the supply of American oil being in the hands of a group of monopolists. If we raise the flash point we simply play into the hands of another group of monopolists, and we may be sure that with the British market at their feet these two groups will not quarrel much.

A small but influential competitor with these two groups of monopolists is the Scotch shale oil industry. This industry has all but been wiped out by the cheaper American products. Naturally, the Scotch Parliamentary "interest" is much impressed with the necessity of raising the flash point, and profess a really touching solicitude for the poor working-man, whose life and the lives of his family are said to be jeopardised by the "deadly 73°." If the flash point is raised, it will in effect be the same as a protective tariff to an industry. Why should we protect the Scotch shale oil industry any more than the Scotch sugar or the Lancashire cotton industries?

In conclusion, we say that no sufficient reason has been shown why the present flash point of petroleum, 73° F., should be raised to 100°. We must remember that on the Continent, especially in Germany, Austria, and France, the flash point of oil used in lamps is about 6° lower than that at present sanctioned by law in this country. Again, in France vast quantities of petrol (a mineral spirit which flashes at the freezing point or a little above) are used in motor-vehicles. Yet accidents on the Continent are exceedingly rare, and the reason why there is this immunity from such accidents as those we in this country are so familiar with, and which form such an inexhaustible mine of sensational "copy" much appreciated by the "Yellow Press," is largely because the Continental working-man is much better educated than the British working-man, the instruction that the former receives as a boy being more technical and practical than

* *Vide* Report of H.M. Consul at Stockholm.

that given in our schools. The remedy for lamp accidents is, then, not to impose an unnecessary burden upon an industry, and therefore upon the general community, but to improve the education of the workers.

The French Motor-Cab Trials.—In our present issue a very full account of these will be found. These trials are beyond question the most exhaustive and have greater scientific value than any trials of motor vehicles yet conducted. For this reason we devote so much space to them, as the data and analysis we are fortunately enabled to publish cannot fail to be of the greatest possible value to constructors and designers. For this reason, too, we are obliged to hold over many matters of lesser importance.

The Judges at the Birmingham Trials.—It would have been difficult, if not impossible, to have selected three greater authorities on automobilism than the distinguished engineers, who, with commendable discrimination, were chosen by the Council of the Royal Agricultural Society to conduct the trials of motor-vehicles at the Birmingham Agricultural Show. They were Professor W. C. Unwin, F.R.S., without exception the greatest living authority on scientific engineering, especially in its later developments; F. W. Webb, M.I.C.E., &c., of Crewe, the distinguished and successful locomotive engineer of the London and North Western Railway Company; and Bryan Donkin, Esq., M.I.M.E., &c., the well-known authority on combustion, whether in steam boilers or gas and oil engines, and in other ways a most distinguished investigator, and lot us add, a pioneer automobilist. These three gentlemen constituted a Court, to which no possible exception could be taken on any ground, of the very highest professional eminence. Their opinions on automobilism will be unhesitatingly accepted both by competitors and the public. We sincerely trust that these gentlemen will be called upon to exercise their judicial functions in future competitions and trials of motor-vehicles as their professional standing is such as to constitute the best guarantee, not only of the highest scientific and technical knowledge, but also of absolute judicial impartiality.

Boilers for Motor-Vehicles.—In our present number we give the official report of an inquiry held to determine the cause of an explosion of a Field tube in a tramcar boiler. As small boilers will be extensively used in the near future for motor-vehicle purposes, it behoves all concerned to take care that the boilers are not only of the best possible make, but that they are opened out at least once a fortnight and carefully examined by a skilled boiler-maker and worked only by a skilled fireman. In the present case no loss of life occurred, but had this boiler been less well looked after an explosion might have been attended with the gravest consequences. These small boilers deteriorate very rapidly; they are, at least those working under the Locomotives on Highways Act must be, of light scantlings, hence the factor of safety, say after a spell of prolonged service, cannot be high. On the other hand, the legal liabilities incurred by owners are very onerous, and hence too much care can hardly be taken by them. We suggest that in every case the boiler should be insured in a good company and the suggestions of inspectors rigidly carried out. We would also urge the importance of using the best procurable water, or if this be difficult, the appearance and formation of scale should be carefully watched and suitable solvents used such as would be recommended by a competent analytical chemist. Lastly, owners of steam motor-vehicles must remember that their boilers work under conditions very much more severe than obtain in the case of railway locomotive, traction, steam-ship, steam-launch, or torpedo-boat boilers. It is in this connection that we see the egregious folly of the Legislature in limiting the weight of vehicles to 3 tons, this means small and light boilers, whereas with a more liberal allowance as to weight, a much larger, stronger, and easier steaming boiler could be provided, and such a boiler would be very much safer.

Harmsworth's Magazine.—Messrs. Harmsworth are always up to date. The introduction of their *Daily Mail* was a revelation to the newspaper world. Its success must have seriously encroached upon the circulation of some of the old-established morning dailies. Their latest publication, *Harmsworth's Magazine*, sold at 3*d*., is a marvel. It is brimful of good things, and a significant sign of the times is the crisply-written short tale by Edgar Jepson, illustrated by H. R. Millar, entitled, "Their Motor-Car Elopement and How it Ended."

AUTOMOTOR VEHICLES AT BIRMINGHAM.

Second Notice.

[FROM OUR OWN CORRESPONDENT.]

When writing to include some particulars of these trials in our June issue, we left the heavy vehicles *en route* for Fazeley, the Daimler van having completed the run. We then investigated the state of the Roots and Venables van, which had been run into about a mile from Bassett's Pole by a non-competing car carrying a party witnessing the trials. The collision damaged the steering gear of the former, causing the van to run into the ditch. The incident was most regrettable for many reasons. After considerable delay the judges were "recovered" from their lunch and brought to the scene of the mishap.

In due course the van was extricated, and with some difficulty it was run back to the Pole and left in the yard of the inn. *hors de combat* for the rest of the trials. Owing to minor damages incurred during its railway journey to Sutton, it had started on its run without a load, and under the circumstances this was fortunate, as otherwise the accident might have caused more costly and extensive damages. As it was, the occupants had a severe shaking.

We then proceeded (thanks to the kindness of Mr. Grimshawe) to run out in the opposite direction to meet the heavy vehicles. Before long we met the Chiswick van running quietly and steadily, and about a mile and a half further on came upon the Leyland lorry. Having given them the road, we followed leisurely until we met the judges' wagonette, which had also come out to meet the vans. Running ahead, we soon reached Bassett's Pole again, to learn that the Chiswick van had done the run in 2 hours 29 minutes. The Leyland lorry arrived soon after, having covered the distance (13¼ miles) in 2 hours 32 minutes.

On Tuesday the crucial test of a 52-mile run was carried out. The course was as follows:—First, round the same course as on Monday; then reverse and run back for about five miles, when a detour was made so as to take Atherton and Coleshill, until the old route was touched at Wishaw, and thence back to Bassett's Pole. In this way the stretch from the Pole towards Wishaw (which for about six miles was a typical rutty, grass-grown country road) was traversed three times. By about 9.25 a.m. the Daimler and Chiswick vehicles were at the Pole, the Daimler leaving at ten minutes to 10, followed by the Chiswick van two minutes later. At 9.55 the Leyland lorry was likewise off, the rear being brought up by a goodly collection of motor-cars, motettes, and cycles. Near Atherstone one of the judges mounted the Daimler van, stopping it on steep hills and on inclines, making it run backwards up the latter, and generally testing its capabilities. It successfully achieved all the tests imposed, thus securing the first prize (£100) in the 1-ton class, after which it ran home without a hitch, covering the distance in six hours, consuming 2 gallons 6 pints of petrol, costing about 1*s*. 9*d*.

In the meantime the heavy vehicles had been coming along well. Between Atherstone and Coleshill the Leyland lorry passed the Chiswick van, the latter beginning to show some signs of distress owing to the hilliness of the route. This was particularly noticeable at Coleshill, where a long, and by no means contemptible, gradient terminates in a sharp rise, practically equal to something between 1 in 7 and 1 in 8. At this point the Chiswick van was certainly overloaded and had to be eased, but it is only fair to state that the van was built for a load of 2½ tons (which it carried at the Liverpool trials), whereas it had to take 3 tons at Birmingham. It is evident 2½ tons is its maximum load for anything like hilly districts.

In due course the two heavy machines were put through their facings on the hills and allowed to proceed. The Leyland van ran without further incident of note to Bassett's Pole in seven hours, having consumed 23¾ gallons of petroleum and evaporated 165 gallons of water, with an average speed of 8 miles per hour. It is interesting to note that it made the "inner circle" of the course 25 minutes quicker than on the previous day, while the Chiswick van took nearly 35 minutes longer, having suffered several delays.

At the Liverpool trials the Leyland lorry had a breakdown through a loose tyre, leading to a collapse of the wheel; but in answer to special inquiries on this point, we were assured that the same wheel was still on the lorry (after being duly repaired) and had carried the lorry safely to the goal which the makers coveted, viz., the £100 prize.

It was 15 minutes past 8 p.m. when the Leyland van returned to Bassett's Pole, but owing to difficulty with the hills it was considerably after 10 p.m. before the Chiswick competitor reappeared. Bearing in mind, however, the fact that it had knowingly overtaxed itself it was plucky to stick to it and run out the course, which it did in a manner that evidently satisfied the judges, who acknowledged its undoubted merits by the second prize of £50. Owing to the unexpected nature of some of the delays the actual running time could not be properly estimated, but the consumption of coal was about 8½ cwt.

Wednesday was devoted to tests, made with a view to calculating the power absorbed by the mechanical friction of the vehicles and motors, the latter being thrown out of gear, when the vehicles were run down one gradient, and a note taken of how far they ascended the next. The results of the calculations made from the data so obtained will be given in the judges' report.

Exhibits in the Show Yard.

Apart from the collection of motors in the show yard, where the Daimler, Roots and Venables, Saunderson, Leyland, and Chiswick (Thornycroft's) vehicles were shown in a group to an admiring and inquisitive crowd, there were a few exhibits of general interest to automobilists.

Messrs. W. Glover and Sons (Limited), Warwick, who are makers of liquid manure and general farm carts, were showing their patent watering van, which, in addition to being excellently made and finished (the wheels being of the gun-carriage type), is arranged to be driven with motor instead of being drawn by a horse. The body is carried on a steel frame in the front of which is neatly fitted a pair of 4 N.H.P. Daimler motors, the cooling water cylinders being in the body of the water-cart tank itself. It is capable of running at two speeds, and is altogether a shapely and capable watering cart. It is credited with 11 B.H.P. and priced at £400.

Messrs. Coulthard, of Preston, showed three small compound steam motors, distinguished by careful designing and attention to details. The lubricating arrangements have been worked out with much care, there being sight-feed cups to each part, and all being shut off by a single cock when the engine is stopped. The eccentric rod and the connecting rod are hollow, and oil is fed down through them to the eccentric and crankpins. There is a piston valve to each cylinder, and the crank races are boxed in to prevent splashing. Steam is supplied by a water-tube boiler, made by Mr. W. Sargeant, the well-known steam-launch builder and engineer, of Strand-on-the-Green, Chiswick. This boiler has 85 square feet of heating surface, and is of the same construction as that recently illustrated in THE AUTOMOTOR.*

Another exhibit of the automotor class which might easily have been overlooked by even the interested visitor, as it was not shown at the "Motor Stand (No. 502)," was a steam tipping wagon, made by Messrs. Mann and Charlesworth, Leeds. In appearance it resembles a small traction engine with a tilting-wagon body placed over the two back wheels. The latter are extra wide, mounted on springs. It is fitted with the makers' patent single eccentric reversing gear. The motive power is steam with compound engine. In addition to being used as a steam tumbril, it is capable of being employed for hauling and thrashing. It carries a load of 3 tons, and is built so as to comply with the Locomotives on Highways Act of 1896. Price £330.

The West Patent Power Tyre Setter Syndicate were showing their hydraulic tyre setters at work and collection, and steel and rubber-tyred wheels also being on view. The machine is capable of hooping wheels up to 6 feet in diameter, with tyres up to 6-inch face and 1¼-inch section. Wheels can be hooped at the rate of 25 per hour for a cost of about 1½*d.* per wheel. As no fire is needed, the tyres being fixed when cold, it is just as cheap to fix one tyre at a time as to fix 50. The accuracy and rapidity of the machine have been greatly augmented by the recent modifications in the trip gear and exhaust cock. A new form of light tyre setter for carriage builders was also shown in conjunction with an hydraulic wheel boxing press.

THE JUDGES.

F. W. WEBB, ESQ., M.C.I.C.E., M.C.I. and S.I., &c.   PROF. W. CAWTHORNE UNWIN, F.R.S., M.I.C.E., Hon. M.I.M.E.   BRYAN DONKIN, ESQ., M.I.C.E., M.I.M.E., &c.

The Oldest Steam Motor in Existence.—The oldest engine in the world is in the possession of the Birmingham Canal Navigations, this engine having been constructed by Boulton and Watt in the year 1777. The order is entered in the firm's books in that year as a single-acting beam engine, with chains at each end of a wood beam, and having the steam cylinder 32 inches in diameter with a stroke of 8 feet, and erected at the Canal Company's pumping station at Rolfe Street, Smethwick. During the present year (1898) this remarkable old engine, which has been regularly at work from the time of its erection to the current year, a period of, say, 120 years, was removed to the Canal Company's station at Ocker Hill, Tipton, there to be re-erected and preserved as a relic of what can be done by good management when dealing with machinery of undoubted quality. It is worthy of note that the Birmingham Canal Navigations favoured Boulton and Watt in 1777 with the order for this engine, and in 1898, or 120 years afterwards, the Company have entrusted the same firm, James Watt and Co., Soho, Smethwick, with the manufacture of two of their modern triple-expansion vertical engines, to be erected at the Walsall pumping station, having 240 H.P. and a pumping capacity of 12,713,000 gallons per day.

* *Vide* THE AUTOMOTOR for April.

LAW REPORTS.

British Motor Syndicate v. Universal Motor-Carriage and Cycle Company.

ON July 1st, before Mr. Justice Stirling, the hearing of this action, brought by the British Motor Syndicate (Limited) against the Universal Motor-Carriage and Cycle Company (Limited), for alleged infringement, was commenced. The hearing occupied several days.

Mr. Fletcher Moulton, Q.C., Mr. Bousfield, Q.C., and Mr. Walter appeared for the plaintiffs; Mr. Phipson Beale, Q.C., Mr. Shaw, and Mr. White appearing for defendants.

Mr. Moulton said that this action was brought by the plaintiffs, as the owners of four patents relating to motors for motor-cars, for the infringement by the defendants of these patents. He need not trouble his lordship with the fourth patent mentioned in the statement of claim. On going into the matter, plaintiffs had come to the conclusion that they could not support the claim of infringement. Therefore, his lordship might consider it as struck out. He would first deal with the Patent No. 9,112 of 1884, granted to Lawrence A. Groie on communication with Gotlieb Daimler, a German inventor. That patent had expired since the bringing of the action. As far as the damages were concerned, the rights of the plaintiffs remained unchanged; it only affected their right to an injunction. He could explain the nature of the invention very simply. It related to gas-engines, and what were called Otto gas-engines The Otto type was the first successful engine. There was a motor struck an explosion every second stroke, and the cycle was this: Starting from the moment of the explosion the piston was driven out by the effect of the explosion, and when it came to the end of its stroke it opened the exhauster. The gas was under greater pressure during the explosion. The piston returned, driving before it out of the exhauster the products of the exhaustion. It then started forward, by the motive of a fly-wheel. It went forward, creating a suction behind it, which drew in the charge for the next explosion, a mixture of air and gas. When it went to the end of its stroke, carried forward by the fly-wheel, the fly-wheel went on and drove it back, all the valves being shut. Then it compressed a mixture of air and gas, which was to give the next explosion, into the back part of the cylinder. So you had an explosion of compressed air and gas. When that took place the cycle he had been describing recommenced. His lordship would see the importance of the introduction of the principle of compression. When you raised the gas to a certain temperature it made no matter. The increase of temperature was independent of whether the gas was compressed or not. It was a very great advantage in this engine that you started with the air and gas under compression at the moment of explosion. Otto, by the introduction of this cycle, made the engine a very great success. The patent in question related solely to engines of this type. That was put quite clearly in the complete specification, and also in the claim. The next point with regard to the gas-engine to which his invention related was the question of ignition. It was necessary it should be ignited at the moment of explosion. If it had not been compressed the problem of ignition would have been easy; but as it was under compression and the cylinder was closed, there arose the difficulty of how to obtain ignition. Otto devised an ingenious gas slide. It effected ignition by moving backwards and forwards at the end of the cylinder. It had a flat face and a pocket. Just before the moment of ignition was intended to take place this little pocket got filled with air and gas, and so ignited at a small gas flame, and the handful of lighted gas was carried beside the hole it lighted into the cylinder. So a match of air and gas was applied once to every two strokes, carrying this handful of burning gas, which arrived at the hole which led into the cylinder at the right moment for making an explosion. No doubt that was a very great invention; for 14 years it practically held a monopoly, although many variations were introduced. But the gas slide, though a useful invention, had the disadvantage that the slightest scratch on the face would make it fail to light. It was a matter of great importance to get rid of this system of ignition by means of a pocketful of ignited gas. A great many suggestions were made. In 1884 Daimler made an extraordinary advance on the valves that had been used as substitutes. This invention drove out the gas slides, and almost entirely all substitutes. It was effected thus: The compression by the gas into the back stroke raised the temperature for one thing, and, of course, put it under considerable pressure. It was found that it required a body of a lower temperature to light gas when it was compressed than it did if it were not. A smaller temperature of the igniting body sufficed to cause an explosion. Daimler took advantage of this, and by means of ignition tubes he arrived at an enormous simplification. This simplification, when applied to motors for motor-carriages, was of great value. By far the largest number of gas-engines were now fitted with these ignition tubes instead of any of the other means for igniting the mixture of air and gas.

Mr. Fletcher Moulton, having dealt with the nature of explosion-engines, proceeded to deal with flame-engines. With these there was no explosion, but there was combustion. His lordship, the learned counsel said, could imagine a stream of gas and air, under pressure of 20 lbs., passing through a tube till it came to something which lit it, and ignited the cylinder. The consequence of this combustion was that there was an enormous explosion of the air and gas, on account of the air and gas generated. Supposing that these products of combustion were still kept at a pressure of 20 lbs., this explosion would mean the driving forward of the piston. In the explosion-engines you got the explosion intermittently and then drove the piston, but you could get it also by this gradual explosion in the same way. That was the distinction between flame-engines and explosion-engines. The whole beauty of Daimler's invention was getting rid of any time mechanism. This allowed compression to take place at its own time without any mechanism at all. Passing on to the next patent, 4,315 of 1885, that was again a patent of Daimler. This was a device for regulating engines. Gas-engines were very much more difficult to regulate than steam-engines. You must have everything in at the moment of explosion. Although a great number of methods had been tried to alter the richness of the mixture, the quantity of explosive charge, they did not seem to succeed. Practically the whole regulation of gas-engines depended upon what might be called a crude method of missing strokes. He did not think any method had really succeeded which graduated the effect of the strokes. These strokes were all taken on their full force, but if the engine were going a little too quickly it had a governor which made it miss strokes sometimes. These were called "hit and miss" regulators. Most engines had this hit and miss regulator, but Daimler conceived the idea of regulating, not by means of affecting the entry, or rather the inlet valve, but by indirectly affecting it through the exhauster. When the engine went too quickly he had an apparatus which locked up the exhauster. The consequence of locking it up was this: the products of combustion could not get out of the cylinder, and the consequence of that was there was always a considerable pressure in the cylinder. He left his inlet valve to work automatically by suction. When he had locked the exhauster valve there never was any suction, so it lost a stroke. This was clearly described in the claim—the method of regulating the speed of gas-engines by causing the discharge valve for the product of combustion to remain closed when the normal speed was exceeded. It did not pledge itself to any particular method of locking the exhausted valve—there would be a hundred different ways of doing that; but the invention was for preventing admission by locking the exhauster out. He did not think there was any anticipation of that claim. The third and last patent that he had to put before his lordship was 10,786 of 1885. This was another early patent by Daimler. He was the first man to conceive the idea of motor-bicycles. These motor-bicycles were now quite practicable. They were not yet largely used, but yet they were being made in fair numbers. Daimler contrived his motor machinery to fit centrally between the two wheels. The claim for infringement related to this patent combination of a vehicle having a driving and steering wheel, running on the same track, with centrally-arranged motor-engines in which was the regulator. The centre of gravity lay in a vertical plane with the wheel track. He put his engine between the central line in the way described. It appeared that it was perfectly novel to fit a motor to a bicycle. Motors fixed to bicycles must be fitted in this way. Mr. Daimler was the first person to show that it was possible to make a bicycle which had no fixed wheel base at all work with a petroleum or gas motor. With regard to the first patent, the ignition tubes, there could be no question but that there had been an infringement. Evidence of a highly technical character was then given.

Mr. John Imray said he had given a great deal of attention to gas-engines. He had also made a study of motors. The great difficulty of these engines was the question of ignition at the right moment. The first gas-engines were ignited by electricity. Then came the Otto method with the face and pocket. That was ignition by a properly-timed igniting mechanism. Another form largely used was heating a tube in connection with the cylinder. But there you had again a properly-timed mechanism. But the mechanism must move at the right time. The plaintiff's invention of 1884 was a much more simple arrangement. Whenever the compression of the charge in the cylinder was completed the contact of the gas with the heated tube was complete. When the gas and air were compressed they would ignite at a much lower temperature. This was of much use in motor-engines. The cycle referred to in the claim was of this character. He did not know of any motor bicycle before the date of the plaintiff's patents. In cross-examination he said he had seen the Daimler machines at work, and also those described in Grote's patent, and in further cross-examination the counsel made a strong point of suggesting that there was a serious discrepancy between Daimler's provisional and complete specification. Mr. Imray also gave evidence as to the anticipations of Daimler's patent, which had been relied on by defendants. Speaking of the patent 4,803 of 1878, he said that in his opinion the specification was strictly limited to the "Otto" cycle.

Mr. A. J. Bolt, the next witness, generally corroborated the evidence of the last witness. In cross-examination witness thought that the Daimler was an example of an engine which worked on the principle of spontaneous combustion, and which had no further devices than those which were shown in Grote. He also admitted that the use of the priming cap was equally applicable to any engine having compression of the explosive charge, whether on the "Otto" cycle or otherwise. Whilst being further questioned on the part played by the governor in Daimler's mechanism, Mr. Justice Stirling interposed, saying:—"The facts, as I understand, are not in dispute as to the *modus operandi*. No doubt your valves are open and theirs are shut, and the point between you must be reduced to one of law, partly in the construction of this claim and partly in the discovery of whether you are the user of an infringement." Witness further admitted that the real purpose effected by Daimler was old, and effected in a special way. He did not agree that the defendants effected their purpose in an exactly opposite way.

Mr. Harry J. Lawson, managing director of the plaintiff Company, was the next witness. In the course of his evidence he mentioned that he owned more motor-cars, he believed, than any other man in the world. He had also five motor-bicycles, and that the patents for the motor-bicycles were purchased by the plaintiffs for a large sum of money. He claimed that no one besides Daimler had successfully combined a bicycle with the arrangement as devised in the plaintiffs' patent. The question of the disposition of the parts was one of enormous importance. Daimler had been 20 years perfecting his invention.

Mr. W. Worby Beaumont, C.E., gave technical evidence corroborating the plaintiffs' claim.

The defence was then opened, the first witness called being Mr. James Swinburne, C.E. He stated that Crossley's and Atkinson's inventions appeared to him to be anticipations of Daimler's.

Mr. Anthony G. New, was carried through a very minute examination and cross-examination in respect to the ignition tube arrangement, mention being made of the Pygmee ignition arrangement.

Mr. Swinburne was recalled for cross-examination by Mr. Fletcher Moulton, Q.C.

On behalf of the defendants Mr. Shaw submitted that the plaintiffs' claim was bad. He contended that the defendants had committed no infringement. They could not have infringed a claim which had been so narrowly construed. In the first claim, the vehicle was spoken of as a bicycle, and in the second as a motor-bicycle. There could be no subject-matter in enclosing the machinery of a bicycle in a casing.

Mr. Fletcher Moulton replied very fully on behalf of the plaintiffs, and at the conclusion, on Friday last, a difference of opinion having arisen between Mr. Moulton, Mr. Shaw, and his lordship upon the construction to be placed upon some of Mr. Swinburne's evidence, before considering the entire evidence, Mr. Justice Stirling decided that he should like to have Mr. Swinburne recalled so that he might hear from him personally the meaning he really intended to convey.

The case was therefore adjourned until this week, after which his lordship will probably take some little time before delivering judgment.

Lord Galloway and the Lamina Accumulator Syndicate.

IN the Chancery Division, on the 8th inst., before Mr. Justice Kekewich, Mr. Warrington, Q.C., moved in the matter of the Lamina Accumulator Syndicate and the Lamina Accumulator Company, on behalf of the Earl of Galloway, for the appointment of a receiver. The Company were the purchasers of the assets of the Syndicate, by whom the debentures held by the Earl of Galloway were granted, and counsel said they were threatening to place a charge of £4,500 on these assets in priority to the debentures in question. A motion came before the Court originally on June 10th, and stood over on terms, in pursuance of which the Lamina Accumulator Company had paid £1,000 to the bankers for Lord Galloway's security and interest on the debentures down to June 30th; but they had made no payment in respect to the principal of the debentures, nor had they done what they were bound to do under the agreement—issue to Lord Galloway debentures in the Company in lieu of the debentures he held in the Syndicate.

Mr. Bramwell Davis, Q.C., who appeared for the Lamina Accumulator Company, said they were anxious that Lord Galloway should receive these new debentures, but they could not get the liquidation of the old Syndicate to complete the matter.

Mr. Cutler, Q.C., appeared for the Lamina Accumulator Syndicate, and said that, before completing, the liquidator required certain small accounts to be paid.

Mr. Justice Kekewich, by consent, ordered the motion to stand over for a fortnight, the Company undertaking not to create any prior charge pending the issue by them of the debentures in question.

A Motor-Car Accident Action.—Issues were ordered on June 28th by the First Division in an action in which Alex. Lang, watchmaker and jeweller, Larkhall, sues the Scottish Motor Omnibus and Car Company (Limited), 66, Cadzow Street, Hamilton, for payment of £1,000 damages in respect of personal injuries. The pursuer states that the defenders have established a constant service of motor-cars between Hamilton and Larkhall for the use and accommodation of the travelling public. On Thursday, December 23rd last, the pursuer was a passenger by one of the defenders' motor-cars run by them from Larkhall to Hamilton. When near High Merryton farm steading, the car was driven in such a manner that it suddenly swerved and was then capsized, with the result that the pursuer was thrown violently on the road and sustained serious injuries. The pursuer avers that the defenders were at fault in entrusting the charge of the car to a lad who was inexperienced and unskilled in the art of driving such a car. The defenders admit that the accident was due to the driving of the car by the lad, but they say that they appointed an experienced and qualified driver, and it was he who allowed the lad to control the car on the occasion in question. They deny liability, but in order to avoid litigation they offer the pursuer 20 shares of £1 each of the Scottish Motor Hiring Company (Limited), in full settlement of his claim.

The British Motor Company (Limited) *v.* Stokes.—In the City of London Court on June 28th Mrs. Caroline Stokes, Park Street, Southend, was sued by the plaintiffs, of 40, Holborn Viaduct, for £5, calls on shares. Mr. Aldous, for the defendant, said that the signature to the application for the shares was a forgery. The plaintiffs could only prove that the application came by post in the ordinary way. They did not know the defendant's signature. They were consequently nonsuited, and ordered to pay the defendant's costs.

The Great Horseless Carriage Company (Limited) *v.* Pallett.—The plaintiffs, of 40, Holborn Viaduct, in the City of London Court, on June 17th, before Mr. Commissioner Kerr, sued Mr. Richard E. C. Pallett, 83, Paris Street, Stoke Newington, for £17 12s. for calls on shares. The defendant objected to pay on the ground that there had been fraudulent misrepresentation on the part of the directors. This was denied by the solicitor for the plaintiffs. As a similar point bad been raised in the High Court in a case which was going to the Court of Appeal, this action was adjourned.

The Great Horseless Carriage Company (Limited) *v.* Flanagan.—In the Queen's Bench Division (Dublin), before Mr. Justice Gibson, Mr. M'Auley (instructed by Messrs. Maguire anp Riordan, Belfast) applied on behalf of Mr. Patrick Flanagan, who resides in Belfast, for leave to put in a special rejoinder to plaintiffs' reply. The action is for £215 for calls on shares A defence was put in alleging that the defendant was misled by the prospectus, which he stated was false and fraudulent. The plaintiff's reply stated that the Company had been wound up, and that consequently the defendant could not rely upon these alleged fraudulent particulars in an action for unpaid calls. Mr. Justice Gibson asked if the action was brought by the liquidator. Mr. M'Auley replied that it had been brought by the Company alone. The liquidator did not appear in it until the delivery of the reply, and the defendant wanted to plead that this winding up was only part of the swindle. Mr. Justice Gibson said he would not like to give leave *ex parte*, but he would allow the defendant to serve a short notice. Counsel, however, should reflect as to what form the notice would assume, and meditate anxiously over the views of the House of Lords in Derry *v.* Peek.

Police Court Proceedings.

The Motor-Vehicle and the Horse.—Before the Milverton Bench, on June 22nd, John Sharpe, Grosvenor Street, Coventry, and Frederick Henry de Veulle, engineer, of Coventry, were summoned by Alfred Shuttleworth, coachman, Kenilworth, for driving a light locomotive at Stoneleigh at a greater speed than 12 miles. Mr. Masser explained that complainant was a coachman in the employ of Mr. Charles Stringer, Park Hill, Kenilworth. On June 9th he was exercising one of his master's horses along the turf on the side of the road from Coventry to Kenilworth, when at the bottom of Burnt Post Hill, between there and Gibbet Hill, he heard the noise of a motor-car behind him, and the loud blowing of a horn. He looked round and saw a motor-car coming in the middle of the road at the rate of from 17 or 18 miles an hour. The horse became restive, and got into the road, while the motor-car came on, and ran into the horse's legs. The legs of the horse were badly injured, and the wheel of the motor-car was buckled. The horse succeeded in getting its legs out of the machine, and bolted, but was shortly afterwards pulled up by the complainant. Mr. Maddocks, in defence, dwelt upon the prejudice that existed against motor-cars, but urged they had as much right to the road as a horse, so long as they did not exceed the regulations. He pointed out that the complainant never raised his hand for the motor-car to stop, and that the horn was blown 60 or 70 yards before the motor-car came up, so that there was ample time for the rider of the horse to give warning if he wished to do so. As to the question of speed, he would like to know where it was that the motor-car was going too fast. Was it when 60 or 70 yards away from the horse, or at the time of impact? Had it been at the time of the impact the consequences must have been much more serious to the horse and to the persons on the car. As to anyone judging the pace of a machine coming on at a distance of 60 yards, it was absolutely ridiculous. After further evidence, the Bench decided that the car was going at more than 12 miles an hour. Defendant was fined £2, including costs. The case against Sharpe was withdrawn.

Not Proven.—William Brown, motor-car driver, and Richard Ashley, engineer, were charged, on June 25th, at Hamilton Police Court (Glasgow), with furiously driving a motor car, whereby it overturned on the Haughhead Brae, and nine persons were injured. On the motion of Mr. Miller, respondents' agent, trials were separated, and Ashley was placed at the bar. After evidence, Sheriff Davidson dismissed the case, holding that the accident was due to displacement of gearing, which, he suspected, was caused by excessive speed, but this had not been proved. The charge against Brown was withdrawn.

Driving Without a License.—At the Burgh Police Court (Dunoon) on June 22nd, Daniel MacPhun, motor-car proprietor, Sandbank, was charged with running a motor-car for hire between Dunoon and Sandbank on Thursday, June 16th, while the said car was not licensed for passengers by the magistrates, contrary to Section 272 of the Burgh Police (Scotland) Act. Objection was taken to the relevancy of the summons, and after Provost Doig and Mr. Cleery, the assessor, had retired to consider the point raised, it was intimated that in order to make the charge relevant, Section 270 of the Act should also have been quoted. The Burgh Prosecutor craved a case. At the Court held for the licensing of hackney carriages and stage coaches, MacPhun refused to accept his license because a condition was attached that he should not be allowed to run his car along Argyll Street but start from the Burgh Buildings. Thomas Wilkinson, the driver of the car, was fined *7s. 6d.* for driving without a license.

Not Guilty, yet has to pay Costs.—Before the Thorpe justices on June 20th, John Block, foreman fitter in the employ of the Motor-Van and Motor-Car Company, was summoned for illegally driving a motor-car at such a pace as to endanger the public safety, at Clacton-on-Sea. It was alleged that defendant drove the car round the corner of Pallister and Station Roads at a dangerous pace, knocking down a labourer named Chaplin, who was considerably bruised, and had to be medically attended. Defendant did not slacken the pace when rounding the corner. Mr. Prior, for the defence, contended that the man Chaplin stepped in the way of the vehicle, which was being driven by a skilful and experienced hand, at the rate of six miles an hour. Chaplin was in a dazed condition through drink, and it was due to his own negligence that he was injured. Having heard the evidence, the Bench dismissed the case on payment of the costs, £1 *0s. 6d.*

Alleged Furious Driving.—At the Southwark Police Court, on the 9th inst., Mr. Walter Charles Bersey, Manager of the London Electrical Cab Company (Limited), of Judson Street, Lambeth, was summoned before Mr. Fenwick to produce the driver of a motor-cab, numbered 17,070, to answer a charge of furious and wanton driving. Mr. H. E. Edmunds, solicitor to the Cabmen's Union, appeared on behalf of the driver, Charles Walter Evans, badge 31. Waterman, 291 M, gave evidence that just before midnight on the 20th of June the defendant Evans drove over London Bridge to the South Eastern Railway Station, and that he went up the railway approach at a rate of from 12 to 14 miles an hour. A man was nearly run over at the crossing, and the witness signalled the driver to stop, but he refused to do so until he returned from the station into the street. When told he would be reported he said the witness must be "hard up for a job." Mr. Fenwick adjourned the case for the attendance of a witness, but would first hear the defendant's witnesses, to save the expense of bringing them again. Thomas Nugent, instructor at the electrical yard, said it was impossible for the cab in question to go more than 8 miles an hour, and as a matter of fact it broke down on the return journey. Wm. Randall said it was the slowest cab out of the 16. The hearing was adjourned.

A Mischievous System of Business.—On the 6th inst., at Guildhall Police Court, before Mr. Alderman Alliston, Edward Alexander Bremner, 31, clerk, giving an address in Eaton Terrace, St. John's Wood, was charged with stealing cheques belonging to his employers, the Motor Manufacturing Company (Limited), Holborn Viaduct, to the amount of about £63, and forging them. It was stated that it was part of prisoner's duty to fill up cheques for signature. Those in respect of which he was charged were payable to Messrs. Robbins and Sons, of Bristol. It was alleged that he forged them and opened an account in the name of Robbins at the Bank of Great Britain, St. Andrew's Hill, giving a false address and a fictitious reference. Mr. Wilkinson, a clerk from the bank, said he believed inquiries were made in the usual way. The Alderman.—Yours is a most mischievous system of conducting business, and open to fraud. You allow this man to open an account with you without getting a proper reference or a proper address. After a short remand the prisoner was committed for trial.

Bankruptcy Court.

Re W. D. RAMSAY.—This was a sitting before Mr. Registrar Brougham, on June 24th, for public examination. The debtor, described as of Cornwall Road, Westbourne Park, stated that he was formerly an explorer, then a butcher, afterwards a hosier, and finally a general commission agent. For some years prior to 1877 he was prospecting and gold mining in New Zealand and Northern Queensland. In 1896 he formed a company, which was registered with a capital of £60,000, under the style of Ramsay's Horse, Carriage, Cycle, and Motor-Car Repository, but as only £350 was subscribed the company did not go to allotment. The accounts, recently filed, showed unsecured debts £683 10*s.*, and debts fully secured £2,000, with assets nil.—Further time being required by the Official

Receiver for the examination of the accounts, the examination was adjourned.

Re ALBERT SMITH.—A sitting of the London Bankruptcy Court was held on June 21st, before Mr. Registrar Linklater, for the public examination of Albert Smith, company promoter, 38 and 39, Parliament Street, Westminster. The accounts presented by the bankrupt show ranking liabilities, £1,194 4*s.*, and assets, "Cash, 12*s.* 11*d.*" Replying to Mr. Pope, the bankrupt said that in March, 1896, he assisted in the promotion of the Peerless Metal Company, and in addition to being appointed as secretary, he received £1,000 cash and £7,000 in shares for his services. He subsequently transferred all the shares to Mr. Wm. Mills, who had provided the funds for the flotation. Then, in June, 1897, they attempted to promote the Peerless Metal and Martino (Limited), the idea being to amalgamate the Peerless Metal Company with a Birmingham business carried on by Messrs. Martino and Son. That flotation fell through, the subscriptions being insufficient to justify proceeding to allotment. The examination was eventually ordered to be concluded.

NEW BATTERY FOR IGNITION AND SPARK COILS.

MESSRS. SHIPPEY BROTHERS, of 13, King Street, Cheapside, are placing on the market a "new type of copper oxide battery," which has been designed by Professor Gordon for oil and gas motor work. The outer jar is a "spun steel shell," enamelled by a special process and very light in weight. The motor-type measures 4½" × 6". The cell is fitted with a compound composition cover, making it nearly watertight, and being insulated from the generating elements by insulating washers fitted both above and below a metallic perforated cylinder which contains the copper element, and around which is placed a zinc cylinder, connection being made by a stout copper wire passing through an insulation bushing on the cover; the copper connection is made by a metal rod which suspends the perforated cylinder, which is furnished with a phosphor-bronze thumbscrew connector. The chief claims for the "Gordon Battery" are (1) long life; (2) high efficiency; (3) economy in cost; (4) absolutely non-freezing; (5) labour saving; (6) low internal resistance; (7) freedom from local action and freedom from gaseous odours. The construction of the cell is strong and simple, and it seems well adapted for its purpose. It furnishes a comparatively large current, which is nearly constant. It is claimed that its life is 120 ampère hours for one charge of the exciting materials, which consist of copper, zinc, and "electro sodium." A sample of this interesting cell has been submitted to us for inspection, and we shall report upon its capabilities in our next issue.

THE DUCHESSE D'UZÉS: THE FIRST "CHAUFFEUSE" IN FRANCE.

(From *La France Automobile.*)

THIS great lady, free from all those prejudices of caste which annihilate many qualifications and caprices, the Duchesse d'Uzés is a type very uncommon at our end of the century. She has passed before the Prefect of Police an examination which has made her the first *chauffeuse* in France, and that is a title which she has added to all those by which public attention already signalled her out. The heroines of Fronde that Cousin loved so much had not more courage than this good Frenchwoman, who undertakes all kinds of generous or benevolent works. And charity has not a more indefatigable zealot than this Parisian, whose hotel in the Avenue des Champs Elysées is known to all the unfortunate. And Diana herself was not fonder of hunting than this sportswoman, who perpetuated the complete traditions of hunting last year at the Castle of Bonelles. But she is, above all, an artist, for the pursuit of which neither politics, benevolence, nor sport has sufficient power to keep her during her moments of leisure; she writes, paints, sculptures, with an astonishing talent, under the pseudonym of "Manuela," and, in short, it is to these intellectual pursuits that this admirable *chauffeuse* adds the sweetest and less deceptive dreams.

Madame Anne de Rocheshouart Mortemart is a Parisian of Paris. From her father she inherits that old blue blood which, so says Xavier de Montépin, gave them the right to keep their heads covered in the presence of the King; on her mother's side she belongs to the rich commoners of Cliquot; she is also much interested in the poor through Louise Michel, who is her friend. At 19 she married the Duc Emanuel d'Uzés, who was a representative of the Assemblée Nationale, and who left her a widow at 30. Her eldest son, Duc Jacques d'Uzés, died several years ago in bravely exploring the Congo. She has another son, who is heir to the old de Crussol family, descendants of the notary Géraud Bastet, and two daughters, who are the wives of the Ducs de Luynes and do Brissac.

The Duchesse d'Uzés, interviewed by an editor of *Gil Blas* on the subject of automobile locomotion, is reported to say:—

"I am astonished to see the stir that has been made about this thing, which is so simple in itself. For more than six months I have been in possession of an automobile carriage, of which I will not mention the stamp, so that none can reproach me with pushing forward my builder, with whom I am quite content. Now, you know, one cannot conduct a vehicle to Paris without having passed a difficult examination; it is true that a large number of *chauffeuses* make game of the police arrangements, but they expose themselves

MADAME LA DUCHESSE D'UZÉS.

to disappointments that I should not care to incur. Allow me, moreover, to remark, in passing, that in spite of all, I shall not have the right to go out with my carriage for a fortnight, until I am in possession of the parchment authorising me to do so. What are my impressions, you ask me? They are delicious. At first it was the pace that pleased me, to pass quickly, quickly all other carriages sufficiently adroitly so as not to touch, then also the pleasure of being able to run along beautiful provincial roads, between avenues of trees of different perfumes which accord sensations calculated to give pleasure to artistic souls who adore nature. And I assure you that all these ideas gave me strength and the necessary coolness to carry through my examination, which seemed too short, much too short. In conclusion I tell you that my example will be followed, I am convinced, by the greater number of the aristocratic Parisian ladies."

We regret to add that this estimable lady has lately been fined for furious driving in Paris.

The Northumberland Agricultural Society's Show.—A parade of motor-vehicles took place at this Society's Show, held in Newcastle on the 13th, 14th, and 15th of this month. Messrs. Toward and Company's No. 1 steam-car, which ran at Liverpool, was present, as also were a steam delivery van and steam tractor by the same firm. Messrs. Atkinson and Philipson's No. 4 steam wagonette also took part, and one or two Daimler cars helped to make a fair show. We intend giving a full description of Messrs. Toward and Co.'s steam tractor in one of our early issues.

COUNTRY ROADS.*

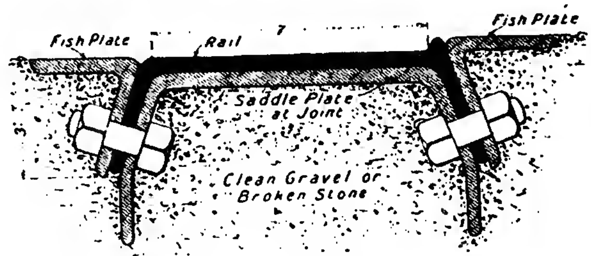
One class of work which promises to give an ever-widening field for the work and study of the engineer is that of improving the means of transportation in the country districts, and it is the object of this paper to review briefly some of the possible improvements. In the first place, the country roads demand attention. You are all, no doubt, well aware of the necessity for a general improvement in this direction, and those who have had personal experience in the matter are also aware of the difficulties encountered in getting such improvements started and carried out in a proper manner. These difficulties arise, to a great extent, from the cost of the proposed works. In fact, the "good roads" movement has suffered in some respects from too much zeal and enthusiasm on the part of many of its advocates, who insist upon a uniform standard of excellence and the highest class of construction, overlooking economic considerations and local conditions. Special emphasis has been laid upon the advantages of stone roads, and various arguments have been presented to show their advantages over other types of construction. Stone roads are excellent in their way and in their place, but there are many localities where the expense would be almost prohibitive, and would not be warranted by the amount of traffic to be accommodated.

It does not follow that good roads cannot be built in such places. Suppose yourself to be in charge of a district where a movement is started in favour of getting something better than the common country road, which is dirty in summer, muddy in the spring and autumn, and comfortably passable only when well paved with packed and frozen snow. Bearing in mind the traffic on the roads, you prepare plans for a system of stone roads, and also prepare a statement of the advantages of such roads, their durability, the easy traction over them, and the small expense required for maintenance. The local authorities, perhaps, simply refuse to consider any such proposition. They will not, and perhaps they cannot, find the means, and they may even hint that the proposition is unreasonable or impractical. You may be satisfied in your own mind that your arguments and estimates are well founded, but the fact remains that you cannot carry your plans into execution. Are you therefore to abandon your work on the ground that it is stone roads or nothing? Not at all, for here comes in that principle of economics which is at the base of many good engineering works, namely, "Do the best that can be done under the existing or limiting conditions."

You look around and consider the available materials, the traffic, and the expenditures which the authorities will be willing to make. Stone suitable for road work—and this does not include every kind of stone—may be obtainable only at a great distance and high cost. Furnace slag may be obtainable at less cost. Gravel of some kind may be near at hand, or clay suitable for burning. Perhaps you can afford to put up a plant to wash the gravel, and so get an excellent material. Or it may be that you cannot get, or afford to get, anything better than the dirt used on the roads whose condition it is desired to improve. Under any of these conditions the engineer will rise to the occasion, and if he cannot get what he considers the best material, he will do his best with such material as he can get. And it must be remembered that fairly good roads can be made with earth or dirt, if they are built with proper care, and then properly and continually maintained. If the farmers and country people in general could be roused to the extent of building good dirt roads, they would probably be surprised at the satisfactory results obtained at small expense. Ample drainage and careful maintenance are necessary, and where a district provides good dirt roads it will usually be found advantageous to employ specially instructed men to give regular attention to the maintenance of the roads.

This question of maintenance is one which must be taken into account with any character of road, no style of construction being sufficiently permanent to admit of its being left to take care of itself. Whether built of hard stone, soft dirt, or any intermediate character of material, it will eventually wear into ruts and holes, the time depending upon the quality of the material and construction and the amount of the traffic. When once such ruts or holes have been formed the deterioration of the road will proceed rapidly, unless repairs are promptly made. In reconstructing roads, improvements in the grades and alignment may often be introduced, as in railway reconstruction. The roads should be planned and laid out by an engineer, built by contract, or by day labour under the direct supervision of the engineer, and then cared for by a permanent gang of men properly instructed and employed solely for this purpose, under the direction of the engineer. The expense of such maintenance need not be great, and would result in continually keeping up much better roads than if the roads were left to wear out until they got in such condition as to make it necessary to dump cart-loads of dirt or gravel to fill holes and low spots.

The next consideration is the use of steel rails along the country roads to facilitate wagon traction and reduce the wear of the roads. Two different types of steel rail construction have been designed for this purpose; in the first the rails resemble rolled joists, with the top flange slightly concave, and in the second they are of inverted trough section. Both are merely theoretical as yet, though the trough rails are in experimental use. The H rails, as proposed, are about 4½ inches high and 3½ inches wide, weighing 24 lbs. per yard, and these would be connected at intervals by tie rods or bars to maintain the gauge. The cost is estimated at about 1,000 dollars —£200—per mile for the metal, exclusive of the macadam or gravel roadbed in which it is proposed to embed the rails. In the other plan the rails are inverted troughs, with a flat top and flat sides, a rib or bead along the outer side of the top serving to guide the wheels. The joints are of special form, with inside saddles and outside splice bars having their ends inclined so as to bring wheels upon the rails. The light type will require about 50 tons of metal, and cost 1,000 dollars—£200—per mile; the heavier 2,000 dollars to 3,500 dollars—£400 to £700—per mile. In addition to this there is the cost of grading and track laying. A short stretch of track of this kind was laid in 1896 in a dirt road near Joliet, with 4 inches of gravel between the rails, and this has lasted well under heavy traffic, including traction engines. Travel on this was easy at a time when other roads were almost impassable.



Very high claims have been made for reduction of traction and increase of loads with such track, but it is not safe to estimate on more than double the load which a horse can draw on fairly good macadam, or perhaps three times the load on a fairly level road. The character of the traffic must of course be taken into account, the advantages of such a trackway being most evident where the road has a continued and heavy traffic. It is questioned also whether it would have any special advantages over a well-built macadam road, except where specially heavy hauling is done, or where the gravel or stone wears out rapidly. It is evident that a good foundation must be provided to keep the rails in proper surface, and the heaving of the ground by frost must be taken into consideration.

In this connection reference may be made to the plan tried near Monmouth, of laying a strip of brick paving on a dirt road. The paving is a single course of brick, 7 feet wide, on 6 inches of sand, held in place by wooden curbs and stakes, while on each side of the paving is about 30 inches of the broken limestone used for macadam roads in that district, harder stone not being available. The cost was about £800 per mile, as compared with £740 for macadam 9 feet wide. In view of the easier traction on the brick, it has been suggested that a still cheaper arrangement could be made by laying two brick trackways 20 inches wide and 3 feet 6 inches apart, embedded in 8 inches of macadam. Either of these systems is applicable to suburban as well as country roads.

So far the subjects considered have referred only to means for improving the ordinary methods of transportation by wagons and carriages; this, however, is not the limit of possibilities in the improvement of transportation.

In many localities there exist some special traffic which may be developed by improved transportation, and, if private interests take up such a matter, the engineer may be called in to advise upon the

* Excerpt of a paper read by Mr. E. E. Russell Tratman, C.E., at the annual meeting of the Illinois Society of Engineers and Surveyors held at Peoria, U.S.A.

best means of transportation. Such special traffic may come from mills, factories, large farms, &c., and the provision for this traffic will include provision for the general local traffic of the district, which, while unimportant in itself, may form a valuable addition to the general receipts. In suburban and country districts, where there is considerable passenger traffic, this may be developed by means of regular lines of omnibuses or motor-carriages operated by steam, oil, or electricity, running between different towns and villages and neighbouring railway stations. In other districts a heavy traffic in raw material and manufactured or agricultural products may be greatly facilitated and economically handled by means of traction engines. Neither of these methods of transportation, however, has as yet received much attention in this country, at least for general traffic purposes, owing largely to the average poor condition of our roads.

The next step to which reference will be made is that of building a railway or a tramway. The former has the smaller scope for developing the purely local traffic of a country district, and is not in general a safe thing for small interests to handle. It is apt to be an uneconomical investment if operated in the usual manner with an infrequent service of ordinary locomotives hauling trains of cars. On country branches or feeder lines, however, a step towards greater economy and efficiency may be made by introducing light steam-cars, with engine and car combined, and giving a better and more liberal service.

The character of line which is specially adapted to the requirements of the freight and passenger traffic of a country district is the tramway, following the main road in general, but cutting across country when desirable, and stopping at any house, farm, factory, or road-crossing to take up or set down passengers, parcels, and general freight. The capabilities of such a line are almost unlimited. Lines of this character are already very numerous and their number is steadily increasing. With this increase comes an improvement in the construction and equipment, due partly to the requirements for increased speed. By far the majority of such lines are operated by electricity on the overhead wire system, but independent motor-cars, operated by steam, compressed air, gas, oil, or storage batteries, or a combination of these, are in use to some extent and have the advantage of requiring no power plant, except for compressed air and batteries, though the latter may be charged at some existing station.

Where the line is built upon the highway it is essential that the rails should offer as little obstruction as possible to the wheels of ordinary vehicles, while at the same time sufficient clearance must be left for the flanges of the wheels. The rails may be of the regular flange or railway section, or of girder section, from 56 lbs. to 85 lbs. per yard, but the tendency is to use heavier rails than those used on steam railways in proportion to the weight of rolling stock and amount of traffic. On many of the smaller lines the cars are small and light, carried on four wheels, but on lines with heavy traffic and high speeds there are large cars with four-wheel bogie trucks. With the high speeds employed on some of these lines special care must be given to the sharp curves which are often necessary, and on one line a right angle curve of 40 feet radius has the ends eased off to 200 feet radius at the tangent points, the transition being made in a distance of 15 feet.

In laying out a line of this character attention should be given to the possibility of improving the grades and curves of the highway during the construction of the line, and also to the possibility of avoiding circuitous routes and bad grades by buying right of way on an improved location, taking care not to lose chances of local traffic merely to shorten the route. Bridges and viaducts will often be required, and may be of wood or steel according to the location and the cost, but care should be taken to have thoroughly safe and substantial structures.

A New Club.—As will be seen from an announcement we make elsewhere, a new Club is in process of formation in South London for, *inter alia*, the discussion of subjects relating to automobilism. A strong committee has been formed, and we understand that numerous applications for membership are coming in. As its name indicates, the Club is mainly composed of foremen engineers, draftsmen, and others engaged in the actual construction and working of motor-vehicles. Such a Club will be able to do a great deal of good in perfecting designs and popularising the movement. At present it is in able hands and we wish it every success.

Ha hirdetök irják kérunk a "THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL" gondolni.

OBITUARY.

MR. JOHN PHILIPSON.

WE regret to record the death of this eminent coachbuilder, which took place on the 24th ult., at his residence in Newcastle-on-Tyne. The deceased gentleman was the senior partner in the firm of Atkinson and Philipson, Newcastle, one of the most important firms of carriage builders in Great Britain. Mr. Philipson was born in Newcastle in 1832, and was educated locally. He was apprenticed to his father and served his time at the bench as a practical body and carriage maker, going for further experience to London, to the firm of Messrs. Briggs and Co. About 30 years ago he succeeded his father, George Hare Philipson, J.P., in the business. During a remarkably active life he was associated with the principal literary and scientific societies in the North of England. As an inventor he added in a practical manner to improved construction, and his services were in constant demand at several international exhibitions. He was made an honorary member of the Carriage Builders' National Association, and was nominated as President of the Institute of British Carriage Manufacturers for the year 1895. He worked very hard and indefatigably to secure the abolition of the carriage tax. His efforts were highly appreciated by everybody connected with the coach-building industry, and on January 22nd, 1891, his labours in this direction were recognised in a handsome illuminated address, which at that time was presented to him by his friends. The address was accompanied by a cheque. The presentation was made at the annual meeting of the Institute of British Carriage Manufacturers, at the Hall, Baker Street, London. Mr. Edward Rogers, of Bristol, was in the chair. The address stated that the testimonial had been subscribed by representatives of the British carriage-building industry and its accessory trades, "as a mark of our appreciation of your exertions in promoting the interests of the industry in the matter of the repeal of the carriage tax, and which, although not entirely successful in obtaining the total repeal of the tax, have contributed largely to secure the important modifications which have been obtained." The address proceeded: "The agitation of the repeal of the tax, which commenced upwards of 40 years ago in your own city of Newcastle, has at your hands, by the energy and impetus you have given to the movement, and by your large expenditure of time and money in promoting the work, been brought, in its entirety, nearly to a successful issue."

Mr. Philipson was a J.P. for Newcastle, and much esteemed as a magistrate. He leaves a large circle of friends to mourn his loss. We might mention, in conclusion, that the deceased gentleman took a great interest in automobilism; and, although not believing in the total suppression of the horse, he recognised that for, at any rate, purely commercial purposes, the motor-vehicle would surely displace the horse-drawn one.

NOTES OF THE MONTH.

AN interesting series of articles on the petroleum industry is appearing in *Knowledge*, from the peu of Mr. Geo. T. Holloway, F.I.C.

M. ALEX. T. HOLLINGSWORTH, the managing director of *Engineering*, has joined the board of Weldon's (Limited), the well-known proprietors of various journals devoted to female interests.

IT is stated that a contract has been given to the Gloucester Railway Carriage and Wagon Company (Limited), by the London Electrical Cab Company (Limited), of Lambeth, for the building of a number of their cabs.

The Deutsche Gold and Silberscheide Anstalt of Frankfort-am-Main, in conjunction with Messrs. Brown, Boveri, and Co., of Baden, are reported to have decided on the construction of large works in Germany for the production of calcium carbide.

THE *Machinery Market* contains in its July number not only an excellent article on the acetylene gas industry, but also gives an equally excellent plate photograph and biography of Professor V. Lewes, R.N., the well known chemist, and the introducer of calcium carbide to this country. Professor Lewes may, with strict truth, be regarded as the father of the industry.

SOME coal cars, each capable of holding 80,000 lbs. (about 36 tons), have recently been built for the Illinois Central Railroad. Each car measures 38 feet 6 inches over end sills, its inside dimensions being 35′ 7″ × 9′ 4″ × 3′ 6½″ high. It runs on two four-wheel bogies, the wheels being 33 inches in diameter, whilst the axle journals are 5 inches in diameter by 9 inches long.

THE *Austral Wheel* for May contains an account of a remarkable motor-cycle owned by Messrs. Suttou Brothers, and which "has just accomplished 400 miles on four gallons of oil." We should like to see that motor. According to the best French practice, the consumption of spirit (gasoline, petrol, or naphtha) is about ·8 pint per mile, and hence a run of 400 miles would require at least 40 gallons.

MR. WALTER C. BERSEY was married to Miss Christina Mackenzie on the 6th inst., at South Hackney Church. After the ceremony the guests were conveyed in about 25 electric cabs to the Hotel Cecil for refreshments and the reception. The bride and bridegroom, however, preferred the ordinary pair-horse brougham. Needless to say the occasion was quite a gala day for South Hackney.

WE notice that the Yarmouth fly-drivers are making energetic but futile efforts to prevent the encroachment of the motor-vehicle upon what they consider their own preserves; as "heavy ratepayers and large employers of labour," they, of course, want to stifle all competition, and allege all sorts of dangers as likely to arise if the hated motor-vehicle is permitted to ply for hire in that select paradise of the cheap tripper.

THE first motor-vehicle mail service between different towns was started in Scotland in the middle of last month. A motor-vehicle has been substituted for a mail-gig between Inveraray, the county town of Argyllshire, and Ardrishaig, a flourishing township on Loch Fyne, at the entrance to the Crinan Canal. The distance between the places is about 25 miles, and there are four postal hamlets to call at on the way. The vehicle travels at the rate of 10 miles au hour.

THE largest locomotive in the world is, observes M. Henri de Parville, the "Giant," of French type, on the Mallet compound articulated system, that was constructed by the Belgian State Railway Administration for the sharp gradients near Liége, having been shown at the Brussels Exhibition of last year. This engine, carried by six pairs of wheels, weighs in running order 108,000 kilos. = 106 tons, which weight is entirely utilised for adhesion; but the arrangement is such that each pair of wheels only loads the rails with 18,000 kilos. = 17¾ tons.

THE Londou Road Car Company have placed upon the route from Hammersmith to King's Cross a new omuibus with wheels which have been fitted with roller bearings, as supplied by the Roller Bearings Company, of Westminster. The hubs are of iron, into the sockets of which wooden spokes are driven, and the bearings, consisting of a series of steel rollers controlled and prevented from cross winding by a bronze cage, enable the car to be moved easily by one man. A uoticeable feature of bearings of this class is the great reductiou effected on the starting resistance, an important matter in an omnibus or tramcar.

THE motor-vehicle is sufficiently an article of public convenience to be recognised by dramatists. Lately, at a certain transpontine theatre well known for its powerful and thrilling tragedies, the villain, instead of "dissembling" in the orthodox way and escapiug in his victim's carriage, brings on his own motor-vehicle, which he conveniently keeps in the back garden. After accomplishing his fell designs against the virtuous daughter of his benefactor, he escapes on his motor-car. Recently, too, in Paris at the Varieties a real motor was driven round the stage in the "Tour du Bois," and amidst great applause.

THE noise and also the disagreeable odour of gas and petroleum engines have, it is reported, been suppressed in a very satisfactory degree by M. Chevalet, who places inside of, or on the top of, the cast-iron chamber in which the products of the explosion are generally received a few scrubber rings, such as are used in gasworks. A considerable diminutiou of the noise was effected by a scrubber 40 cm. (15¾ inches) diameter placed over a 3½ H.P. petroleum-engine, and also upon a 1 H.P. gas-engine. With the latter class of motors it is not necessary to sprinkle with oil the shavings ou the plates of the scrubber, but with a petroleum-engine this precaution should be taken. Disagreeable odour is thus almost completely suppressed, if a naturally inodorous oil be used for the sprinkling; and this oil may serve for lubrication, after having been freed, by settlement or decantation or by filtering, from the solid matter which it may have drawn along when traversing the plates and shavings of the scrubber, &c.

CYCLING as a "sport" is exhausted and ceases to attract, for the simple reason that a bent-backed man clothed iu curious garb running round and round on a track is uot of itself an exciting thing, neither does it prove anything of use. It moreover encourages a low class of gambling. Still, those who are interested in promoting "contests"—races, records, and other childish delights, dear to the heart of the average cyclist, cannot afford to see their "sport," as they call it, languish, and so they have hit upon a novel and distinctly elevating source of attraction, viz., the slaughtering of live oxen in the "grounds." Thus, at a recent cycle meet at Wood Green, two professional gentlemen, Messrs. Paul Tetzel, of Chicago, and Edward Harper, of London, competed for the international beef-dressing championship aud £400. Over 2,000 spectators witnessed the contest. The American proved the winuer, dressing a couple of bullocks, fit to be placed on the market, in 18 m. 33 s. Harper occupied 22 m. 22 s. to do the same amount of work. We shall now have to keep note of our kindred sport of beef-dressing. This exhilarating pastime, says the *Scottish Wheel*, cau be cordially recommended to the notice of our cycling clubs who wish to introduce novel features into their club fixtures.

IT is, however, satisfactory to note that this disgusting, brutalising, and outrageous spectacle is not likely to be repeated, as it is in itself illegal. But to think that at the end of this nineteenth century such an exhibition should be possible in order to attract visitors to a cycle show is in itself striking evidence of the innate brutality of the mob. We wax virtuously indignant at the horrors of the Spanish bull ring and the callousness of the Latin people to animal suffering, but are these latter any worse than those "2,000 spectators" at Wood Green who witnessed the slaughtering contest?

WALSALL is an interesting town, the inhabitants whereof are much addicted to the manufacture of saddlery and other things used by horses. It rejoices, or rather did, in being represented in Parliament by Mr. Sydney Gedge, a shining light of no mean order. Mr. Gedge, as befits one in his position who has been converted from the worship of the horse to that other belief which sees commercial salvation for the country in the motor-vehicle, naturally is zealous on behalf of the latter, and so presided at the lunch given by Mr. H. J. Lawson lately at the Whitehall Rooms. Walsall is indignant and sorrowful; its confidence has been abused. It is not as though an enemy had done this thing, but their own guide, their own familiar friend and representative, to thus in effect depreciate a native industry and help on the cause of automobilism is too bad. The outraged feeling of the free and independent voters of Walsall is finding free expression in the local Press.

As many inquiries reach us as to the price of petroleum, we give the following quotations recently received by the London County Council from various firms. The Council specified for the supply of petroleum illuminating oil having a flash point of not less than 105° F. (Abel test):—Middleton Bros., 3⅝*d.* and 5⅛*d.* a gallon; Anglo-Caucasian Oil Company (Limited), 3⅞*d.* a gallon; Young's Paraffin Light and Mineral Oil Company (Limited), 4½*d.* a gallon; Mineral Oils Corporations (Limited), 4½*d.* a gallon; Pinchin, Johnson, and Co., 5*d.* a gallon; T. Walton and Co., 5¼*d.* a gallon; J. F. Percival and the Kerosene Company (Limited), 5⅜*d.* a gallon; Livett Frank and Son, 5½*d.* a gallon; and R. W. Medhurst, 7½*d.* a gallon. The chemist of the Council who examined the samples submitted with the tenders, reported that the sample of the oil sent in by Young's Paraffin Light and Mineral Oil Company (Limited) had a flashing point of 128° F. (Abel test), and that the oil appeared to be the safest of those offered to the Council. The lower priced samples did not possess the flashing point stipulated for. Under these circumstances the tender of Young's Paraffin Light and Mineral Oil Company (Limited), for the supply of petroleum oil at 4½*d.* a gallon for one year from July 1st, 1898, to June 30th, 1899, was accepted.

Worm-gearing for Electrical Motor-Vehicles.—The advantages claimed for worm-gearing, as opposed to spur-gearing, are:—(1) That the former allows the use of high-speed, and therefore lighter and cheaper, motors; (2) the motor can be at a distance from its driven axle, on which only the weight of the worm and gear need bear directly; in the case of a double truck, the motor driving one axle can be supported on springs over the other axle; (3) the saving in cost on the smaller motor would allow of wrought-iron magnets and laminated pole-pieces, thus increasing the torque; (4) greater clearance can be obtained between the motor and the road-bed; (5) since worm-gearing is not a reversible combination, it forms an efficient brake when current is cut off; (6) repairs to small motors are easier and cheaper. The one disadvantage noticed is that a disabled car cannot be towed without detaching the worm-gear. The author suggests rolling friction as a possible improvement in worm-gearing, and predicts that double-reduction gearing, which superseded the more efficient single-reduction gearing, will in turn give place to worm-gearing, the loss in efficiency being outweighed in both cases by advantages gained in other respects.—*Science Abstracts.*

THE AUTOMOBILE CLUB OF GREAT BRITAIN.

THE Automobile Club of Great Britain has been very busy since our last issue. Many of its members who are specially interested in the automobile movement visited the Paris Automobile Exhibition in the middle of June. Mr. Frederick R. Simms was very energetic in forming this party, which included, amongst others, the Chairman (Mr. Roger Wallace, Q.C.), Mr. Frank Butler (Hon. Treasurer), Mr. Alfred Bird, Mr. Worby Beaumont, Mr. P. Drummond (of Stirling), Mr. Herbert Capel, Mr. J. H. Knight, Mr. E. Townsend, Mr. C. Twist, Mr. A. L. White, Mr. A. Mulliner, Capt. Sampson, J.P., Mr. Lyons Sampson, and the Secretary (Mr. C. Johnson).

The President of the French Club was so good as to make these gentlemen honorary members of the Automobile Club de France during their sojourn in Paris. Nothing could be more delightful, after a day's hard work examining the Exhibition, than to take the Club motor omnibus to the villa of the Club in the Bois de Boulogne and to dine under the trees there.

The run of the Automobile Club to Virginia Water was a great success (except as regards the dinner itself). The Club ran three motor-wagonettes for its members. These were supplied by the Daimler Company.

(1) Club wagonette No. I, driven by Mr. A. H. D. Altree. Passengers: Mr. and Mrs. Lyons Sampson and friend, Mr. and Mrs. Worby Beaumont, and Mr. and Mrs. Staplee Firth.
(2) Club wagonette No. II, driven by Mr. E. M. C. Instone. Passengers: Sir John Leng, M.P., Lady Leng, Mr. and Mrs. T. Bousquet Browne, and the Secretary.
(3) Club wagonette No. III, driven by G. R. Sewell. Passengers Sir J. R. Somers Vine, C.M.G., Mr. H. Somers Vine, Mr. Berger Graham, Mr. Alfred Thompson, Mr. Leonard, Mr. H. P. Wolff.

There were the following carriages also:—

(4) Britannia electric carriage (the Honourable J. H. H. Berkeley).
(5) Britannia electric carriage, No. 2.
(6) Benz, $2\frac{9}{10}$ H.P. (Mr. Frank Butler).
(7) De Dion tricycle (Mr. R. Phillips).
(8) Benz Ideal (Mr. H. Hewetson).
(9) Benz, $2\frac{9}{10}$ H.P. (Mr. W. P. C. Wills).
(10) Arnold (Mr. R. W. Buttemer).
(11) Daimler Victoria (Mr. C. Cordingley).

Considerable astonishment was created at Henley by the sight of the motor-carriages of the Automobile Club standing close to the water's edge on the lawn specially reserved for the Club close to the enclosures of the Sports Club, Bath Club, &c.

Some of the carriages drove from London to Henley and back in the day, and their occupants sat comfortably in them and viewed the racing. At the back of the enclosure there was an excellent Club tent in which luncheons, &c., were served to members and their friends on the three days of the regatta. One Henley is so like another that *habitués* are ever on the look out for novelties. The Automobile Club enclosure was the novelty of the regatta, and as such excited much comment and interest; but it was remarkable to notice that, whereas a few months ago motor-vehicles were treated with scorn and contempt, they were at Henley the cause of serious examination and polite inquiry.

Mr. Lyons Sampson had invited a few other members of the Automobile Club to drive with him to Hurlingham. It was somewhat of a departure to see the occupants of the carriage dressed in top hats, frock-coats, &c. However, they certainly looked smart, and demonstrated the fact that a yachting costume is not indispensable to carriage exercise, because there are no horses attached to the vehicle. The authorities of Hurlingham on this occasion gave the motor-wagonette a place next to the coaches.

Mr. Herbert de Stern (who has recently been elected a member of the Automobile Club) has just given a large garden party at the historic Strawberry Hill House, which is now his property. He drove down on a Daimler, and from eight to ten owner-members of the Automobile Club drove their motors to his party.

The Committee of Sandown Park Racecourse have reserved an enclosure for the Automobile Club for the Eclipse Stakes meeting on the 15th and 16th inst.

Perhaps one of the most enjoyable functions of the season in connection with British automobilism will be the entertainment which Mr. Frank Butler (the Honorary Treasurer) is giving to the Automobile Club at his well-known house boat, the "Dolce far Niente," at Shiplake, on the 23rd inst. Mr. Butler has asked a large and distinguished company to meet the Club. A marquee is to be erected on the meadow behind Mr. Butler's houseboat, and over 300 guests have been invited to luncheon. Signor Bocchi's orchestra will be present.

Some of the members will stay at Henley on the night of the 23rd inst., and will run from Henley to Oxford and back on the 24th, and to London on the 25th.

Preparations are in progress for the Club Tour to South Hants and Cowes Regatta. We are asked to request members who wish to join in this tour to communicate with the Secretary.

Among the recent candidates for membership of the Automobile Club are Mr. Henry Edmunds (St. Stephen's and Whitehall Clubs), Mr. Harold Wade (Sports Club), Mr. G. A. Schenley (R. Yacht Squadron), Mr. W. A. Smith (National Liberal Club), Mr. Francis H. Medhurst, B.Sc. (St. Stephen's Club), Mr. W. E. Hipkins (Derby Club, Derby), Mr. Roland Browne (Devonshire Club), Mr. J. A. Holder (Conservative Club, Birmingham), who has just acquired an 8 H.P. Daimler carriage.

DIARY OF THE FORTHCOMING ARRANGEMENTS OF THE AUTOMOBILE CLUB OF GREAT BRITAIN.

Friday, July 15th, and Saturday, 16th. Run to Sandown Park Races and back for Eclipse Stakes.—An enclosure to contain six motor-carriages will be set aside on the racecourse for the Automobile Club.

Saturday, July 23rd. Run to Shiplake. Luncheon by invitation at Mr. Frank Butler's houseboat. Supper at Henley. Sleep at Henley.

Tour to Henley and Oxford.—Saturday, July 23rd, Sunday, 24th, and Monday, 25th.

Club wagonettes and private motor-vehicles which have not proceeded to Henley earlier in the day in answer to Mr. Butler's invitation, will leave the Club on Saturday, July 23rd, at 3 p.m., and will proceed *viâ* the Bath Road, Twyford, Wargrave, to Henley. Supper will be served at Henley at 9.30 p.m. The Saturday nights and the Sunday nights will be spent at Henley. On Sunday, July 24th, there will be a circular tour to Oxford and back. The start will take place at 10.30 a.m., and the route to Oxford will be *viâ* Nettlebed (4¾), Shillingford, Dorchester (14), Sandford, Iffley, to Oxford (23¼ miles). Luncheon will be served at Oxford at 1 o'clock. The start on the return journey will be made at 4 o'clock, and will be *viâ* Abingdon (6½), Stevenon (12¼), Blewbury (16¾), Streetly (22), Pangbourne (26), Reading (32), Twyford (37), Henley (41¾). Supper at Henley at 9 p.m. on Sunday night.

Monday, July 25th. Return to London. NOTE.—One of the Club wagonettes will leave Henley at 7 a.m., so as to land members in London between 10 and 11 on Monday morning.

August Tour. Cowes Regatta.—Saturday, July 30th, to Wednesday, August 3rd, or Thursday, 4th.

It is proposed to start from the Club on Saturday, July 30th, at 11 a.m., for Guildford (29¾) miles, Farnham (30¾), Alton (50). Sleep at "Swan Hotel," Alton.

Sunday, July 31st. Alton to Portsmouth (31 miles). Sleep at Southampton.

Monday, August 1st. (Bank Holiday). Club launch will run to witness the Royal London Yacht Club Regatta at Cowes. Sleep at Southampton.

Tuesday, August 2nd. Club launch will run to witness the Royal Yacht Squadron Regatta at Cowes. Sleep at Southampton.

Wednesday, August 3rd. Start back for London.

Thursday, August 4th. Complete journey for London.

(*The return journey may be commenced on Tuesday, August 2nd.*)

REVIEWS OF BOOKS.

"Les Automobiles sur Rails." Par G. DUMONT, Ingénieur des Arts et Manufactures. (Paris: Gauthier-Villars et fils, Quai des Grands Augustins, 55, 1898).

THIS work gives a quasi-technical account of that branch of automobilism covered by its title, but, having regard to the already extensive literature on the subject, and also to what we may term the inceptive development of automobilism, we question whether any useful purpose is served by describing systems of traction, many of which in the course of a few years will be relegated to the category of vain efforts. At the same time M. Dumont has done his work well within the limits at his disposal. He does not tell us much that is fresh, but his explanations are to the point. He describes nearly all the existing systems, but not with sufficient detail to be of value to the designer. The illustrations are on too small a scale to be of any use—a common defect in French technical literature. There are some useful tables giving attained results in various systems. As a record of street railway work in Europe the book has some value, but more than this we cannot say.

"Electro Dynamics: The Direct Current Motor." By CHARLES ASHLEY CARUS-WILSON, M.A. Cantab., M.I.E.E. (Longmans, Green, and Co., 39, Paternoster Row, London, 1898.) Price 7*s*. 6*d*.

IT is rarely one comes across an author who, so to speak, plunges at once into his subject. Usually, and especially so where electricity is the subject, a lot of orthodox and elementary matter is prefixed, and the advanced student is carefully taken through the interesting but somewhat jejune experiments associated with the logs of a dead frog or the skin of a defunct cat, in order to impress upon him the difference between static and voltaic conditions of electricity.

Professor Carus-Wilson, without assuming that his reader is, like himself, an expert in the higher branches of applied electricity, nevertheless requires a rather extensive knowledge on the part of those who would benefit by his teaching, and we rather question whether it is wise to take so much for granted. Thus, not a few students will find some difficulty, we should think, in grasping at once the full significance of the "induction factor" of a dynamo—not that we object to the use of this new term, but its precipitation upon one is somewhat sudden. It is, however, after all, an obvious term in dynamo design; it is an important factor; it represents the product of the number of surface conductors of the armature, the number of polar divisions of the latter, and the number of useful lines per pole, divided by the number of units in 1 volt. Further on this is defined as the induced volts by the revolutions per second of the armature. By varying the current in the magnets different values of the induction factor are obtained, and if those be plotted on a sheet of squared paper the "induction curve" is obtained, and if the ordinates of this be multiplied by revolutions per second we get the well-known "characteristic" curve. This first chapter is decidedly, at least to us, novel. It is followed by one in which the conditions for uniform motion are discussed. Hysterisis is defined as an expenditure of energy in the form of work—also to us a new definition, but we see no reason to question the reasoning by which the Professor reaches this conclusion. The torque on a motor-shaft is shown to consist of five elements, including hysterisis. In Chapter III the various equations of the induction factor for various specified conditions that obtain in practice are discussed, and we then come to the discussion of shunt and series wound motors. Here the student will find a mass of accurate information of an exceedingly instructive and valuable kind. The method of utilising two motors connected by a differential gearing, so that by varying the induction factor of them both inversely motion to a shaft is imparted, strikes us as exceedingly good and having wide possibilities. We are not surprised to learn that a German firm has already applied it.

The different methods of connecting motors are described, and many practical lessons deduced. Perhaps one of the most important conclusions reached is that series-connected motors for railway work are objectionable unless the driving wheels are coupled by connecting-rods. Considerations of space forbid us to notice the remaining chapters on "Efficiency," "Control," "The Force Factor." We can, however, especially commend that one on "Acceleration." This difficult subject is most admirably treated, and the same remark applies to the chapters on "Time Curves" and "The Design of Railway Motors."

We have read this work with advantage. Its great merits are that it puts electric traction in its most recent developments before the student, not alone in the theoretical aspect, but chiefly and mainly in its practical application. Indeed, it is a mistake to speak of this work as a theoretical treatise. As we have said, the Professor supposes that his readers have a fairly good mathematical training. Such will have no difficulty in following him. His style is by no means that of the teacher, but he remembers the weaknesses of students, and important deductions are printed in heavier type. Perhaps to many the most valuable feature of the work is the plethora of examples taken from actual and recent practice. After studying this work we feel that electric traction, unlike steamship propulsion, admits of very accurate determination—a comforting reflection for shareholders. It is undoubtedly the best book we know of on the subject.

"Science Abstracts." (London: Taylor and Francis, Red Lion Court, Fleet Street, 1898.) Price 3*s.* each.

SUCH is the rapid advance of scientific research that it is difficult for a busy man engaged in technical work to keep himself posted up in what is being done in other fields. Most men who endeavour to do conscientiously find that they have to subscribe to numerous technical journals and to belong to one or more scientific societies, in order to obtain a sufficiency of technical literature for their own private consumption. Although there is a vast quantity of matter dealing with scientific research published every week, yet much of it is mere literary embellishment or "padding" out of which one, often with difficulty, extracts the facts. It was, therefore, a happy thought to appoint a body of physicists engaged in various branches of pure and applied science and to entrust them with the task of wading through this mass of literature, and, to use a newspaper phrase, "boil it down" and presenting it to the scientific public in the shape of extracts. This has been undertaken by the Councils of the Institution of Electrical Engineers and the Physical Society respectively. The "abstractors" comprise many of the best known men in the physical world, and they have as editor Mr. J. Swinburne. The scientific public has thus every guarantee that the work is well done. The first number was issued in January, and the high level of general excellence then exhibited has been well maintained in each succeeding issue; the publication is, we should say, a monthly one. Physics, of course, covers a large number of sciences; in other words, it means natural philosophy. It will thus be seen that these abstracts appeal to a very large body of readers and workers. We ourselves find them very useful, and can recommend them to all who have not much time to spend in reading or studying. To students they will be especially useful. The price is, however, somewhat high, but this no doubt will be reduced as the sale increases. We welcome this new contribution to scientific literature, and trust it may have a prosperous career.

"The People's Guide to the Workman's Compensation Act." By R. M. MINTON-SENHOUSE, Barrister-at-Law, and G. F. EMERY, L.L.M., Barrister-at-Law. (London: Bemrose and Sons (Limited), Old Bailey.) Price 1*d.*

VARIOUS opinions obtain as to the necessity and effect of this Act, but that it is one in which working men—using this much-abused word in its ordinary restrictive meaning—are vitally interested is beyond question. Perhaps it is for that reason that probably not one "working man" out of a thousand understands any more about it than that it increases the employers' liability in some vague and undefined way. No excuse can now be made for any workman not understanding what the State has done for him by this Compensation Act. For the sum of one penny we have here a plain exposition of the Act divested of legal technicalities and well indexed. By the aid of this tiny work one can tell at a glance whether any stated employment is covered by the Act, but we should not advise any one to take the Act too literally, as until its intention has been interpreted by the judges—and most of our modern legislation is unintelligible until it has gone through this judicial ordeal—the framers of Acts not always knowing what they do mean—it will be well to hesitate. We may expect that the litigation arising out of this Act will be pretty extensive, so would-be litigants will not have to wait very long. In the meantime they can study this pennyworth of legal lore with advantage and let us hope with profit.

"Acetylene Gas and Calcium Carbide." By G. F. THOMPSON, Consulting Engineer. (Liverpool, Sixteth Street; London, E. and F. N. Spon (Limited): 1898.) Price 3*s.* 6*d.*

THE author of this work is a well-known expert in many branches of engineering and his description of acetylene gas, its manufacture, application, &c., may be taken as bringing our knowledge up to date and also as possessing the great merit of being authoritative. That this new illuminant, or, rather, that this new compound, calcium carbide, has a very great future before it is unquestionable. Acetylene is not, we think, likely to supersede gas or electricity in towns, but in isolated positions, such as country houses, lighthouses, ships, and lightships, especially the latter, its adoption to every other form of illumination is merely, allowing even for the Chinese-like conservatism of the authorities, a question of a few years. Mr. Thompson's book will do much to extend the use of this gas. He describes the process of its manufacture and its use in plain but not too technical language, and also the various systems of generators employed. Those whose business it is to keep themselves *au fait* with developments in lighting may not find much in this work that they did not know, but the lay reader who is desirous of learning "all about" acetylene cannot do better than read Mr. Thompson's excellent little work, which we trust will have a large circulation. With acetylene as with so many other products in their early applications, there is a good deal of prejudice on the part of the public to remove. Mr. Thompson clearly shows how this gas may be used with absolute safety provided ordinary common sense is employed, which, needless to say, is not always the case. After using coal gas as an illuminant for nearly a century, have we not the housemaid who *will* seek for a leak with a lighted taper, and can we expect that this always interesting, though at times trying, domestic will exercise greater intelligence with acetylene? She may—if the School Board will include Mr. Thompson's book in their curriculum, in which science in a very mild but very popular form is rendered easy of assimilation by the rising generation.

"Carnet du Chauffeur pour 1898." Par LE COMTE DE LA VILLETTE. (Paris: Rebierre et fils, éditeurs, 15, Rue Grenier, Saint-Lazare, 1898).

THIS is an automobilist's pocket-book which will no doubt appeal to the amateur a good deal more than it does to the professional engineer. It is dedicated to the members of the Automobile Club of France, of which body the author is technical secretary. There is a calendar giving times of rising and setting of sun and moon, with other astronomical information. We trust we shall not be hurting any one's feelings if we say that the insertion of ecclesiastical data in an automobilist's calendar strikes us as rather incongruous. The calendar is followed by a number of log sheets; then comes a table of octroi duties, and a list of depôts throughout France where petrol can be obtained. There is also a list of constructors, police regulations, hints for automobilists on repairs, &c. The principal vehicles are described and instructions given for working them. With the reservation above, we have nothing but praise for this useful handbook, and compliment its author on its, if somewhat tardy, appearance.

"Lubricants, Oils, and Greases." By ILTYD I. REDWOOD. (New York: Spon and Chamberlain; London: E. and F. W. Spon, 1898.) Price 4*s.* 6*d.*

WITH the more scientific treatment of machinery, with the idea of obtaining the greatest efficiency, lubrication is a factor of increasing importance. What we may term the physics of lubrication is comparatively a new field of research, and so little is known of the laws of the subject that the Institution of Mechanical Engineers some time ago appointed a special committee to investigate and report. This committee did much good work, and although Beauchamp Tower, Dewrance, and some few others have also worked in this field, we are still without a satisfactory theory of lubrication. The latest writer is Mr. Iltyd Redwood who, as a chemist, is more concerned with the composition of various lubricants than with their practical use. Engineers as a class rarely bother themselves about the chemical composition of the materials they employ, and much of the contradictory experience of which one hears so much can be attributed to the absence of exact information regarding the composition of the material employed. Every engineer knows, or rather thinks he knows, how to select a good lubricating oil, but the tests, or what passes for such, have little practical value unless they also include a fairly complete analysis. Mr. Redwood has, therefore, rendered a good service in putting into the hands of engineers a treatise which while mainly chemical is yet written largely from the point of view of the user. He divides lubricants into two classes—oils and greases, the former including mineral, fatty, and "other" oils, while the latter is represented by compounds of oils and fats that are solid or seem solid at the ordinary temperature. This is hardly a scientific classification, but it is a practical one. We should rather prefer to have three classes—animal, vegetable, and mineral.

The description of mineral oils is rather brief. Speaking of the tests for a mineral lubricant he says that the specific gravity and viscosity tests count for little. This is so, unless the viscosity is measured at a high temperature. He shows us how viscosity can be obtained by means of wax as an adulterant. He neither puts much faith in "testing machines," neither do we, unless these express the lubricating value of an oil in terms of work. Thus a shaft will absorb so many foot-pounds with one lubricant, and so many foot-pounds with another. This really is the best test. The chapter on fatty oils is very good for the information it gives of various compositions. What is termed compounding seems to us to be but a euphemism in many instances for adulteration. In the chapter, "Test of Oils," there is again much valuable information, and with the aid of a few reagents the engineer should have but little difficulty in determining whether his oil is adulterated. There is a useful chapter on the action of oils on various metals. In conclusion, this is a work which automobilists will do well to read, as the use of a suitable lubricant is of the utmost importance in fast-running light oil-motors.

"Duncan's Manual of Tramways, Omnibuses, and Electric Railways." 21st Edition. (London: T. J. Whiting and Sons, South Place, E.C., 1898.) Price 3*s*. 6*d*.

As this work is so well-known and, we may add, so much appreciated, any lengthy review would be superfluous. We have only to say that the work is in its 21st edition and is quite up to date. Those of our readers interested in motor-vehicle schemes will find this work exceedingly useful.

Les Sports Modernes. l'Automobile. Paris, 24, Boulevard des Capucines; London, Goupil and Co., 25, Bedford Street, Strand. Price 2 francs.

Automobilism is, at any rate in France, essentially a modern sport. Our artistic and cultivated neighbours have found out that horse-racing, hunting, and the like, are barbarous and degrading pursuits, tending to brutalise rather than refine, and as "sports"—save the mark—now obsolete, or fast becoming so. Automobilism, on the other hand, is free from animal associations, it requires intelligence and skill of a cultivated kind, and hence it is essentially the relaxation of educated persons. For this reason the English mobs used to bowl when they saw a motor-vehicle, and for this reason our bucolic magistrates exhibit not infrequently an intensely splenetic discrimination against automobilists who come before them to receive Justices' justice. For this reason, too, the literature of automobilism is not likely to be appreciated by those who seek what they term "sporting intelligence" in the columns of the halfpenny evening papers. Automobilism is, as we say, in France a sport, and hence it is very fitting that a journal should be established that would deal with automobilism from the sporting point of view. *Les Sports Modernes* has been established for the purpose of dealing, as its title implies, with modern sports, and very properly has devoted its first number to automobilism. This first number is an excellent example of French illustrated journalism, quite eclipsing any of our weeklies. We do not know how it is that the French printers can produce such well-coloured illustrations and English printers seemingly cannot, or, at any rate, do not. In the number before us are several well-executed coloured and plain illustrations of great artistic merit. The articles are mainly historical and descriptive, and are well written. The technical matter is well done—not too technical but sufficient to give amateurs some good practical information. The various types of motor-vehicles are well described and illustrated, as are the more prominent automobilists. We gather that it is *de rigeur* in France for *chauffeurs* to affect a special costume, of which a cap, generally of the Russian naval pattern, is the principal article. When the German Emperor was in England he made the German naval cap fashionable amongst yachtsmen and others who are not, but who like to look like, naval or mail steamship officers. We observe that British automobilists are affecting the use of the German, Russian, or British naval cap. This is not good taste, and we also observe that such well-known automobilists as Comte de Dion, M. Daimler, M. Bouton, Sir David Salomons, Professor Redwood, to mention but a few names, do not, as might be imagined, offend in the manner indicated. A distinctive costume for automobilists, including a cap, may or may not be desirable, but a naval cap on a landsman is, at all times and under all circumstances, an incongruity that we protest against vigorously. In *Les Sports Modernes* is a special article on the "Costume of an Automobilist," and illustrated examples are given. A *chauffeur*, we learn, wears in the summer time a tourist jacket, knickers, and gaiters, the whole surmounted by a Russian naval cap. In the winter a long fur coat is worn; in this costume the *chauffeur* resembles a Russian Customs officer. A chief engineer of an automobile is dressed somewhat like a British bandsman in a quasi-military costume and military cap; his assistant is habited like a commissionaire, but with a plain military cap. It will thus be seen that the philosophy of clothes occupies the attention of our contemporary as well as the philosophy of automobiles.

The Engineering Magazine.—The June issue contains, among other interesting matter, a capital article on "Great Naval Guns," by L. J. Prindle, which is well worth reading. An equally interesting but more amusing article is "Unprofitable Engineering Projects in Western America," by A. G. Allan. From this we learn that the methods of exploiting, so graphically described by Dickens 30 years ago, still flourishes exceedingly, and if anything are improved upon. There is something distinctly humorous in the idea of selling a "dry canal" and "giving away a garden tract," the said tract consisting of granite boulders. A. Horrick describes "The Ground Current of Electric Railways," and shows the methods adopted for preventing electrolysis. As relating to one branch of automobilism, "Dredging on the Mississippi," is a readable account of the difficulties experienced in maintaining open channels in that river.

Cassier's Magazine.—In view of the war between the United States and Spain, Cassier's is especially interesting, the present number being a purely naval one. It comprises the following articles, all well written, well illustrated, and the whole well printed:—"The Ram in Modern War Fleets." In combat and collision. In the British fleet. In the French, Italian, and German fleets. With 49 illustrations. By William Ledyard Cathcart. "Modern Ships of War." A brief review of different types. With eight illustrations. By Lieut.-Commander Richard Wainwright, U.S.N. "The Spanish Armada." Its defeat in 1588. With 17 illustrations. By Charles N. Robinson. "Some Practical Notes on American Battleships. As seen by 'The Man Behind the Gun.'" By E. W. Eherle, U.S.N. "Battleships of the United States Navy." A review of the ships now in service. With 10 illustrations. By George H. Shepard, Engineer Corps, U.S.N. "Mechanism of Modern Naval War." The increasing complexity of modern naval vessels. Illustrated. By Charles H. Cramp. Current Topics—"Modern Warships in Conflict," "Auxiliary Steam Machinery Aboard Ship," "The Stevens Rotating Armourclad," "An Early Dutch Ironclad" (illustrated), "Should Twin Screws of Ships Turn Inwards or Outwards?" "Armourclad Torpedo Boats," "The First British Man-of-War," "Ventilation in Warships." Considerations of space prevent us dealing with these any further than to mention them, but we may say that the article on the "Spanish Armada," by Captain Robinson, R.N., the well-known naval editor of the *Army and Navy Gazette*, is distinctly good reading, and is the best account of this great naval episode we have seen.

Revue de Méchanique is as usual brimful of high-class matter. Perhaps the article which is of especial interest to automobilists is on "Superheated Steam," by M. Sinigaglia. M. Rateau continues his exhaustive analysis of the theory of turbines and luxuriates in mathematics in his task.

We have also received:—*Science Abstracts, The Journal of the Society of Arts, The Indian Engineer, Industries and Iron, The Practical Engineer, Transport, Coach-Builders' and Wheelwrights' Art Journal, The Journal of Acetylene Gas Lighting, Knowledge, Machinery Market Review, Phillips' Monthly Machinery Register,* *The London Chamber of Commerce Journal, Indiarubber World, Cyclist, Scottish Wheel, Irish Field, The Yachting World, The Engineering Magazine, La Revue de Méchanique, La Locomotion Automobile, La France Automobile, L'Industrie Velocipédique et Automobile, L'Automobile Illustré, La Moniteur Automobile, La Revue des Transports Parisiens, Les Sports, L'Energie Électrique, Der Motorwagen, Samokat, Horseless Age, American Wheelman, Transactions of the American Society of Mechanical Engineers, Transactions of the American Institute of Electrical Engineers, Journal of the Western Society of Engineers, The Motocycle, The Scientific Australian, The Austral Wheel, Australasian Coach-Builder and Saddler*, &c., &c.

CATALOGUES.

ERNEST SCOTT AND MOUNTAIN (Limited) have issued a catalogue of their specialities in engines, boilers, dynamos, &c., which, for fulness of information and copious illustration, leaves little to be desired. The work forms, in fact, a kind of trade text book, so excellently are the various machines described. The branches of engineering followed by this firm are many and varied, and range from electric lighting and welding plant to coal cutting machinery and forced draught fans. The information relating to these various appliances is extremely full and plain, so that an ordinary clerk would have no difficulty in placing an order without the aid of any engineering knowledge. Altogether an excellent catalogue and most useful book for the office.

MAKERS and designers of motor-vehicles will do well to obtain the catalogue and price list of Messrs. W. E. Cary, of Manchester. This firm makes a speciality of all parts used in vehicle construction, and have a deservedly high reputation for the excellence of their springs and axles. In the arrangement of their catalogue a system of various-coloured lists for the various articles is adopted, with the result that one can at once find a description and price of any article without having to turn over a multitude of pages. We notice some new designs for motor-vehicle axles.

MESSRS. JULIUS HARVEY AND CO., of 11, Queen Victoria Street, E.C., well known in the motor trade on account, amongst other things, of their success with Post Office work, have sent us an illustrated list of steam motor-vehicles, and are prepared to quote and supply not only these, but also oil or electric motor-cars of every description.

PETROLEUM COMMITTEE'S REPORT.

AFTER an inquiry extending over four Sessions the Select Committee on Petroleum have now concluded their labours. Those members of the Committee who had agreed with the Chairman in opposing the raising of the flash point were at the final meeting on the 13th inst. in a majority, and could have rejected the report by a majority of two. They still felt unable to support it so long as it contained the recommendation which was inserted some weeks ago. In view, however, of the practical value of other recommendations, especially as to storage and transport of petroleum, and in order that the work of the Committee should not prove futile and without result, two of the majority withdrew from the room to avoid voting when the final question was put, and the Chairman did not vote, which enabled the advocates of a high flash point to carry the report by a majority of one.

The following is a summary of the recommendations agreed to :—

1. That the present law affecting petroleum spirit, not being adequate for public safety, should be amended in the manner specified in the report.
2. To adopt a flash point of 100° (Abel close test) as the dividing line between petroleum oil and petroleum spirit.
3. Legislation to control the storage, transport, and sale of petroleum generally and admixtures of the same with other substances, certain heavy oils being exempted.
4. To provide for an efficient system of testing.
5. To provide for adequate supervision and administration by local authorities.
6. That official inquiries be made into the causes of accidents arising from the storage, transport, or use of inflammable liquids.
7. Statutory powers to enable the Secretary of State to issue orders affecting the manufacture and sale of lamps.
8. To spread information among the public as to the nature of petroleum and the management of petroleum lamps.

The Committee added to these recommendations the following conclusions :—

"That to place such legislative restrictions on petroleum oil below 100° (Abel close test) as are placed on petroleum spirit would have the effect of preventing the use of such oil for domestic or trade purposes; that the effect of such legislation would be to materially raise the cost of petroleum to the consumer; that it is in accordance with the evidence that, if immunity from accidents is to be secured, it will be necessary to prevent the use of oil below 100°; that the number of lamp accidents has not increased out of proportion to the vast increase in the number of lamps used; and that if freedom from accidents is to be secured ordinary care must be exercised in the use of petroleum, whether of 73° or 100° flash point."

CORRESPONDENCE.

*** *We do not hold ourselves responsible for opinions expressed by our Correspondents.*

*** *The name and address of the writer (not necessarily for publication)* MUST *in all cases accompany letters intended for insertion or containing queries.*

*** *Correspondents are particularly requested to write on one side of the paper* ONLY, *to place the subject of their letters as a headline at the top of the sheet, and their names and addresses at the foot. Attention to these matters saves much time and ensures the insertion of the letter.*

A COMMENT ON THE LIVERPOOL TRIALS.

To the Editor of THE AUTOMOTOR.

SIR,—The appearance of Messrs. Thornycroft's six-wheeled vehicle at the Liverpool trials is an interesting circumstance, though the articulation limits it to forward movement only. At the same time, its steering capabilities in that direction are obviously superior to those of the "Lifu" lorry, No. 1, with its truly portentous wheel base. Why, in the latter case, the driving-wheels could not be placed "amidships" and trailing steerers provided, it is difficult to see: unless a *furniture wagon* is to be regarded as the model for motor-vehicles, rather than our well-tried friend the *locomotive*.—I am, &c.,

ALFRED J. ALLEN.

London Institution, E.C., *June 27th.*

INSURANCE AND THE STORAGE OF PETROL.

To the Editor of THE AUTOMOTOR.

SIR,—Since writing the letter which appeared in your last number on the "Storage of Petrol," I have at last managed to exact a reply from the two insurance offices I am interested in. They both will allow me to keep 40 gallons of petrol in the two tanks, authorised by the Local Government Board, *in my house*, without detriment to my policy or increase of premium.—I remain, Sir, yours faithfully,

F. M. GOWAN.

26, Clarendon Square, Lesmington.

[Should the attempt that is being made to raise the flash point of common petroleum succeed, the latter will become a "dangerous substance," and hence the insurance companies will probably raise the premium on all policies covering the storage of petroleum of all kinds that flashes under 100° F.—ED.]

TANGYE'S REVERSING GEAR FOR UNI-DIRECTION MOTORS.

IN applying a gas or oil engine to the propulsion of vessels or motor-vehicles, we can hardly do without a separate reversing gear, except in the first instance, when we can propel the boat by means of a reversible screw, as carried out by Messrs. Tolch and Co., the arrangement of which latter we presume to be known to our readers.

In other cases we find special means for reversing devised, among which the "White" gear is noticeable as being comparatively simple, compact, and efficient.

Referring to the accompanying illustration, the engine crank-shaft, A (*see* Fig. 1), engages the shaft, B, which may be the propeller shaft, or say, the countershaft when in a motor-vehicle, by means of four mitres, *a*, *b*, *c*, *d*, of which two, *d*, *d*, run loose on their respective axles, c_2, c_2. The latter are in one with the bush, *c*, which in turn runs loose on the prolongation, A^1, of the engine-shaft, A.

The axles, c_2, revolve with the brake blocks, f_1 and f_2, which latter may be, at the will of the operator, expanded so as to press radially against the ring, *e*, *e*, which is a fixture, or they may be caused to produce friction with their inner ring surfaces on the rims, a^1, a_2, b^1, b_2, of the mitre wheels, *a*, *b*; they may finally be brought in such a position relatively to the fixed ring and the aforesaid rims, so as to clear both when rotating.

These operations of the brake are effected by means of the lever, n^1, of

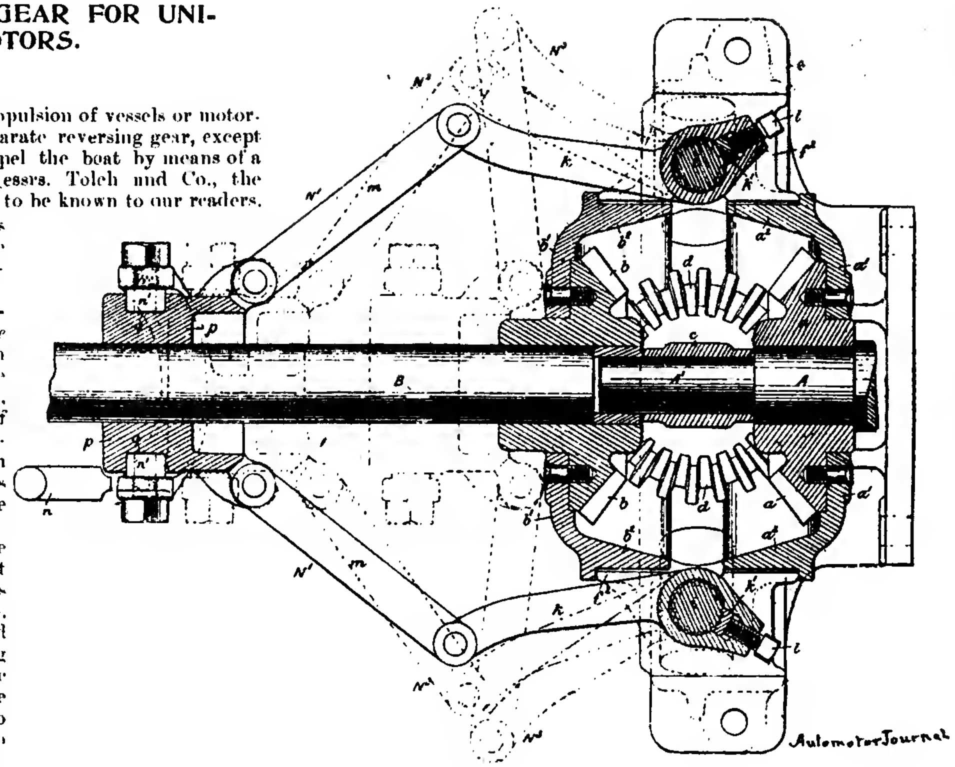


FIG. 1.

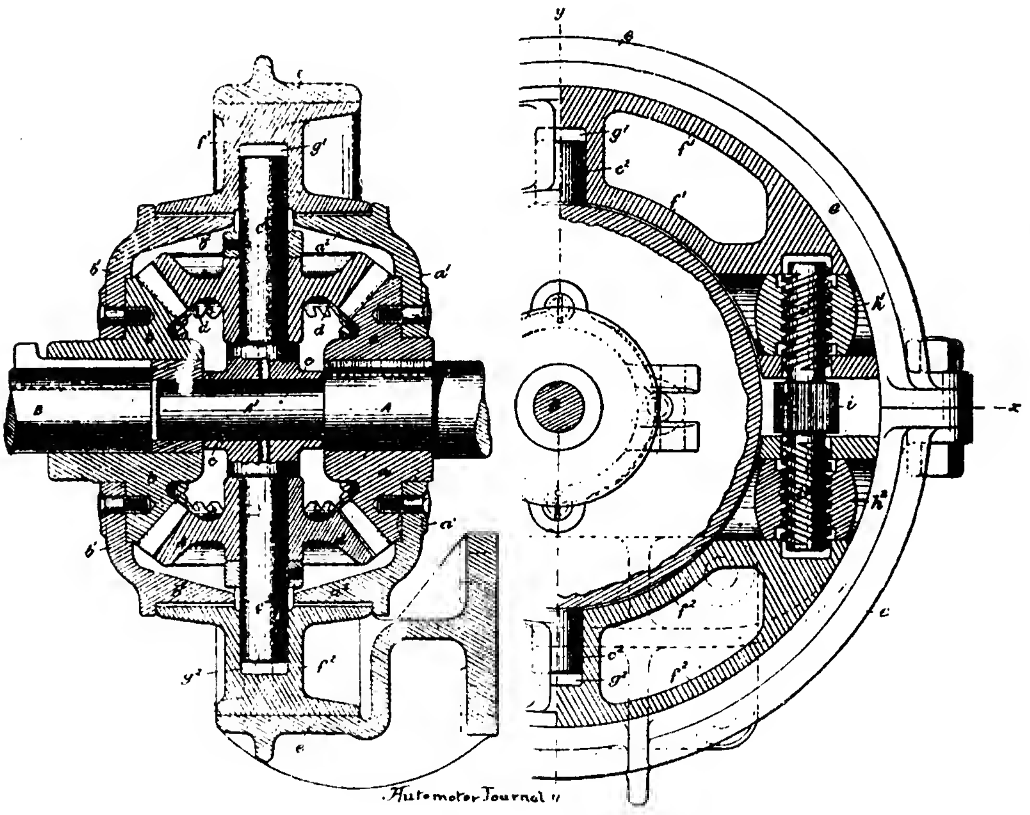


FIG. 2.

the clutch collar, *p*, the latter running loose on shaft, B, which lever, through N^1, *m*, and *k*, can be moved so as to turn the double screw, i^1, i_2 (*see* Fig. 2).

This screw carries right and left hand thread, the part between the threads is serrated, so as to allow of easy adjustment of lever, *k*, by means of a serrated key. When the screw is turned it will either bring the two nuts, h^1 and h^2, nearer to each other or farther apart, it will therefore also expand or contract the brake blocks, f^1, f^2, in which the nuts are let in. When P is in the left hand position (*see* Fig. 1) the brake is applied externally, making cc_2, c_2 stationary, and, as it were, part and parcel of the ring, *e*; in this case B will turn with equal speed, but inversely to A.

In the position at the extreme right (shown in dotted lines), the brake is brought to bear on a_2 and b_2, therefore A will directly rotate B through the medium of a_2, f_2, f_2, b_2, in the intermediate position the brake establishes no connecting bridge, so that the vehicle or the boat is not being propelled whilst the engine runs.

To transmit more or less speed in one sense of rotation or other, the brake blocks are moved more or less inwards or outwards. This device, as already remarked, we consider compact and mechanical, but we must express our doubt as to the above-mentioned capacity to vary speed, such a variation could only be effected whilst considerable slip goes on; this taking place under pressure means waste of power, besides undue wear when of long duration. Furthermore, we know by experience that clutches of this or similar type are, as a rule, either very efficient in "slipping" or in "biting," and the gear in which these two opposite qualities are combined must possess very great merit.

FOREIGN NOTES.

The Concours des Poids Lourds will be held at Versailles in October next, and the vehicles will traverse the same routes as last year.

In order to gratify the wishes of those who like to go as fast as they can on their motor-vehicles, and to do this without risking a prosecution for excessive speed, it is proposed to establish an automobile drome in Paris.

An English branch of the Panhard and Levassor Company has been formed, with a capital of 2,500,000 francs, to sell these vehicles in England. There will be four directors, two French, MM. Pierron and Bouhey, and two English.

A Commission composed of MM. Sartiaux (as President), E. Hospitalier (Vice-President), Beau, Eschwège, Fontaine, Hérard, Mildé, De la Valette (members), and with M. Geoffray as Secretary, has been appointed by the French Automobile Club to study the question of the supply of electric current to automotor vehicles.

At a recent meeting of the committee of the Automobile Club of France a letter was read from a firm of accumulator manufacturers. In this letter the firm, whose name did not transpire, offered to set aside a sum of £1,000, to be given to the maker of any accumulator which could be proved to be better than their own. The committee resolved to write to the firm in question, stating that they were willing to accept the £1,000, and to make it a prize for the best accumulator in the secondary-battery competition, which it is proposed to hold next winter.

The "Fleuri Automobile" is an annual event projected by the *Journal des Sports*. It, as its name implies, is a procession of garlanded motor-vehicles, and its purpose has been to do for motor-vehicles what the May day procession does for horse-vehicles—that is, to create and foster public interest in them. The idea is a good one, and this year the procession was unusually successful, as in Paris just now there are a great many motor-vehicles, attracted thither by the Exposition of Automobiles in the Tuileries Gardens. Nearly every type of motor-vehicle was represented, and all covered in flowers. The procession was a great success, and there was not a single hitch with the machinery of any of the vehicles.

The great and increasing popularity of automobilism in France among the females of what a lately deceased statesman used to term the "leisured classes" is to be explained by the fact that it makes no demand either upon muscular exertion or conventional rules, and, lastly, is select because expensive. Cycling has ceased to be—indeed, it never has been—a very fashionable or favourite exercise with the wealthy and healthy females, because it involves considerable muscular effort, and to indulge in it with safety necessitates the use of a bifurcated garment, which many women with strong hereditary prejudices object to wear. Cycling, too, is cheap, and the possession of a cycle is not evidence of the social or financial standing of the owner, whereas a motor-vehicle and membership of the A.C.F. is at least evidence of superior, if not of excessive, means. That automobilism is fashionable may be gathered from the fact that the halfpenny London papers, which are read by members of the toiling masses, naturally devote columns to automobilism in Paris.

In our last issue we commented upon the fact that the British War Office has not yet learned to appreciate the utility of motor-vehicles. It will no doubt make some experiments in a few years' time, after every other military Power has decided to adopt motor-vehicles. The French military authorities are carefully examining the question of the employment of motor-vehicles, and at the recent manœuvres several of the latter were tried. General Jamont is the first commander who has reported on the innovation, and his experiences in Morvan have been so satisfactory that the Ministry of War is about to acquire a number of motor-vehicles for scouting purposes. Others to carry six men have also been ordered for service with the artillery.

A circular of the French War Ministry inviting owners of automobiles to present themselves for military service with their vehicles is evidently destined (says the Paris correspondent of the *Daily Chronicle*) to alter the condition of the French army. Even in time of peace the experiment will be generalised in manœuvres and by the commissariat department. The saving of time and economy in horses appear incalculable, according to the report of Lieutenant Gerard, whose suggested method for quickly furnishing the military authorities with necessary data is that now applied to all vessels, including pleasure yachts, by the Ministry of Marine. The circular signed by General Billot virtually enjoins registration, by which automobiles of all kinds are made subject to the call of the War Office.

According to the Paris correspondent of the *Morning Post*, the French Courts have relieved Comte De Dion, the well known sportsman and automobilist, from the legal guardian appointed in 1879 to manage his affairs. Comte De Dion has in recent years given proof of a business talent of which he showed little promise 20 years ago. In 1887 he and two partners founded a tricycle and motor-vehicle factory, which now employs 450 workmen and clears a profit of 100,000 francs a month. In the circumstances it is not to be wondered at that the Court made no difficulty in granting Comte De Dion's request to be relieved of his judicial trustee. We congratulate the Count not so much for his resumption of his civil responsibilities, but more for the extraordinary business capacity and prudence he has developed.

The Liverpool Corporation and Automobilism.—As one result, partial or otherwise, of the recent heavy motor-vehicle trials in Liverpool the Corporation has placed an order for a steam refuse van with the Lancashire Steam Motor Company, of Leyland, the builders of what will historically be known as the "No. 5," which, on the whole, made an admirable performance at the trials in question, and which also, as shown by the table published in our last issue, exhibited great economy in fuel consumption. The new van is to carry from 4 to 5 tons, and will no doubt embody the experiences gained during the trials. We should like to conclude with the usual stereotyped congratulations for everybody concerned for doing what any respectable municipal corporation should have done at least two years ago. We however must be just and impartial, and so we cordially congratulate the Liverpool municipal authorities on their sagacity and remarkable enterprise in following the example set by the municipal authorities of a small village on the banks of the Thames called Chiswick.

The Paris Cab Trials.—According to *L'Eclairage Electrique*, the cost per kilometre of electrical vehicles at the time trials in Paris was about 0·05 franc, on the basis of a charge of 0·30 franc per kilowatt-hour, at which price it is sold in the section of the Place Clichy. Each vehicle, in fact, expended current to the extent of 2½ to 3¼ francs' worth on the route of 60 kilometres, the current consumed varying from 9·73 kilowatt-hours up to nearly 14 kilowatt-hours in different vehicles. Petroleum vehicles cost very much more. The minimum consumption of petrol by the Peugeot vehicle was 13 litres per day. Petrol cannot be bought for less than 0·6 franc per litre. Thus the journey cost would be 7·8 francs, or practically 78 pence for 39 miles, being practically 2*d.* per mile—an amount heavy enough for two persons, being equal to a third-class railway fare. The expense in repairs, &c., of the electric accumulators has been given as 3 francs per day per vehicle. Added to the cost of the energy, this implies a cost of about 6 francs, as against 7·8 for petrol—not a wide difference after all, but sufficient to show the success of electric vehicles in city work, and establishing this form of energy as cheaper than others.

THE LONDON STEAM OMNIBUS COMPANY (LIMITED).

That motor-omnibuses will in the near future be the chief form of public conveyance in our streets there is little doubt. But, in our opinion, this greatly to be desired end will hardly be helped forward by the statements set forth in the prospectus of the London Steam Omnibus Company. Why it should be deemed necessary to issue such a badly-drafted document we cannot understand. Plain facts and figures arranged fairly and with discretion should surely have more weight with investors than the reiteration of absurdly-worded comparisons between the existing omnibus and tramway companies and the 400 *proposed* steam and petrol omnibuses of this new Company. We thoroughly believe in the future of motor omnibuses, and we therefore regret the form in which the London Steam Omnibus Company's prospectus is issued. The directors are all experienced and practical men, and the Company will undoubtedly possess the right to build vehicles of a type to suit the requirements of our suburban traffic; but to capitalise the Company upon the estimated immediate earnings of 400 steam and petrol omnibuses, which have still to be built, is an insult to the common-sense of even the simplest investor. The directors have certainly not been pessimistic in accepting as a basis for estimating dividends the calculation of the accountants that the takings of the Company will amount to £353,600 per annum, such revenue being arrived at by multiplying Mr. Sidney Straker's estimated 400 omnibuses (which he says "should in due course be able to be placed upon the road by the Company") by the average takings of the London General Omnibus Company, viz., £17 per week per omnibus. How Mr. Straker arrives at his calculation that the Company will have funds available to place 400 omnibuses upon the road ("probably 200 of steam and 200 of petrol") we fail to see, even allowing that the entire capital be subscribed, considering the onerous terms of purchase, and as he states his figures are based upon the official report of last year's heavy trials of the French Automobile Club. In this report (*see* The Automotor, p. 135, Vol. II, January, 1898) it will be found the prime cost of a De Dion and Bouton steam bus to carry 16 passengers is 22,000 francs. Allowing, therefore, that the suggested 200 be purchased, these alone would swallow up about £176,000. The terms of purchase referred to are as follows:—

As the consideration for the granting of a license to use certain patents under certain conditions the purchasing Company (the London Steam Omnibus Company) shall allot and issue to the licensors, the British Motor Company (Limited), or their nominees, 21,000 fully paid-up shares of £10 each in the capital of the purchasing Company in ordinary and founders' shares, there being allotted and issued one founder's share for every 20 ordinary shares or cash in lieu of such ordinary and founders' shares, or partly by such fully-paid shares and partly in cash, provided that all subscriptions for shares in the capital of the purchasing Company prior to completion as mentioned in Clause 2 (undertaking to grant license within 50 days of purchasing Company going to allotment), shall be applied as to one-half thereof to working capital for the working of the business and the construction and purchase of omnibuses, and as to the other half thereof to the licensors in reduction of the said purchase-money, and any balance (if any) then remaining unsatisfied shall be satisfied by the allotment and issue on the terms as to founders' and ordinary shares as aforesaid of fully-paid shares in the capital of the purchasing Company to the nominal amount of such balance.

As to the question of value of this license, for which £210,000 is to be paid, in the first schedule to the agreement the British Motor Company are careful to protect themselves by not guaranteeing the validity of any of their patents for which they are granting licenses. The licenses to be granted hold good only so far as the licensors are empowered to grant licenses. Which may mean nothing. Further on they even more clearly protect themselves from guarantee as follows:—"The licensees shall not at any time hereafter dispute or question the validity, utility, or novelty of the said inventions, or any of them, or any letters patent granted in respect thereof, and nothing herein contained shall be deemed or construed as a guarantee or warranty on the part of the licensors of the validity, utility, or novelty of the inventions or letters patent, or that the same, or any of them, are in force or of effect or subsisting." Truly a nice waiver clause to have in an agreement undertaking to pay £210,000 for an article which may turn out presently to have been absolutely valueless at the time of sale. In the face of the price asked, and the many statements as to these wonderful patents, the least the subscribers should receive should be an absolute guarantee of the validity of each patent licensed. Apart from the value of the patent rights and the financial soundness, or the reverse, of the proposed scheme, and ignoring the bombastic padding and extraordinary get-up of the whole prospectus, which savours more of a Richardson's show play bill than a business proposition for business people, a few of the figures and facts set forth are well worth study as giving some idea of the possibilities of the future of automobilism for the people. Thus the recital of the carrying and earning power of the leading omnibus and tramway companies fairly takes one's breath away. There can be little doubt that sooner or later a very large proportion, if not all, of these vast numbers will be conveyed by automotor-vehicles, but considering the unavoidable slowness of the makers in turning out motor-vehicles, we hardly think anything beyond a small percentage of the passengers can possibly be taken away by motor-omnibuses for some years to come, and we feel perfectly certain that such astute gentlemen as preside over the affairs of the present omnibus companies are not likely to allow their business to be entirely appropriated when they can so easily adopt steam and other motive power to their own systems, when they consider they are justified in that step. We certainly believe, if the aims of the London Steam Omnibus Company are carried through to a commercial success, that it will be a great lever to force on the existing horse-omnibus corporations to substitute mechanical traction for the present objectionable method. And, therefore, irrespective of patent rights, if the capital of the London Steam Omnibus Company is subscribed sufficiently to enable the commercial possibilities of mechanical passenger traction to be successfully demonstrated, we shall be glad to congratulate the shareholders upon their investment, the management upon its ability, and not begrudge the promoters of the concern the price obtained, although to our mind it is very far in excess of any sum that should under any conditions be asked, considering the many difficulties and weak points to be overcome, the heavy capitalisation thereby created giving little promise of shareholders *ever* realising a return on their investment. The British Motor Company, if their protestations as to the enormous value of their patents be genuine, should not hesitate to take all their interest in *deferred* shares instead of taking pound for pound *in cash* with the Steam Omnibus Company of all the moneys subscribed by shareholders for the practical purpose of bringing those patents into an earning condition.

The vendors are quite generous when they state that, "with a view to showing their confidence in the future of the business, and in order that the cash subscribers may receive out of the profits of the purchasing Company a dividend on their shares before the vendors' shares rank for dividend, the licensors hereby agree that the fully-paid ordinary shares (if any) allotted to them hereunder shall be deferred as to dividend in the manner and to the extent following, that is to say: No dividend will be payable on the vendors' shares until the business has earned a net profit of more than 6 per cent. upon the capital subscribed and paid up. The vendors' shares are then entitled to dividends until they have received 6 per cent., when all the shares are entitled to rank equally for dividend. After the Company has paid a dividend of 6 per cent. upon its entire issued capital, the distinction between the two classes of shares will thereafter cease."

This is all very well after a sum of over £100,000 in cash (which, at the discretion of the directors, might even be increased to £210,000 in cash) has been provided for. What is wanted is that the "confidence" should be carried a step further, and this £100,000 odd be allowed to remain in the coffers of the Company. If the *whole* of the subscriptions were to be available for working capital, and the vendors or licensors were willing to take the *whole* of their interest in deferred shares, even allowing such shares to take a much larger proportion of profits after the preferred shareholders (otherwise those who find the cash to enable the chestnuts to be taken out of the fire) had been paid a fair percentage, then we should deem it right to recommend our readers to subscribe to what might presently be a very valuable security. As the arrangements and capitalisation now stand, however, we consider the scheme to be of a highly speculative nature, and one hardly to be recommended to widows and clergymen.

The engineers appointed by the Municipality of Paris to conduct the examinations for proficiency in automobilism are MM. Walkenaer and Boschet.

"THE AUTOMOTOR" TESTING LABORATORY.

As we are so frequently consulted by our readers and subscribers, both lay and professional, with regard to new inventions, apparati, materials, &c., used in automobilism, we have decided to undertake the testing of such, and for that purpose are making suitable arrangements. These tests will be carried out by competent persons under the superintendence of our technical editor. The conditions on which we undertake to carry out such tests and our charges for making the same, may be learned by application to the office of THE AUTOMOTOR, 62, St. Martin's Lane, Charing Cross, London, W.C. Communications should be endorsed "Testing Department."

Test of Lubricating Oil.

Messrs. Wells and Co., Oil Works, Manchester, have forwarded us a sample of lubricating oil intended for the cylinders, &c., of motor-vehicles, which we have examined with the following results:—

The colour is orange yellow; the oil is very translucent, and when seen by reflected light has a deep bloom or fluorescence. At the temperature of 16° C. its specific gravity is 25 on the Baumé scale, or ·905 as compared with water. Its viscosity, even at high temperature, is very good. The oil flashes at 215° C., or 420·8° F. At this temperature the colour gradually deepens, but the fluorescence is still maintained, and no nitrous fumes are given off. Within the range of temperatures stated no acid reaction was perceived. The oil is a blended mineral oil, and eminently *well suited for the cylinders of motor-vehicles.*

The Lombard Corrugated Rim.

We have received a sample rim from the Lombard Tube Company, Birmingham. This rim has a series of corrugations formed on its inner periphery, which unquestionably greatly increase the ability to resist distortive stresses, and hence a rim of equal strength with existing types can be produced with a decrease of weight. As we have not subjected this rim to any mechanical test, we are unable to state definitely what the exact economical advantage is.

Bickford's Petroleum Burners.

We have had one of these burners (No. 1 B) for some time under varying tests in a water-tube boiler. The burner is of simple construction, and when fitted up and used according to the maker's instructions it is satisfactory in every way. The feature which especially commends itself to us is the provision of a thermal storage in the shape of iron bars fitted over the burner; when these become red hot, as they do in the course of a few minutes, they materially assist in ensuring perfect combustion, and the result is that when the burner is at work there is a nearly pure, non-luminous blue flame without smoke or deposit; this means, of course, that the combustion is complete. To ensure this result in its most perfect form very careful manipulation of the air-supply and the air-pressure is, however, necessary. We obtained the best result when the air for combustion (properly regulated on entering the furnace) was heated by contact with the hot surfaces, &c., and with the petroleum under a pressure of about 8 to 10 lbs. per square inch. Under these conditions there was no visible discharge from the chimney, the products of combustion being pure carbon monoxide. In the boiler in question steam showed at 20 minutes after the burner was in full operation; in another 25 minutes there was 50 lbs. of steam. In a careful test for consumption, in the first hour, allowing for lighting up and imperfect combustion, 9·35 pints of oil were consumed; in the second hour, with everything fully heated, the consumpt was 9·1 pints. The oil was ordinary burning oil, specific gravity ·820, and flashing at 76° F.

While this burner is unquestionably very efficient, it has certain structural defects which, however, may easily be remedied. We think the vaporiser and the two side tubes should be encased, so as to prevent the fall in temperature of the former which occurs when the fire door is opened, or when too much cold air is admitted. The burner also suffers from the defect common to all this type of burner, and which so far has not yet been remedied in any of them, in that it is somewhat noisy, but not excessively so.

For motor-vehicle and steam-launch work we can recommend the Bickford burner, as it is, if properly managed, very efficient. It is easily manipulated, and cheap to make and repair.

NEW INVENTIONS.

Claiming particularly to apply directly or indirectly to Motor Vehicles, &c.

Compiled for "THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL" by HERBERT HADDAN and Co., Registered Patent Agents, of 18, Buckingham Street, Strand, W.C., London.

Patents Applied For.

Abbreviations: Impts., Improvements in; Relg., Relating to.

1898.			
June	3.	12,454.	J. S. CHRITCHLEY and A. J. DRAKE. Impts. relg. driving gear.
,,	3.	12,461.	J. W. TOWLE. Impts. in fenders for motor-cars, &c.
,,	3.	12,471.	L. COUDAT. Impts. electrically-propelled motor-cars.
,,	4.	12,498.	W. HYSLOP. Impts. relg. driving cranks for mechanically propelled vehicles.
,,	6.	12,654.	H. A. Y. STOAKES. Impts. pneumatic handles.
,,	7.	12,757.	P. A. RENAUX. Impts. driving mechanism.
,,	8.	12,782.	J. R. SCOFIELD, G. D. HUNT, J. W. HUNT, O. HUNT, and J. P. DEGENHART. Impts. in gearing.
,,	8.	12,830.	J. ARNOTT. Impts. ventilators.
,,	9.	12,870.	N. H. JONES and E. P. PHIBBS. Improved handle.
,,	9.	12,888.	J. and J. KENNEDY. Impts. relg. driving gear.
,,	9.	12,935.	W. R. WYNNE. Impts. signalling and controlling apparatus.
,,	11.	13,066.	D. SMITH. Intermediate variable driving gear.
,,	11.	13,117.	A. J. BOULT (J. Frankel). Impts. relg. motors and motor-vehicles.
,,	14.	13,281.	R. W. SMITH. Manufacture of front fork crown heads.
,,	15.	13,374.	R. EGG. Impts. motor-driven street vehicles.
,,	15.	13,397.	W. J. BREWER and J. E. COOPER. Impts. automotor cars.
,,	16.	13,415.	E. J. CURTIN. Impts. relg. working of cycles, motor-cars, &c.
,,	17.	13,539.	E. E. BRAND. Impts. wheels and frames.
,,	17.	13,555.	A. F. SPOONER (F. Bouilly). Impts. motor-cycles.
,,	18.	13,584.	J. W. GLOVER and T. GREEVES. Impts. motor-vehicles.
,,	18.	13,624.	G. F. REDFERN (Brouhot and Co.). Impts. motor-vehicles.
,,	20.	13,684.	E. N. STONEY and A. SHARP. Driving gear.
,,	20.	13,704.	C. T. B. SANGSTER. Impts. carburetters for oil engines.
,,	20.	13,705.	C. M. LINLEY and C. T. B. SANGSTER. Impts. variable speed gear.
,,	21.	13,750.	J. G. A. RHODIN. Impts. relg. autocycles, &c.
,,	22.	13,899.	W. R. LAKE (La Compagnie Française des Cycles). Impts. friction clutch mechanism.
,,	23.	13,924.	J. HUTTON. Power transmission gearing.
,,	24.	14,006.	J. T. ELLIS. Inflated rubber appurtenances.
,,	29.	14,315.	E. HENRIQUEZ. Impts. motor-carriages, &c.
,,	29.	14,352.	E. FRANCIS and P. ANGOIS. Application of liquefied gases for propulsion.

Specifications Published.

THE following is a List of Specifications recently published, and obtainable at the Patent Office, 25, Southampton Buildings, London, W.C., at the uniform charge of 8*d.* per copy. Owing to the enormous pressure upon our columns it has been found impossible to deal in any other form with the accumulation of patents now being taken out in connection with automobilism. As far as possible, a selection for special mention is made by the Editor from the more prominent inventions:—

Applied for during 1897.

12,924. W. P. THOMPSON (B. Loutzky, Nuremburg, Germany). Four-stroke cycle motor.

13,511. J. R. ARKLE, Meldon Park Farm, Morpeth, Northumberland. Hubs.

17,085. J. RIDGE, Selborne, Hassocks, Sussex. Apparatus for indicating or recording distance, time, and fare.

28,205. H. P. MAXIM, 1, Columbia Street, Hartford, Conn., U.S.A. Running gear and frames.

45. G. H. MIDDLETON and G. MACBETH, 53, Oliver Street, Birmingham. Hubs.

2,378. W. ROWBOTHAM, 27, Vittoria Street, Birmingham. Primary batteries.

8,547. J. E. THORNTON and J. P. LEA, Rokeby, Oldfield Road, Altrincham. Heated compressed-air motors.

8,663. A. HOLMES, Portland Road, Newcastle-on-Tyne. Dynamo-electric machines, or electric motors.

10,042. T. W. NAYLER, Friar Street, Hereford. Mechanism for axles.

10,801. J. SPIEL, 85, Thurmstrasse, Berlin. Incandescent wick burner for liquid fuel.

10,968. W. A. STEVENS and R. A. BARKER, Victoria Works, Maidstone. Governors.

13,032. R. O. Allsop, 37, Norfolk Street, Strand, London. Starting apparatus.
13,309. M. H. Smith, 47, Victoria Street, Westminster, London. Steering apparatus.
13,559. J. Robertson, 412-424, St. Vincent Street, Glasgow. Tyres.
9,276. W. Rowbotham, 24, Harleyford Road, Vauxhall, London. Primary batteries.
9,463. T. Klaus, 103, Route de Versailles, Billancourt, France. Motor-vehicles.
11,861. O. Lindner, 41, Rue Gallait, Brussels. Accumulators.
12,957. A. Muller and H. Tudor, 90, Bergstrasse, Hagen, Germany. Transforming alternating into continuous electric currents, or *vice versâ*.
12,985. G. H. Middleton and G. Macbeth, 53, Oliver Street, Birmingham. Hubs.
13,113. J. Spiel, 85, Thurmstrasse, Berlin. Burners for liquid fuels.
13,402. R. R. Symon and H. A. House, 20, Abchurch Lane, London. Tubulous steam boilers.
13,988. G. G. Hunt, Britannia Works, Wharf Road, London, N. Vaporisers and igniters.
9,107. E. Rossel, 12, Rue des Sarrazins, Lille (Nord), France. Autonotor road vehicles.
9,460. L. Renault, 14, Place de Laborde, Paris. Fluid pressure generators.
9,963. A. H. L. Grivel, 6, Rue des Poissonniers, Neuilly (Seine). France. Carburetted air or internal combustion engines.
10,080. R. R. Symon and H. A. House, jun., 20, Abchurch Lane. E.C. Driving gear.
10,081. R. R. Symon and H. A. House, jun., 20, Abchurch Lane, E.C. Steam or other heat engines.
10,097. C. E. Henroid, 23, Franch Street, Bienne, Switzerland. Internal combustion engines.
11,547. W. H. Casley and A. F. Woodman, 97, Paris Street, Exeter. Hydrocarbon motors.
11,619. P. S. Pilcher, Artillery Mansions, Victoria Street, London. Engines actuated by mixed products of combustion and steam.
14,255. A. A. Common, 63, Eaton Rise, Ealing, W. Power-driven road vehicles.
14,455. H. C. Capel, 168, Dalston Lane, London, N.E. Gas engines.
14,559. J. Simpson, Brachead, Whins of Milton, Stirling. Instantaneous steam generators.
10,519. C. M. Johnson, Broad Street House, London, E.C. Reduction of smell and visible vapour from the exhaust of oil and other explosion motors.
11,334. J. Vaughan-Sherrin, 28, Victoria Street, London, S.W. Electric ignition devices.
11,801. J. Fielding, Upton St. Leonards, Gloucestershire. Vaporising and igniting device.
28,161. V. H. Ernst, 705, Summit Avenue, Jersey City, U.S.A. Steam motors.
10,421. C. Powell, 75, Wiltshire Road, Brixton, London, S.W. Driving gear.
12,117. A. J. Pool, Elmsgreen, Chipstable, Somerset. Explosion engines.
12,225. W. B. Thompson, Thornbank, Dundee. Motor-cars and the traction of vehicles.
13,019. F. J. Gibbs and W. Wright, 70, Lower Hurst Street, Birmingham. Lugs or joining sockets of tubular frames.
13,196. J. Gardner, Marine View, Knott End, Fleetwood, Lancs. Chain gearing.
10,804. W. Baines and others, 5 and 6, Great Winchester Street, London. Motor or power-driven cycles or other vehicles.
10,961. J. F. Sargeant and F. Longhurst, Holly Bank, Bracknell, Berks. Handle bars.
11,375. R. E. B. Crampton, Mansion House Buildings, London. Means for attaching crank axles and pedal spindles.
11,951. M. A. Lamy and C. Richard, 36, Rue la Bouyere, Paris. Internal combustion engine.
11,221. Nave. Electric road-vehicles.
13,003. F. Henriod-Schweizer, Marin, Neuchatel, Switzerland. Self-propelled vehicles.
13,020. F. J. Gibbs and W. Wright, 70, Lower Hurst Street, Birmingham. Parts of motor-carriages.
15,147. A. Heinemann and W. Schafer, 78, Koniggratzer-strasse, Berlin. Accumulators.
15,870. A. Muller and H. Tudor, 31a, Luisenstrasse, Berlin. Electrical propulsion.
16,411. N. Seunier, 96, Rue de Longchamp, Paris. Hydrocarbon motor.
17,127. E. Petreano, 95, Boulevard Beaumarchais, Paris. Gas and hydrocarbon engines.
20,145. A. Lehmann and A. Mann, 46a, Georgenstrasse, Berlin. Accumulator plates.
14,126. F. J. Wich, 15, Clyde Road, Didsbury, Lancs. Speed recorder.
14,288. G. E. Davis, District Bank, Ludlow, Salop. Lamps.
14,766. A. Whittall, 4, Comberton Terrace, Kidderminster. Metallic rims for wheels.

1898.

2,757. G. Bapst and A. Greler, 5, Rue Scribé, Paris. Petroleum or gas engines.
686. H. A. Bertheau, Bibliotheksgatan, No. 1, Stockholm, Sweden. Gas and petroleum engines.
1,671. J. H. Kirk and J. W. Jeffs, Jessamine Villa, Orchard Road, Erdington. Frames.
2,332. J. S. V. Bickford, Camborne, Cornwall. Oil vapour burners.
2,013. E. Capitaine, Frankfurt-on-the-Main, Germany. Lamp for heating the vaporiser and ignition tube of oil engines.
2,195. F. Tentschert, V. Franzengasse 18, Vienna. Motor-engine mechanism.
4,743. Leigh (B. J. X. Gosselin, 12, Rue de St. Quentin, Paris). Gas and petroleum motors.
3,993. A. J. Boult (Société Nouvelle des Établissements Decauville Aine. 13, Boulevard Malesherbes, Paris). Electric ignition devices.
3,483. F. F. Swain, 280, Saint Water Street, Chicago, Illinois, U.S.A. Metallic packing.
4,261. C. A. R. Mansfeldt, 36, Pollard Street, South Shields. Metallic packing.
3,992. A. J. Boult, La Société Nouvelle des Etablissements Decauville Ainé, 13, Boulevard Malesherbes, Paris. Carburetters.
3,991. A. J. Boult, La Société Nouvelle des Etablissements Decauville Ainé, 13, Boulevard Malesherbes, Paris. Motor road-vehicles.
5,570. J. T. Johnson (A. L. Riker, New York, U.S.A.). Self-propelled vehicles.
6,947. G. E. Whitney, 88, Falcon Street, East Boston, Mass., U.S.A. Motive-power engines.
155. F. Alsina, 16, Rue Codols, Barcelona, Spain. Apparatus for regulating explosion-engines.
6,721. R. Demeuse, Brussels, Belgium. Motor-cars.
2,156. Holt. Lubricators.
5,712. W. S. Sargeant, Strand-on-the-Green, Chiswick, London. Oil-vapour burners.
6,764. H. H. Lake (A. de Forselles, 1, Boulevardsgatan, Helsingfors, Finland). Vaporising burners.
6,961. J. J. Tonkin and J. Eaton, 25, Cortlandt Street, New York, U.S.A. Steam boilers.
8713. B. McInnerney, 619, S. 16th Street, Omaha, U.S.A. Generators for electrical igniters in gas or like engines.

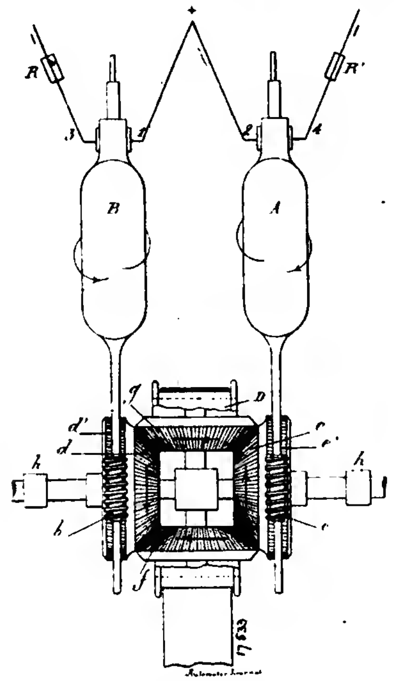
17,533. Differential Gear. G. R. Blot, 16, Rue Drouot, Paris. July 26th, 1897.

Relates to differential gear so arranged as to give facilities for starting, stopping, reversing, or varying the speed of a machine, especially such as are employed to drive motor-cars or vessels.

For this purpose a pair of engines or electric motors, each of which can have its direction of movement, power, and speed independently varied, are connected by suitable gear each to a bevel wheel, these two wheels facing each other and free on one shaft, on which is also mounted between them, free to turn, a drum, sprocket wheel, or toothed wheel, from which motion is conveyed by belt, chain, or gearing to the machine, motor-car, or vessel. Within this drum or wheel, on radial axes, are mounted two bevel pinions both in gear, with both the bevel wheels.

When both bevel wheels revolve with equal speed in opposite directions driving the pinions, the drum or wheel in which they are mounted remains at rest, but when the relative speed or direction of the bevel wheels is varied, then the drum or wheel containing the pinions is driven in the one direction or the other with a speed depending on the relative speeds of the two bevel wheels.

B and A indicate two armatures of electro-motors driven in opposite direction, their commutators having the brushes, 1, 2, connected to the + terminal, and 3, 4, connected to the − terminal of a source of electricity, the velocities of the armatures being varied as required by rheostats, R, R[1]. On the axes of the armatures are



worms, b and c, gearing with worm wheels, d^1, e^1, attached to bevel wheels, d, e, which gear with pinions, f and g, mounted on axes within a drum, D, which drives a belt or might be toothed to drive a chain, or it might be connected by gearing to the machine to be driven. A modified form is also described and shown.

6,947. Motive Power Engines. G. E. Whitney, 88, Falcon Street, East Boston. March 22nd, 1898.

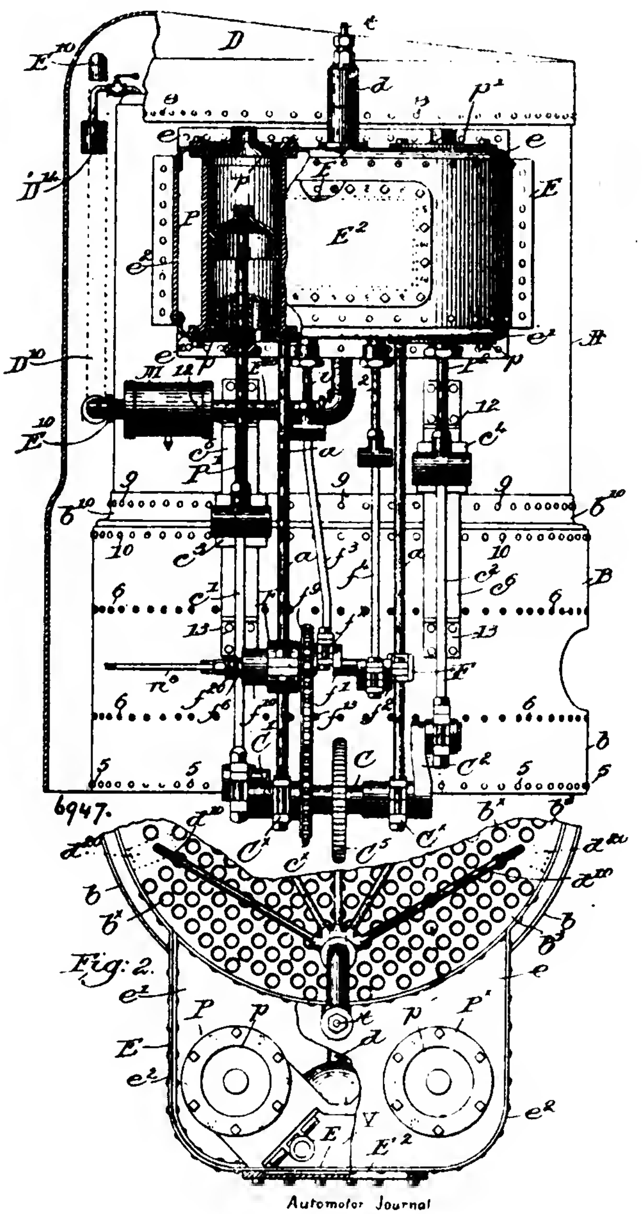
Relates to motive power engine particularly adapted as a motor for a road vehicle, and consists mainly of an upright steam boiler comprising a fire chamber, water leg, and shell, the water leg having inner and outer walls joined at their lower ends and forming the sides of the fire chamber, the outer wall being a continuation of said shell, a lower tube head attached to the inner wall of the water leg and forming the top of the fire chamber, an upper tube head attached to the upper portion of said shell, fire tubes constituting a rigid connection between said heads within the boiler shell, and communicating with the fire chamber, the tubes being composed of a material having a different rate of expansion from that of the material of the shell, and an expansion member interposed between the parts of the boiler which support the tube heads, whereby the difference of expansion between the parts joining the peripheries of the said heads and the tubes joining the interior portions of the heads is permitted without injury. A jacket surrounds the engine cylinder and is secured to the boiler shell, said jacket communicating with the interior of the boiler, an independent steam supply connection between the cylinder and the boiler being provided, whereby the hot water and steam may circulate around the cylinder and valve chest. The cylinder heads are externally removable and adapted to be secured to the cylinder ends.

The engine is mounted externally on the boiler, and comprises its cylinder and main shaft, the beforesaid jacket surrounding and supporting the cylinder and secured to the boiler, bearings for the main shaft, a support for said bearings laterally rigid and adapted to yield vertically, and secured to the boiler shell, and upright brace rods rigidly connecting said bearings and cylinder.

A plurality of tubular branches in the upper part of the boiler lead to a single inlet to the throttle from different points of the upper tube head, and communicate with the steam space, whereby passage of water to the throttle is prevented.

Baffle plates are provided below the tube head and the inner ends of the branches.

A lever connected with the throttle has a fixed fulcrum and a toggle is used, one arm of which is jointed to said lever, the other arm having a fixed fulcrum, and means connected with the joint of the toggle, to straighten or break the latter and thereby rock the throttle actuating lever.



A flue is provided for the escape of the products of combustion, a steam exhaust pipe leading from the cylinder and opening into said flue, and a muffler and pressure equaliser in said pipe between the cylinder and the flue, whereby the exhaust of the steam into the flue is made continuous instead of intermittent, and the steam, or particles of water condensed therefrom is dried and made invisible.

A removable cover is provided for an opening in the jacket adjacent the valve chest, whereby access may be had to either the valve chest or cylinder while the steam in the boiler and in the jacket surrounding the cylinder and valve chest is under pressure.

9,107. Automotor Road Vehicles. E. Rossel, 12, Rue des Sarrazins, Lille (Nord), France. Date claimed, September 11th, 1896. Date of application, April 9th, 1897.

This invention relates to a system of automotor car driven by a petroleum or other engine. The framing of the vehicle is constructed of a double frame of very light steel tubing to which are fixed the engine, A, and the whole of the propelling mechanism contained in boxes, B and C. The carriage body, which is independent of the framing and can be easily dismounted, is secured to the frame by means of six bolts.

The engine, A, preferably of the Daimler oil-engine type, drives, through a friction clutch, E, a central wheel which is in constant gear with four satellite wheels carried by two discs concentric to the central wheel, and capable of revolving about their centre or of being momentarily rendered stationary by the driver by means of a handle, D, placed near the steering handle. Four other wheels are respectively in one with the four wheels previously mentioned, the whole being arranged in such manner that the pitch circles of these latter wheels shall touch the inside of a circle, which is also concentric with the central wheel. Another wheel is keyed upon an intermediate shaft parallel to that of the engine whose pitch circle touches externally the circle, and upon the same shaft is keyed a bevel pinion in gear with a similar wheel keyed on the shaft of the balance gear, T, upon whose opposite ends are keyed sprocket pinions, U, which drive, through endless chains, sprocket wheels, V, fast on the rear driving wheels.

X is a hand lever for acting on brake straps passing round drums, Y, for braking the driving wheels, and Z is a pedal which operates another brake strap acting on a drum, *a*. on the balance gear shaft. On applying one or other of these brakes the clutch, E, is at the same time acted on for throwing the engine out of gear with the driving mechanism. The engine may be slowed momentarily by means of a third hand lever, *b*, acting on the regulator for obtaining speeds intermediate of those afforded by the four combinations of the train of gearing before described. The hand levers, *b*, D, X, are grouped around the steering handle, *d*, as shown, so as to be within reach of the driver, who is thus enabled to instantly and easily execute any manœuvre necessary for the proper working of the vehicle.

The steering handle, *d*, acts on the steering wheels, which swivel on independent pivots through connecting rods and an elbow lever. The fore part of the vehicle is supported upon a single cross spring, *i*, fixed to the lower member of the framing by a horizontal axis, *j*, parallel to the longitudinal axis of the vehicle. The two ends of the spring are connected to the axle by straps, *k*. The axle is connected in the horizontal plane to the framing of the vehicle by two connecting rods, *l*, having ball and socket joints, so that the axle is free to oscillate on axis, *j*, the motion being limited by the spring, *i*, through the straps, *k*, and the axle being guided in a vertical direction by the two universal jointed connecting rods, *l*.

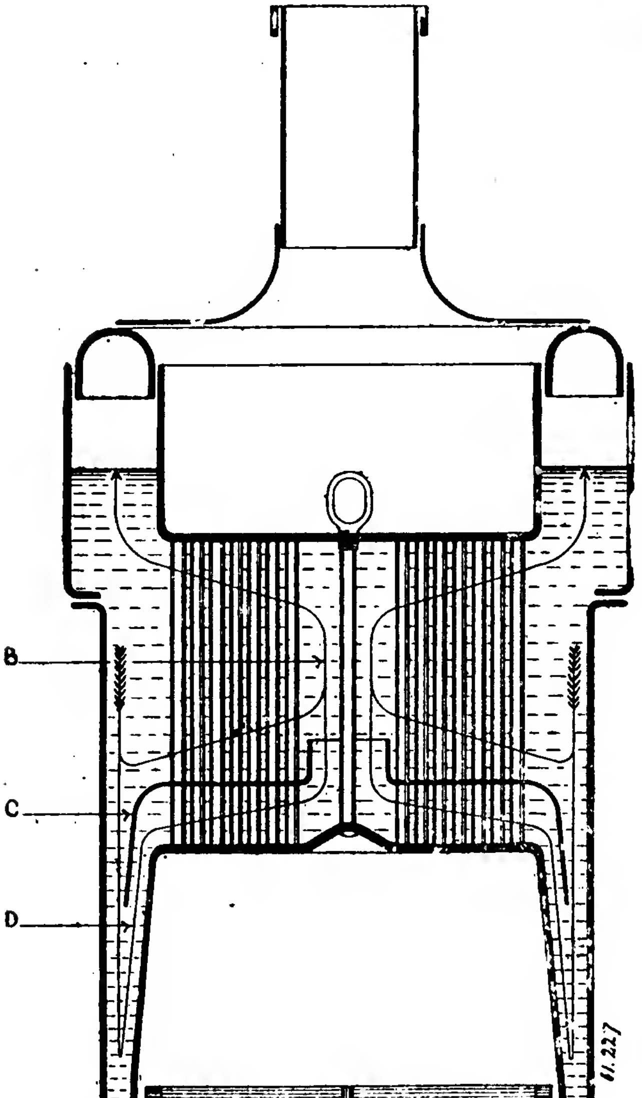
A petroleum tank, e, is placed at the front of the vehicle which is is in direct communication with a constant level carburetter from which the engine is supplied; *f* is a tank containing water for cooling the engine cylinders, for which purpose a small centrifugal or other pump, *g*, driven from clutch, E, by a friction pulley, *h*, is employed for producing a circulation of water around the cylinders and expelling the heated water into the double tubular framing of the vehicle, which serves as a cooler and whence the water is returned to the tank, *f*, and to the engine. A winch handle, *m*, serves for starting the engine through the sprocket wheels, *n*, *o*, and endless chain, *p*.

11,227. Steam Boilers. L. J. Todd, 25, Brooke Road, Stoke Newington, Middlesex. May 5th, 1897.

This invention relates to that class of steam boilers in which there is a firebox in the lower part, from the roof of which fire tubes are carried upwards to a smoke-box, which may be either wet or dry, at the top of the boiler.

The fire tubes are arranged in the furnace roof in an annular manner, so as to leave a large space in the centre of the boiler free from tubes. Then, in the water space of the boiler, a little distance above the top of the furnace, is placed a circulating plate, pierced with holes for the tubes to pass through, and which turns upwards with a large opening into the central space which is free from tubes. When a dry smokebox is used, a deflector is placed in the upper part of the open central water space.

The circulating plate may either be flat, or may be coned upwards from the circumference to the central or other discharge hole; and if desired, may be made to partly surround the sides of the furnace, in addition to covering the top of the same.

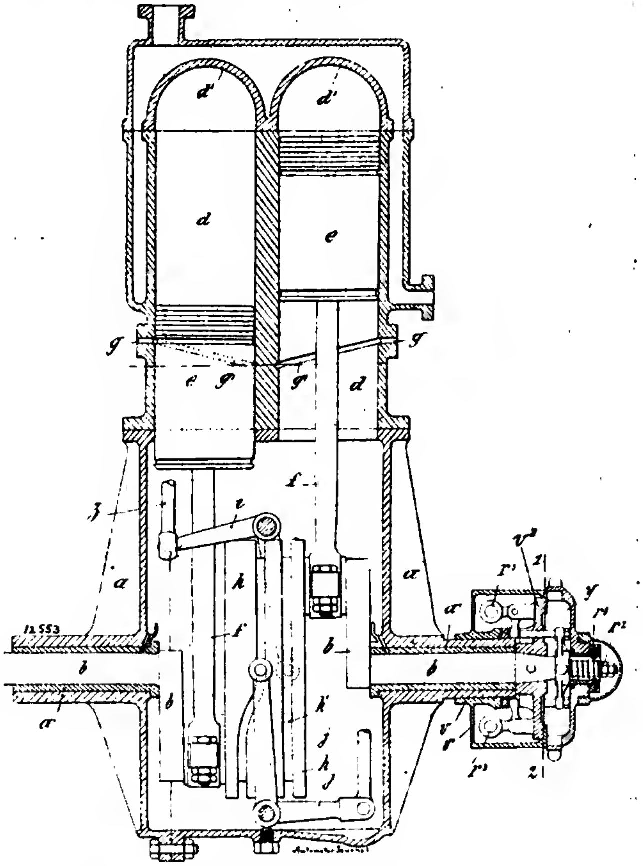


With this boiler a circulation of water, directly over the roof of the furnace crown towards the central or other open space, commences whenever the fire is lighted. And as the heat increases the circulation becomes more rapid, until, with a hot fire, a violent stream of water washes over the furnace top, and pours up the central or other space, until, when meeting with its deflector, it is thereby compelled to spread laterally amongst and throughout the tubes. The lower part of the tubes are thus first washed transversely with a rapid current advancing towards the central or other open space, and are then again washed transversely by the same current returning from the central or other open space towards the outer part of the boiler.

12,553. Petroleum and Like Motors. E. Rossel, 82, Rue des Sarrazins, Lille (Nord), France. May 20th, 1897.

The motor comprises in principle a frame, *a*, formed by two halves of a box united by a tight joint, and together forming an hermetic box or case, in which are provided two bronze sockets or bearings, a^1, through which passes the driving-shaft, *b*. This box is partially filled with oil, which whilst the motor is acting is projected upon the internal walls by centrifugal action, thus ensuring the lubrication of the driving-shaft, the pins, the connecting-rods, and of the different distributing parts, and likewise the partial lubrication of the cylinders and pistons, such lubrication being further provided for by means of a special arrangement which is hereinafter described.

Upon the frame, *a*, are fixed the cylinders, *d*, closed at their upper portions by spherical ends, d^1, which are in one piece with the admission and discharge valve chambers. These valve chambers, the



spherical ends and the upper portion of the cylinders, in which the explosion of the explosive mixture takes place, are entirely surrounded by a water-jacket, in which the circulation is maintained in any convenient manner, and in suitable conditions for keeping the cavities around which it passes at the most appropriate temperature for ensuring the efficient working of the motor.

In the cylinders, *d*, slide the pistons, *e*, provided with segmental parts, and which transmit their motion to the driving-shaft, *b*, by means of the two connecting-rods, *f*.

The lubrication of the cylinders and pistons is completed by means of one or more lubricators communicating with the tubes, *g*, and distributing their oil all round the piston through an inclined transverse groove, g^1, formed upon the inner face of the cylinders; this oil completely lubricates the cylinder, as it is carried along by the two further grooves or channels formed upon the two extremities of the pistons.

The motor is of the four-cycle type, and has two cylinders with cranks placed at 180°. The admission valves of this motor are automatically actuated, and the escape valves are governed by the assemblage consisting of the rods, *z*, the levers, *i*, *j*, and the pulley, *k*, which latter is fixed upon the crank-shaft.

The suction of the explosive mixture is effected by the piston itself; in descending it produces a vacuum above it—the valve rises under the influence of the atmospheric pressure, and allows the mixture arriving by a pipe to pass. During its return, the piston compresses the explosive mixture and closes the admission valve, which is held upon its seat by a spring of suitable tension.

Immediately after this compression the explosion is effected by means of a platinum tube raised to incandescence by a burner of any appropriate description. This tube is fixed by a union upon a second tube of steel, which is screwed in the wall of the valve chamber and opens near to the admission valves in proximity to the inlet for the mixture of fresh gas.

During the second return stroke, the gases are expelled through a valve, and are conducted through a tube into discharge receivers suitably arranged in order to prevent noise and to completely reduce the pressure of the gases before discharging them into the open air. These discharge valves are raised by the two vertical rods, *z*, which are actuated by the two bent levers, *i* and *j*, whose oscillatory motion is produced by the groove, h^1, formed upon the circumference of the pulley, *h*, and by means of the two parts sliding in the said groove. As this groove passes twice round the pulley before returning to its point of departure, the vertical rods only act upon the valves upon every second revolution.

A centrifugal governor placed upon the driving-shaft, *b*, actuates a lever which acts upon the horizontal rod placed in front of the cylinders, and causes by its displacement from left to right the rise of the extremity of pawls, which thereupon engage in the notches formed in the corresponding parts, and force these parts to turn around their respective axes upon the rising of the vertical rods, and thus prevent these rods from causing the discharge valves to open.

The centrifugal governor is regulated for a predetermined normal speed by means of the spring, r^1, and nuts, r^2. When this normal speed is exceeded the balls, r^3, separate from the axis and push from right to left the sleeve, *v*, which slides upon the socket, a^1, of the frame acting upon the lever, *s*, which prevents the discharge valves from rising.

Upon the back of the plate, v^2, carrying the governor, and which is keyed upon the driving-shaft, is arranged a pawl movable around its axis; this pawl tends, under the influence of a spring, to gear with a ratchet-wheel, *y*, having four internal teeth. This wheel, which is loose upon the driving-shaft, is capable of receiving, either by means of a handle or by means of a chain and pinion, a rotary motion in the same direction as the motor; this motion is transmitted to the shaft by the pawl, and, when an explosion takes place, the motor starts and the pawl, which turns with the driving-shaft, disengages itself under the influence of centrifugal force, whilst the wheel, *y*, remains at rest.

One device for the regulation of the admission valves comprises a pinion fixed upon the driving-shaft and driving a wheel on a shaft parallel to the driving-shaft upon which second shaft moves a sleeve having two cams upon which the vertical rods constantly bear by means of the rollers, and an articulated lever which lifts the rods of the admission valves.

The cam sleeve is displaced by the action of the governor. When working at a normal speed, the cams raise every second revolution each of the admission valves. If this speed is exceeded, the governor displaces the cam sleeve, the rollers bear against the cylindrical portion, the rods are no longer raised, no explosive mixture is introduced into the cylinders, and the motor resumes its normal speed.

7,479. Variable Speed Apparatus. J. W. Hall, 1, Wiltshire Road, Brixton, Surrey. April 8th, 1896.

The apparatus consists of a disc fitted on the end of a short shaft which rotates in suitable bearings, and round the face of the disc are fitted several force pumps or cylinders, the connecting rods of the pistons or plungers of which are operated or driven by the engine shaft either direct by a crank, or by gearing. The pumps draw the working fluid from a casing which surrounds the disc and delivers it into a central hole in the short shaft, and motion is given to the vehicle by suitable gearing from this shaft. When the outer end of the hole in the shaft is open, the pumps will deliver their fluid without resistance, and therefore the disc and shaft will remain at rest, but when it is closed by a valve, the pumps will be unable to deliver their contents, and therefore the disc and shaft will be compelled to rotate, and so give motion to the vehicle, the rate of speed depending on whether the shaft hole or pump delivery is wholly or partly closed.

On the end of the short shaft opposite to that which carries the disc is fixed radially to the shaft preferably three or more cylinders which rotate with the shaft, the connecting rods of their pistons being connected to a crank which is fixed, the cylinders revolving instead of the crank.

These cylinders are of greater collective capacity than the total capacity of the pump cylinders, according to the number of times it is desired to gear the revolutions of the disc and shaft below the speed of the engine shaft.

The valves for the distribution of the working fluid to the large cylinders can be worked by an eccentric on the fixed crank-shaft above mentioned, and the passages for the flow of working fluid from the small to the large cylinders can be made through the body of the short shaft.

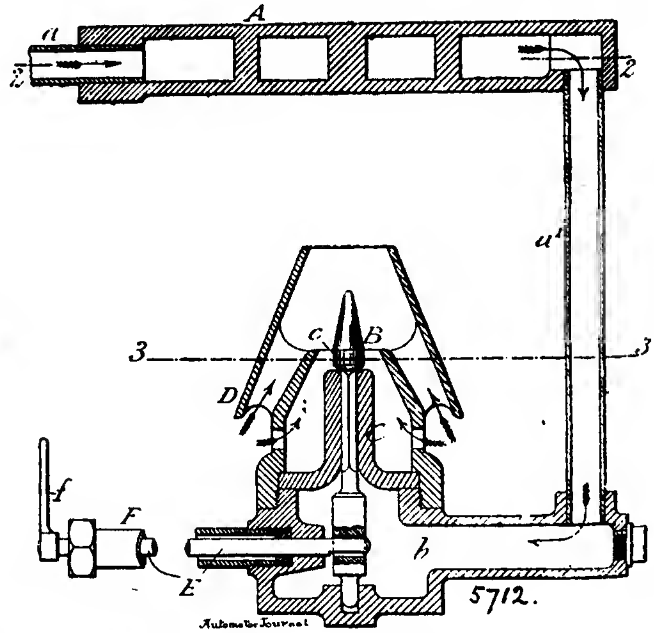
For the purpose of completely stopping or partly slowing down the motion of the vehicle an arrangement may be used to allow the working fluid to pass away from the pump cylinders without doing work on the vehicle, or the valves of the large cylinders may be so fitted as to allow the fluid to pass them without doing work, and when the hill climbing gear is not in use.

This invention may be used for gearing up instead of or in addition to gearing down.

5,712. Oil Vapour Burners. W. S. Sargeant, Strand-on-the-Green, Chiswick, London. March 8th, 1898.

Relates to a burner for the combustion of oil vapour generated by the heat of the burner itself.

A is the vaporiser supplied with a regulated quantity of oil, which enters by the pipe, *a*, and becomes vaporised as it takes a zigzag



course, the vapour descending from an outlet at the opposite end by a pipe, a^1, to a space, *b*, below the burner, B. This burner comprises a central tube, C, through which passes the squared or longitudinally grooved stem of a valve, *c*, and the tube, C, is surrounded by a shield, D, having inlet for air entering as indicated by the arrows. In the lower part of the valve stem there is a slotted hole, in which is engaged the eccentric end of a spindle, E, which extends along a tube, F, and through a stuffing box, and terminates in a handle, *f*, by which it can be turned.

The vapour ascending from the space, *b*, up the tube, C, issues between the valve, *c*, and its seating, and, being ignited while it mixes with the air, forms a flame which heats the vaporiser, A, and, passing upwards around it, serves to heat a boiler or other body situated above the vaporiser.

By turning the handle, *f*, the valve, *c*, can be raised or lowered a little, so as to increase or diminish the flame as may be required.

THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL

A RECORD AND REVIEW OF APPLIED AUTOMATIC LOCOMOTION.

Circulates amongst Makers and Users of Motor-Cars, Cycles, etc., in the United Kingdom, the Colonies and the Continent.

VOL. II. No. 23. AUGUST 15TH, 1898. PRICE SIXPENCE.

CONTENTS.

THE PARIS-AMSTERDAM-PARIS MOTO-VEHICLE COMPETITION.

ORGANISED by the Joint Committees of the French and Belgian Automobile Clubs, this procession of motor-vehicles from Paris to Amsterdam and back has involved much labour and difficulty in bringing to a successful issue. At one time it seemed as though the idea of such a competition would have to be abandoned, owing to the difficulties in selecting the routes and the generally indifferent nature of the roads in Belgium. However, thanks to the indefatigable labours of the Committees, roads were repaired in places, and arrangements for accommodation, stores, supplies, repairs, &c., made. In the early stage of the idea it was proposed to race to Amsterdam, but clearly a race in the ordinary acceptance of the word was out of the question, as being not only attended with considerable risk in consequence of the state of the roads, but it was also at variance with the legal regulations obtaining in many towns as to the speed of vehicles, these regulations being much more drastic in Holland and Belgium than in France, and also extremely primitive in their character. Thus the question of what constitutes excessive speed is not determined by the number of units of length passed over in a unit of time, as with us, but by comparison with the performances of a local cart-horse. Thanks, however, to the influence that the two Clubs were able to exert in high places, the local authorities considerably relaxed their regulations and in other ways facilitated the success of the competition. It was found, too, that while many automobilists were desirous of participating in the competition, yet they were not disposed to indulge in racing; hence the competition was resolved into two parts—the one comprising those who wished to cover the ground in the least time, and the other those who desired to make it a tour. In the first (that is, for the race) there were 62 entries, and in the second (for the tour) there were 32.

The vehicles entered were divided into three separate classes, and these were subdivided into groups. Class A was for vehicles entirely propelled by mechanical means, and having at least seating capacity for two people. This class included three groups, the first being those vehicles having a seating accommodation for two persons, the second those seating four or five persons, and the third those carrying six or more persons.

Class B comprised motocycles. These vehicles had to be mechanically propelled, with or without the adjunct of muscular effort; the weight empty, without passengers or stores, being limited to 200 kilos = 440 lbs. In this class there were four groups: the first including motocycles weighing less than 220 lbs. empty, and fitted for one passenger; the second, motocycles also weighing less than 220 lbs., but fitted for more than one passenger; the third, motocycles weighing from 220 to 440 lbs., and carrying one person; and the fourth for motocycles of this weight, but fitted for carrying several persons.

Class C comprised those vehicles which could not be included in the two previous classes.

Such a great distance between the two capitals necessitated the race, or, more correctly, the procession, being divided into stages; the programme finally arranged was:—Leaving Paris on July 7th, the first stage was Champigny, Villiers, Jorsequy, Coulommiers, Montmerail, Champaubert, Epernay, Reims, Rocroy, Fermoy, Givet, Giergnon, Ardenne—distance, 199·6 miles. The second stage, on July 8th, was Ardennes-Nymèque, a distance of 165 miles. The third stage, on July 9th, was Nymèque-Amsterdam—distance, 68·5 miles. The fourth stage, on July 10th, included excursions in the neighbourhood of Amsterdam, but on this date the first stage for the return journey was arranged—it was Amsterdam-Liège—distance, 179·0 miles. The sixth stage was, on July 11th, Liège, Luxembourg, Verdun—distance, 164 miles; and on the 12th the final stage was Verdun, Chalons-sur-Marne, Melun, to Paris (Porte Maillor)—distance, 193 miles, the total distance being 943 miles corrected.

The following table contains the particulars of the vehicles arranged according to their classification. The first part relates to the vehicles entered for the race, and the second part those which were entered for the tour:—

2 L 4

List of Vehicles taking part in Race.

Official No.	Name of Owner.	Name of Builder.	Motor. Type.	Motor. Power.
	Class A, Group 1.—*Vehicles carrying two or three persons.*			
1	Charron	Panhard et Levassor	Phénix	8
2	Gilles Hourgières ..	„ „	„	8
3	Clément	„ „	„	8
4	Ed. Adam	„ „	„	8
5	Leys	„ „	„	6
6	De Knyff	„ „	„	8
7	E. Voigt	„ „	„	6
8	Heath	„ „	„	6
9	Balacéano	„ „	„	6
10	G. Vinet	Amédée Bollée	A. Bollée	8
11	Ed. Gaudry	„ „	„	8
12	Baron de Dietrich ..	„ „	„	6
13	Baron Turckoim ..	„ „	„	6
14	René Loysel	„ „	„	8
15	Vicomte de la Combe..	Panhard et Levassor	Phénix	6
16	Lord Carnarvon ..	Peugeot	Peugeot	6
17	Antony	„	„	6
19	Soc. Anon. Peugeot ..	„	„	8
20	„ „ „ ..	„	„	8
21	„ „ „ ..	„	„	8
30	Vallée	Vallée	—	6
31	A. Bollée fils	Amédée Bollée	A. Bollée	
33	Georges Richard ..	Georges Richard	Richard	5
34	Sté. Georges Richard..	„ „	„	5
36	Breuil	Peugeot	Peugeot	8
46	Roscoff	Mors	Mors	6
47	Docteur Pascal ..	Panhard	Phénix	8
49	Levegh	Mors	Mors	6
50	Chesnay	„	„	6
51	Vital - Bouhours et Duret	Georges Richard	Richard	4
52	Duchan	Panhard	Phénix	6
53	Soc. Cont. Automobile	Gauthier et Wehrlé	G. Wehrlé	6
54	„ „ „	„ „	Benz	
56	Maison Parisienne ..	Maison Parisienne	„	6
57	Delahaye	Delahaye	Delahaye	6
63	V. Popp et fils.. ..	Victor Popp	E. Lacoste	8
64	Roch, Brault et Cie. ..	Soc. Franco-Belge Automobile	Wincke	7
67	Automobiles Léo ..	Automobiles Léo	Pygmée	9
	Class A, Group 2.—*Vehicles carrying four or five persons.*			
22	Soc. Anon. Peugeot ..	Peugeot	Peugeot	8
35	Jacques Marcel ..	Panhard et Levassor	Phénix	8
38	Broo	Mors	Mors	8
45	De Dion et Bouton ..	De Dion et Bouton	De Dion et Bouton	
48	Vicomte de la Barre de Nanteuil ..	Amédée Bollée	A. Bollée	9
53	Soc. Cont. Automobile	Gauthier et Wehrlé	G. Wehrlé	
58	Delahaye	Delahaye	Delahaye	6
62	Vicomte Popp et fils ..	Victor Popp	E. Lacoste	8
65	Maison Parisienne ..	Maison Parisienne	Benz	6
68	Automobiles Léo ..	Automobiles Léo	Pygmée	
	Class A, Group 3.—*Vehicles carrying six persons, or over.*			
66	Maison Parisienne ..	Maison Parisienne	Benz	9
	Class B, Group 1.—*Motocycles weighing less than 220 lbs., and carrying one person.*			
18	De Santos Dumont ..	De Dion et Bouton	De Dion et Bouton	$1\frac{3}{4}$
27	Vicomte Gaétan de Meaulne	„ „	„	$1\frac{3}{4}$
39	De Dion et Bouton ..	„ „	„	$1\frac{3}{4}$
	Class B, Group 1—(contd.).			
40	De Dion et Bouton ..	De Dion et Bouton	De Dion et Bouton	$1\frac{3}{4}$
41	„ „ ..	„ „	„	$1\frac{3}{4}$
42	„ „ ..	„ „	„	$1\frac{3}{4}$
43	„ „ ..	„ „	„	$1\frac{3}{4}$
44	„ „ ..	„ „	„	$1\frac{3}{4}$
61	Georges Ducom	„ „	„	$1\frac{3}{4}$
69	Marcelin	Phébus	„	$1\frac{3}{4}$
72	Comiot	Comiot	„	$1\frac{3}{4}$
	Class B, Group 3.—*Motocycles weighing less than 440 lbs., and carrying one person.*			
28	Soc. Decauville ..	Decauville	Decauville	$2\frac{1}{2}$
29	„ „ ..	„	„	$2\frac{1}{2}$
70	„ Anon. Voit. Bollée	Soc. Anon. Voit Bollée	L. Bollée	4
71	„ „ „	„	„	4

List of Vehicles taking part in Tour.

Official No.	Name of Owner.	Name of Builder.	Motor. Type.	Motor. Power.
	Class A, Group 1.—*Vehicles carrying two or three persons.*			
104	Escargot	Mors	Mors	5
105	Soc. Decauville ..	Decauville	Decauville	$2\frac{1}{2}$
106	E. Manchon	Panhard et Levassor	Phénix	4
109	Laforge..	Baille Lemaire	—	5
115	De Diétrich	De Diétrich	A. Bollée	6
120	Michelin	Panhard et Levassor	Phénix	6
123	Stephen Ribes.. ..	Delahaye	Delahaye	8
124	Ricard	Peugeot	Peugeot	6
126	Diligeon	Hurtu	Hurtu	4
128	Delahaye	Delahaye	Delahaye	6
	Class A, Group 2.—*Vehicles carrying four or six persons.*			
103	Delizy	Panhard et Levassor	Phénix	6
108	Roch-Brault	Soc. Franco-Belge Automobile	Winck	6
114	De Diétrich	De Diétrich	A. Bollée	9
116	„	„	„	6
119	Guyenet et Balvay ..	—	Daimler	8
121	Walrus	Mors	Mors	6
125	Lapanne	Panhard et Levassor	Phénix	6
129	Delahaye	Delahaye	Delahaye	6
	Class A, Group 3.—*Vehicles carrying six or more persons.*			
101	Pierron	Panhard et Levassor	Phénix	12
118	Léon de Bertier ..	Amédée Bollée	A. Bollée	9
130	Delahaye	Delahaye	Delahaye	8
131	„	„	„	8
132	A. de Lucenski ..	„	„	8
	Class B, Group 1.—*Motocycles weighing less than 220 lbs., and carrying one person.*			
107	Riguelle	De Dion et Bouton	De Dion et Bouton	$1\frac{3}{4}$
110	Laurent	„	„	$1\frac{3}{4}$
111	Degrais	Marot	„	$1\frac{3}{4}$
112	Comte de Périgord ..	Créanche	„	$1\frac{3}{4}$
113	Georges Dehacker ..	„	„	$1\frac{3}{4}$
122	Griet	Berthaume	—	$1\frac{3}{4}$
	Class C.—*Various.*			
102	G. Piet Lataudrie ..	Bollée	—	3
117	Soc. Decauville ..	Soc. Decauville	—	
127	Soc. Anon. Voit. Bollée	Soc. Anon. Voit. Bollée	L. Bollée	3

Unlike the Paris cab trials, the present competition possessed little of interest to the constructor, although it must be admitted that the successful accomplishment of such a long and trying journey is a valuable test of endurance and good workmanship. Several of the vehicles had been specially built with a view to breaking the record, and were fitted, as will be seen by a reference to the accompanying table, with exceptionally powerful motors. The roads were generally of an inferior description, especially near the French frontier, and not a few accidents resulted in consequence of this.

Possessing, as we say, but few features of technical interest, it is not our intention to describe each day's proceedings or to analyse the performances of the various vehicles. The net results are contained in the following table, which refers entirely to those vehicles taking part in the race:—

Order of arrival.	Official number.	Net time corrected.	Mean speed.
Class A—		h. m.	m.p.h.
1	1	33 04	26·82
2	3	33 25	25·74
3	11	34 8	25·2
4	6	34 58	24·66
5	14	35 19	24·36
6	4	35 45	24·00
7	19	36 20	23 64
8	21	38 26	22·38
9	49	38 41	22·20
10	17	39 30	21·60
11	50	43 58	19·56
12	2	46 50	18·48
13	8	48 58	17·58
14	47	52 30	16·38
15	51	57 27	14·94
Class B—			
1	69	39 36	21·78
2	43	41 20	20·82
3	39	52 42	16·32
4	41	54 19	15·84
5	27	58 51	14·64
Class C—			
1	29	50 14	17·16
2	71	54 3	15·84

It will be seen that the speeds attained were really very high, the highest being more than twice that allowed by the British law, while the lowest is also higher than is permitted by the latter.

The following is a list of the winners in the race, together with the amount of the prizes:—

CLASS A, GROUP 1.—*Vehicles carrying two or three persons.*

	Francs.
Charron	4,000
Clément (Girardot)..	2,000
Gaudry	1,700
De Knyff	1,500
Loysel	1,200
Adam..	1,000
Peugeot (Doriot)	700
Peugeot (Krœutler)	600
Levegh	550
Antony	500
Chesnay	450
G. Hourgières	400
Heath	350
Docteur Pascal (J. Parix)..	300

CLASS B, GROUP 1.—*Motocycles weighing less than 220 lbs., carrying one person.*

	Francs.
Marcellin	1,000
Osmond	500
Corre..	400
Teste..	300
G. de Méaulne	200

CLASS B, GROUP 3.—*Motocycles weighing over 220 lbs. and under 440 lbs., carrying one person.*

	Francs.
Decauville (Corbière)	1,000
Voiturette Bollée (Léon)	500

It was a condition for obtaining a prize that competitors in the race should attain a speed of, at least, 15 miles per hour for ordinary vehicles, and 12 miles per hour for motocycles.

There were the usual crop of accidents, but nothing really very serious or involving any personal injury. One or two vehicles received damage through collision. One was upset in a ditch, and the contents of the petrol tank igniting set fire to the vehicle. A rider of a motocycle, by a curious mischance, steered his machine into a horse-pond and fell off; his machine pursued its course and emerged at the other side, being, however, captured before doing any harm through being out of control.

As usual the wheels gave the most trouble. Many vehicles suffered from insufficient axle surface and had hot bearings, others had trouble with their tyres, especially if these latter were solid. Of all the vehicles fitted with solid tyres, but one, we understand, succeeded in accomplishing the whole journey, this was No. 118, which was a large vehicle carrying six persons, and weighing upwards of 3,300 lbs., its mean speed was 16·7 miles per hour. It gained the prize in its class, and ran most successfully; it is fitted with that kind of tyre known as the "Ideal" in this country and as the "bande Kelly" on the Continent.

As an interesting fact it may be stated that more than 3,200 gallons of petrol, costing 22,500 francs, were consumed during the competition. On the whole the race must be considered a satisfactory demonstration of the speed and staying qualities of well-built vehicles. In the present state of public opinion, both in France and England, as regards speed it must be confessed that the results of the Paris-Amsterdam-Paris race were of a negative character as such speeds as were attained are in most places illegal. Perhaps the most useful information disclosed by this race is the great improvement that has taken place in matters of detail. The machines are much more reliable and easier to manage and under better control than those of earlier models.

As will be seen, M. Marcellin, the well-known rider, was the winner in the class of motor-tricycles. We understand he used the new Dunlop motor-cycle tyre, and went through the whole journey without a single puncture.

The Flash-Point of Petroleum.—At the recent meeting of the London County Council the Public Control Committee reported at length upon the reference from the Council as to the prevention of petroleum lamp accidents. They agreed with the recommendation of the Select Committee upon the subject, and urged that the Government should introduce during the present Session a short Bill for raising the flash-point named in the Petroleum Act of 1879 from 73° F. to 100° F. (Abel close test). This was, however, adjourned, as the Home Secretary had stated in the House of Commons that he was not yet prepared to introduce any fresh legislation without full consideration.

New Russian Oil Company.—The Baku Russian Petroleum Company (Limited) has been registered, with a capital of £1,500,000, divided into 75,000 preference shares and 75,000 ordinary shares of £1 each. From the Company's prospectus it appears that of the share capital a present issue of 650,000 preference shares and 650,000 ordinary shares is offered to the public for subscription. The Company is formed to purchase and amalgamate as going concerns and to further develop the petroleum properties owned by Messrs. G. M. Arefelloff and Co. and Messrs. Boudagoff Brothers and Co., and situated in the Baku district of Southern Russia, in the townships of Sabunchi, Balakhany Romany, and Bibi-Elbat, and at Pouta, Bulbuli, Kerged, Bina, Karadi, Khirdalan, in the same neighbourhood, and at Sundzbensky, near Crosney. The properties of Messrs. Arafelloff and Co. cover an area of about 160 acres, excluding surface leases, of which a large proportion is freehold, and the remainder leasehold. Messrs. Boudagoff Brothers' properties cover an area of 100 acres, freehold. The oil is mainly obtained by pumping, but it is said that during recent years fountains have spouted from time to time on the properties, and fountains, if continuous, must greatly augment the yield. In addition to the oil lands, the Company will acquire pumping stations, reservoirs, pipe lines, storage tanks, buildings, and three refineries, the details of which are set out in the reports accompanying the prospectus.

2 M

THE PARIS MOTO-VEHICLE EXHIBITION.

This exhibition, held under the auspices of the French Automobile Club, was undoubtedly the most successful and comprehensive that has yet been held in connection with the automobile industry. Former exhibitions of motor-vehicles both in England and in France have been sadly lacking in completeness and have not been sufficiently representative. The present exhibition was in every respects what such a display should be. It was well organised and admirably managed and was in short thoroughly representative of the most modern developments in automobilism. We do not attempt to describe it in detail, as rapid and hasty descriptions of complicated mechanism are of but little use to anyone unless accompanied by drawings. It is sufficient to say that all or nearly all the leading Continental makers exhibited numerous examples of their skill; and a very fine collection of motors and vehicles was on view. While there is no great development in the methods of obtaining power for propulsion, yet there is a very noticeable advance in the direction of improved design. The mechanisms generally have less of a "toy" or model-engine look, and are better finished. Thus cams are correctly formed, as are the teeth of spur wheels. Axle bearings, too, have larger surfaces; the means of lubrication are also better. In brief, great improvements in small but important details are the characteristics of this exhibition of motor-vehicles. It was very rightly insisted upon by the organising Committee that only practicable vehicles should be shown, *i.e.*, each vehicle had to be practically tried before it was accepted; thus the visitor had the full and comforting assurance that he was examining real working vehicles. Of the four agents used as prime movers—hydrocarbon spirit, *i.e.*, petrol, hydrocarbon oil, *i.e.*, petroleum, electricity, and steam—the far greater number of motors employed the first. As is well known the spirit motor is the favourite on the Continent, and the light and inflammable spirit employed is used with a most remarkable immunity from accident. Electricity comes next, and as is well known to our readers this motive power has been selected for the Paris cab services. Steam is extensively employed in country districts for heavy automobilism, and such firms as Scotte and De Dion, having their hands free as regards weight, have produced some splendid examples of heavy road vehicles. Petroleum oil motors are hardly used at all either in France or England for vehicles. We observe that few, if any, British firms were represented. This, no doubt, can be explained by the impossibility of manufacturing vehicles for Continental use, the high tariff effectually shutting out British motor-vehicles, as they do so many other articles of British make. In conclusion we must congratulate the Automobile Club of France upon the most complete and instructive exhibition of automobiles yet held.

The Paris Cab Competition.—With reference to the very full report of this, which we were glad to be able to place before our readers in our last issue, we think it only right to state, and we do so with much pleasure, that we were very largely indebted to our excellent contemporary *L'Industrie Electrique*, of which that distinguished engineer and automobilist, M. Hospitalier, is the director. It was by a pure inadvertence that we did not make this acknowledgment in the body of our report.

BROWN'S MOTO-VEHICLE.

Mr. W. H. Brown, of Devizes, is well known as an enthusiastic and successful automobilist, and has designed and built more than one vehicle. Gaining experience he has improved upon his previous designs, and his latest model we illustrate in the accompanying drawings. As will be seen, the vehicle is a kind of steam wagonette with seating accommodation for four persons, but contrary to usual practice the machinery is kept in the rear, and is cased in, so that any noise from the gears or oily smell from the engine is reduced very considerably. The present form of carriage is the outcome of considerable time and experiment. The passengers are seated sideways, which has the advantage of being more sociable and enables the driver to get a good view of the road behind as well as in front, and this in crowded traffic is most important. The boiler is of the vertical multitubular type, oil fired; it works at 150 to 200 lbs. per square inch, and steam can be raised from all cold to 150 lbs. in 18 minutes after lighting.

The engine has two high pressure cylinders, each $2\frac{1}{4}$ inches

Fig. 1.—Brown's Steam Moto-Vehicle.

diameter by 3 inches stroke, and is fitted with link motion reversing gear, and when the car is started is adjusted to cut off the steam at about $\frac{3}{4}$ stroke. The engine runs at 312 revs. per minute, and drives the car at 12 miles per hour. Two speeds are fitted, and although more might give a slightly higher average speed, Mr. Brown does not think it would compensate for the extra weight and complication.

The engine drives direct through the two-speed gear on to the jack-in-the-box gear which transmits the power through pitch wheels and chains to the road wheels, which are of wood, and fitted with solid rubber tyres. The car is fitted with two powerful band brakes and two tyre brakes, beside which the reversing gear is an excellent emergency brake.

The oil tank holds about 12 gallons of oil, and the supply of water is equal to a run of about 18 or 20 miles on an average road. The working expenses are about a penny per mile.

A most important feature in a steam-car is that when the car is stopped the engine is at rest also, thus avoiding the vibration so apparent in oil motor-vehicles. Mr. Brown finds that an average speed of 10 to 12 miles per hour can be maintained on an average road without any difficulty.

THE PARIS CAB COMPANIES.

THE Paris correspondent of the *Financial Times* of the 18th ult. gives the following particulars of the two best-known cab companies in Paris, viz., the Compagnie Générale and the Urbaine. Both of these are very big concerns, whose shares are dealt in daily on the market. The first named, the Compagnie Générale, is in a fairly prosperous condition, and the net profits for 1897 were higher by nearly £14,000 than those of the previous year. The dividend declared at the last general meeting was at the rate of 28 francs 80 cents. per share. The 500 franc shares are at present quoted at 837 francs, so that the dividend represents a little over 3 per cent. The Company owns 8,246 cabs, which are valued at 596 francs each, or just under £24; and 12,166 horses, priced at 300 francs, or £12, each, though, of course, they cost more than that to the Company. The cost of horse keep is 1 franc 26 cents. per day per beast, and, says the writer, the poor beasts do not look very fat on what they get. The Company possesses land and buildings valued at 30,368,052 francs, or over £1,214,000. Its capital, according to the last accounts submitted, amounts to 29,456,000 francs, or £1,178,240, plus a debenture capital of 16,257,000 francs, or £650,280, and it possesses a reserve fund of over 4,761,000 francs, or £190,440. Its outstanding liabilities do not exceed 5,500,000 francs, whilst the total net profits for 1897 were close on 2,000,000 francs, or £80,000. The directors have been experimenting considerably during the past two years, with a view to adopting motor traction for all their cabs. After various experiments the directors have now secured what they believe to be an almost ideal electric motor, which, it appears, gives the most excellent results. Before, however, adopting it altogether, the directors are having 100 cabs fitted with the new motor, and if, as they expect, the results are satisfactory the whole of the Company's rolling stock will be transformed by the year 1900 and horse traction done away with. Considerable capital will, of course, be required to effect this, but the directors can obtain it without difficulty by the issue of debentures and by the sale of a considerable portion of their property, which, under the altered circumstances, would not be of further use. Then, again, the amount annually spent in the purchase and keep of horses will be at their disposal. At the last general meeting the shareholders gave the directors authority to issue debentures for this purpose to the extent of 10,000,000 francs.

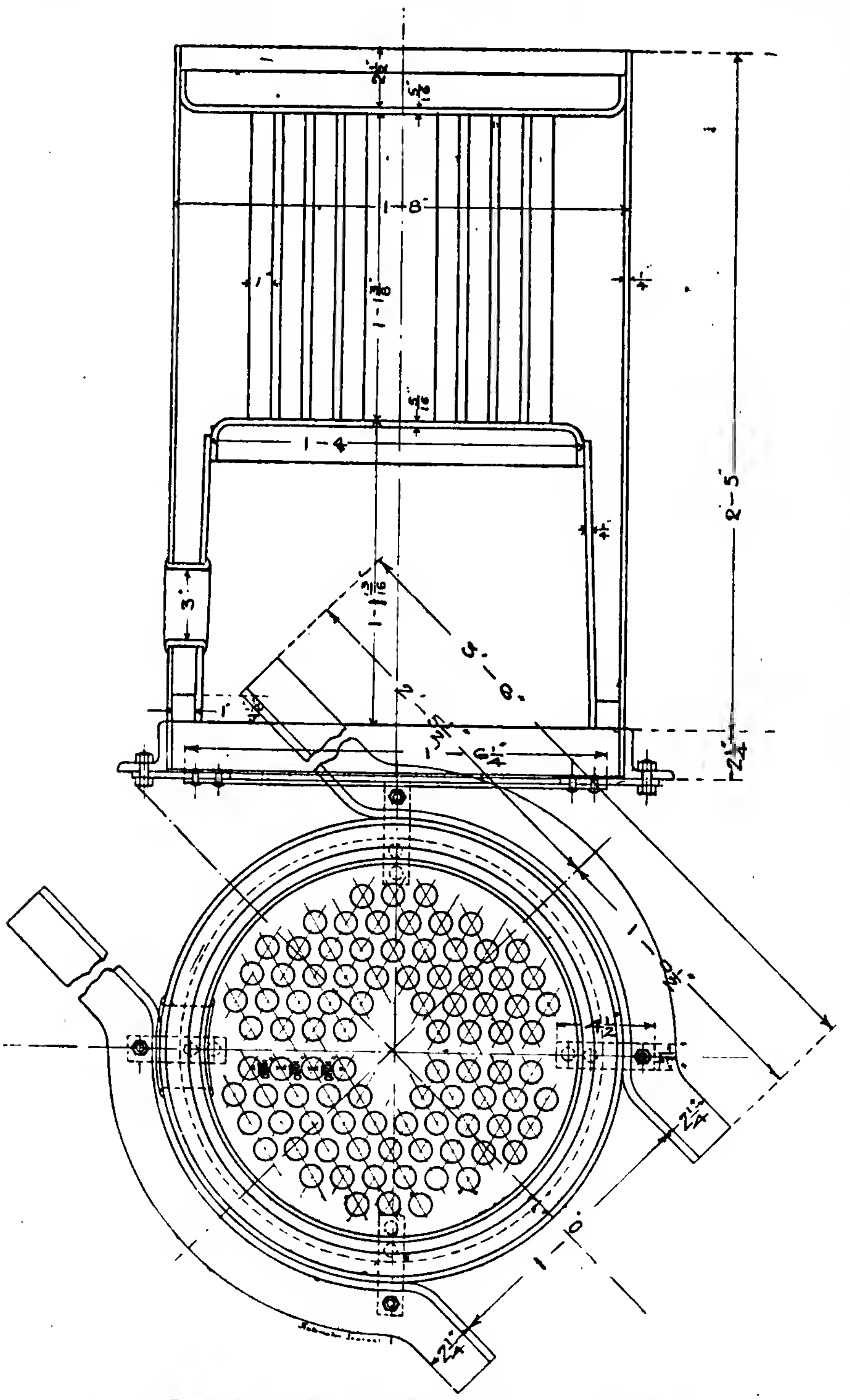


FIG. 2.—BROWN'S STEAM MOTO-VEHICLE (Elevation and Plan of Boiler).

negotiations fell through.

As a result of its display at the recent Exposition of Automobiles in Paris, the Hartford Manufacturing Company, of Connecticut, has, we are glad to say, secured an order for eight electric carriages.

AUTOMOBILISM IN FRANCE AND ENGLAND.

The following is a translation of a letter lately written by Sir David Salomons, Bart., President S.P.T.A., to M. Paul Giffard, editor-in-chief of *Le Velo* :—

Dear Mr. Giffard,

I am certain that your nation will not hesitate to recognise that few people are so well disciplined, and demand less administrative tutelage, than the inhabitants of Great Britain.

I have observed this fact on several occasions, which the French newspapers relate with surprise, that the police are commended by all the English people; equally so, the fact that a word or gesture of a policeman suffices to keep all classes of people in order. All this is due to our laws and the kind of education we receive.

In France the Government does everything for the people. It controls their hospitals, organises popular fêtes by means of subsidies, protects every branch of trade that seems feeble—in a word, assists the French as if they were quite unable to walk alone.

In England the citizen is given up to himself and does not receive from his Government either assistance or encouragement. It is then very natural that from his earliest infancy he learns to be independent; thus, later on, he possesses confidence in himself and the necessary initiative for the battle of life. This explains why with us each individual does his best to maintain order instead of waiting for others to maintain it for him. But you will say, where do these remarks come in in the question of rules concerning the movements of automotors in France? Yet these things are connected in a very evident manner.

In England there are certain rules that you know of as well as I do, limiting the weight of vehicles and many other details, with the sole aim of preventing the automotor-carriage from becoming a public danger. Thus it is that in case of accidents the owner is liable for damages without prejudice to any previous penal system. Under these conditions nobody in England would think of putting on the road a vehicle that was in any way dangerous, much less to confide the direction of a carriage to a conductor who was not perfectly experienced. Apart from that we are absolutely free in all that concerns the new mode of locomotion; no examination is necessary and no conductor's permit is required.

In France, on the contrary, most absurd restrictions are imposed on the public both with regard to carriages and conductors. The English method is much preferable for this reason, that it is the individual possessor who directs an automotor who is considered responsible for the security of the public, whereas in France the system of examinations and permits take from the individual this responsibility up to a certain point.

In reality, the examination of carriages is absurd the instant it is not made each time the vehicle leaves the coach-house; it is thus necessary for an engineer in connection with the prefecture to be appointed to survey each departure of a carriage. You will soon see where that will end.

As I have all my life been used to driving horses, I can by experience personally certify that it is easier to drive an automotor than to hold in a "noble beast." Moreover, no difficulty is made in France with drivers, although, to be logical, each carriage and horse should be examined, considering that a "horsy" accident is much more serious than an automotor accident. The number of people killed or injured by horses every day in London is considerable, but probably it has been thus since the beginning of the century and we do not pay much attention to it here. Is not the title "Noble Beasts," inaugurated by the *Velo*, instructive?

I well know it will be remarked that the number of carriages drawn by horses is very much more considerable than that of automotors, but this seems to me the best argument in favour of much more liberty for the new vehicles. At the commencement of railways accidents were much more frequent than at the present time, although the number of passengers has increased enormously. Thanks to this fact no ridiculous restrictions have been enacted.

It is to be hoped it will be the same with automotors, and I feel convinced that before many years have elapsed the fear of carriages without horses, by which some people are affected, will have disappeared, and that accidents will be very rare. This is the idea which guided our legislators when the new law with regard to the regulation of automotor traffic in England was voted by Parliament.

I trust you will interpret my remarks in the spirit in which they are written, that is to say, not as a critic of French customs, but as the ideas of a man who has much respect and affection for the country who has given to the world many, if not all, the lessons of civilisation, and which can be considered as the cradle of art in modern times.

Yours very sincerely,
David Salomons.

THE ACETYLENE EXHIBITION.*

At the official opening of this exhibition in the East Conference Hall at the Imperial Institute, London, Major-General Sir Owen Tudor Burne, G.C.I.E., K.C.S.I., the chairman of the Council, presided, and was supported on the platform by Sir Frederick Abel, K.C.B., F.R.S., Sir Frederick Bramwell, Bart., D.C.L., F.R.S., Professor Vivian B. Lewis, Mr. Boverton Redwood, F.R.S., Professor J. M. Thomson, LL.D., F.R.S., Sir Robert Herbert, Sir Henry Trueman Wood, M.A., and other gentlemen.

Addressing the fairly large assembled company of Fellows of the Imperial Institute and their guests, the Chairman, in a short and pithy address, narrated the history of the present exhibition, which was initiated on the suggestion of Sir Frederick Abel, who, feeling assured of the growing commercial importance of acetylene, and being cognisant of the mystery attaching to the illuminant in the minds of the general public, thought that a public exhibition of the means of generating the gas, and of its illuminating powers, such exhibition being officially and impartially conducted, would be the best means of dispelling that mystery and of showing the benefits attaching to this new gas as an illuminant. Through its secretary, Sir Henry Trueman Wood, M.A., the Society of Arts organised an acting council, of which the chairman was president, the galleries of the Imperial Institute were placed at its disposal, and the London County Council kindly lent them the use of their Testing House in Harrow Road, and also of the invaluable services of their officers, Mr. Pemberton Stubbs and Mr. Duffield. Every single apparatus in the exhibition had undergone severe, continued, and impartial test at the hands of these gentlemen before being allowed to be installed on the premises. The safety of each apparatus shown may therefore be taken as certified by its very presence in the exhibition building; its efficiency will be the subject of daily test and observation during the exhibition, and a full report thereon will be made in due course. The chairman proceeded to explain in simple language what calcium carbide is, and how on its decomposition on coming in contact with water this acetylene gas is evolved, and concluded a most interesting speech by inviting those present to accompany him through the exhibition galleries to examine the collected exhibits, and also to see the generators in actual operation in the open building erected for that purpose in the grounds.

According to the regulations which have been prepared by the committee, the generators are classified under three heads, namely: (1) Those in which the gas is generated by water being allowed to drop or flow in a small stream on to the top of the carbide; (2) those in which the water rises around the carbide; and (3) those in which the carbide falls into the water. Further sub-divisions are made in relation to automatic and non-automatic generators. The term "automatic" covers those generators which have a storage capacity for gas less than the total volume which the charge of carbide is capable of generating, and which depend upon some special contrivance for stopping contact between the water and carbide when the consumption of gas ceases. The term "non-automatic" includes those generators in which a holder of sufficient capacity is provided to receive the whole of the gas made from the largest charge of carbide which the apparatus is capable of taking.

The rules which govern these sub-divisions are :—(*a*) in the automatic types the pressure must not exceed 100 inches; (*b*) when the apparatus is first charged the air in the generating chamber must not exceed one-fifth of the capacity of the apparatus; (*c*) the generation of gas to be speedily arrested when closing the outlet-cock; (*d*) the decomposition of the carbide not to give rise to excessive heating. To the non-automatic generators sub-sections (*a*) and (*d*) also apply, and, in addition, it is provided that the air space in the generating chamber should be as small as possible, and that in the event of the delivery pipe from the generating chamber to the holder becoming choked the gas can escape either by blowing a

* Unavoidably held over from our last issue.—Ed.

seal or by driving back feed-water end escaping through the tank. All the generators sent in were tested hy the London County Council, and only those which passed the test were admitted to the exhibition. There are two sets of exhibits, one of which comprise apparatus, which is shown at rest in one of the galleries, whilst the other embodies generators shown in operation in a specially-erected building located in the grounds, the gas produced heing utilised in an adjoining gallery.

Pressure on our space forhids us to do more than give a brief enumeration of the various exhibits. Among these, however, are many worth inspection, tho principal exhibits being as follows:—

The International Industrial Syndicate show the Buffington system of acetylene generator. This consists of a carbide holder, above which is a water tank fitted with an automatic valve, both heing attached to and connected up with the gasholder. Water is allowed to trickle on the carbide, and the gas on being formed passes into the receiver. As the gasholder rises the water is automatically cut off, and as the gas is consumed water is admitted to the carbide chamber, and the generation of gas recommences.

The British Pure Acetylene Gas Syndicate exhibit a generator invented hy M. Pistel. This generator is easily manipulated and is of simple yet efficient design. Messrs. Thorn and Hoddle, of New Tothill Street, Westminster, have an installation especially suitable for those engaged in photographic work. The Midland Acetylene Syndicate show an automatic generator which only is in action when the gas is required. Messrs. Exley and Co., of Huddersfield, also have a good automatic arrangement in their generator. The Calcium Carbide Company, of Cheapside, show en excellent plant, very suitable for country houses. The Lines Acetylene Gas Company, of Dale Street, Liverpool, have a varied display of generators and apparati.

The Acetylene Gas Corporation, of 100, Queen Victoria Street, London, exhibit Fourchotte's Generator and Holder; the latter consists of a bell-shaped cover, arranged so as to rise and fall when the volume of gas is increased or diminished in proportion to the consumption.

Another good type of generation, that known as the "Beacon,' which is being placed on the market by the Acetylene Beacon Light Company, of Colmore Row, Birmingham. The "Beacon" generator does not require frequent charging; the carhide chamber is made to hold from 30 to 1,000 lhs., and it may therefore be left to take care of itself for several months at a stretch if desired. Another point is that there is plenty of cooling surface, and the tank is enclosed, which prevents the gas overflowing or smell arising from the water.

Another very simple and efficient generetor is that known as the "Thornton-Scarth," which is heing manufactured hy the Thornton-Scarth Automatic Lighting Syndicate (Limited), Vittoria Street, Birmingham. This generator seems to fulfil most of the essentials of a perfect acetylene gasometer, it being a simple, safe, end automatic apparatus. The user has simply to keep the generator supplied with cerbide and water, the rest is automatically done. The gas is produced under the perfect control of the floating holder. If the gas is generated too fast, the holder rises and cuts off the water supply. Then as the gas is used up the holder slowly falls, allowing the water to again drop upon the carhide and so continue the creation of gas.

An ingenious automatic generator is that of Sir Charles Forbes. This consists of a cistern which is filled with water to a given level. The water is admitted to the gas bell, and rises until it reaches a small orifice hored in an inner vertical tube, whence it drops into a cone and is conveyed to the carbide, which is placed in a drawer beneath, therehy liberating the acetylene.

Mr. C. Crastin, of 16, Tollington-road, Holloway, London, shows a very practical generator, which is automatic in its action. There is a carbide chamber on each side of the gasholder, and water is fed in until a given quantity of gas is made, when it is shut off until it is again required, when the supply is automatically turned on. The main features of this generator are small storage space, uniform pressure, and no overflow of water, while the cost of working is a minimum. This plant struck us as heing very neat and compact.

Mr. R. Lucas, of Westcombe Hill, Blackheath, showed an acetylene motor bicycle, but the method employed was not very apparent, and no one was present on the occasion of our visit to explain it. No doubt we shall hear more about it in time.

The exhibition, as a whole, was very successful, and has done much to extend the use of acetylene as an illuminant.

AN ELECTRICAL DIFFERENTIAL GEAR.

At the recent meeting of the Physical Society Professor Carus-Wilson (whose work on electric traction was lately reviewed in The Automotor) exhibited an apparatus to illustrate the action of two electric motors, coupled in such a way as to admit of their rotating at different speeds. The two shafts are placed in line, and each is fitted with a hevel wheel, gearing into an intermediate wheel. The axis of the intermediate wheel is at right angles to the line of the motor shafts, and is free to rotate in a plane at right angles to that line. The motors can be made to rotate at different speeds hy altering the strength of the magnets of either or hoth. The motion of the intermediate wheel depends upon the difference of the two speeds, or upon their mean, according to their relative directions of rotation. A simple graphic construction enables the action to he predetermined for any given load on the intermediate wheel. Calling the two motors A and B, and the intermediate wheel C, lines can he drawn on a base of current to represent the speeds and the torques for each motor. If the motions of A and B are in the same direction, the load or torque is the same on each, and of similar sign. Hence, as the load on the wheel, C, is increased, the speeds of A and B tend to become equal (if A had been running faster than B), and for a certain load on C the speeds of A and B will be equal. If the load on C is further increased, B will run faster than A. Also, there will he a certain value for the load on C, at which the motion of A will reverse. A further increase of the load on C will bring C to rest, A and B then rotating at equal speeds is opposite directions. When the load on C is nothing, let the motors rotate in opposite directions, A running faster than B. The motion of C now depends upon the difference of speeds of A and B. When a load is put on C, the motion of A is retarded, while that of B is assisted, hence B takes less current, and A takes more. The torques on the two motors, due to the load on C, are now of equal amount, but of opposite sign. As the load on C is increased, the speed of A is reduced, and that of B increased, until the two are equal, and C comes to rest. B is now acting as a generator, and sending current into A. If the load on C is simply that due to friction, the process cannot he carried further. But if the load on C is reversed the speed of B becomes greater than that of A, and the motion of C is reversed. In the steering gear designed by the Union Electricitäts Gesellschaft, the intermediate wheel is made to actuate a rudder hy differential action. The motion is reversed hy making the speed of one motor greater or less than thet of the other.

AUTOMOBILISM IN AUSTRIA.

A correspondent of the *Morning Post* writes from Vienna:—Though the interest in motor-cars in Austria is relatively slight, the various touring clubs are seeking to make them popular. An Austrian Automohile Club has been formed, and in conjunction with the Austrian Touring Club it has arranged an International Automohile and Bicycle Tour through the South Tyrol for the latter half of this month. Seeing that the track lies over the Stilfserjoch, along one of the highest roads in Europe (2,814 metres above the sea level), the ride will not only be a test of endurance but of the relative qualities of the various makes. The competitors will proceed from Sulden, hy way of Trafoi, Meran, Bozen, and Toblach, as far as the Strada d'Allemagna, and thence over the Strada d'Ampezzo to Cortina, crossing the Austrian frontier at San Vito, returning to Austrian territory near Monte Croce Pontet, and ending their journey at Penegal, near Bozen. Controlling stations will be established along the entire route with the object of avoiding any undue strain on the part of the competitors. From a military point of view the undertaking is not without importance. The Tyrol is not too plentifully hlessed with railways, and the hicycle and the motor-car will now demonstrate the possibility or impossibility of the passage of traffic along the mountain routes and through the passes of Austria. As a direct consequence, it is not unlikely that the tour will stimulate the movement for the construction of strategic routes throughout the whole of Western Austria.

MUNICIPAL AUTOMOBILISM IN HACKNEY.

At a recent meeting of the Hackney Vestry (a somewhat progressive body in some respects, but hopelessly unenligbtened on automobilism) Mr. Yarrow Baldock proposed a motion to the effect that considering the large and increasing amounts paid by the Vestry for horse-hire and cartage, and with a view to facilitate the work of slopping and dusting being undertaken entirely by the Vestry without the intervention of a contractor, it be referred to the General Purposes and Sanitary Committee as to the practicability and possible economy of employing for the purposes of the Vestry carts and vans driven by electrical or other automatic motors; as to the advisability of fitting suitable motors to the water-carts and other vehicles, all or any, at present the property of the Vestry; and as to the advisability of the purchase by the Vestry, for experimental purposes, of a motor-van or vans of the most approved pattern designed for the collection of refuse and scavenging, either or both. Mr. Richmond contended that Mr. Yarrow Baldock was very premature. They had not even got their electrical station, so he should like to know if they did get these motors where they were going to get their electrical supply from.

The Vestry agreed with Mr. Richmond, and adjourned the consideration of the matter for another year.

It has not occurred to these opponents of economical administration that they are wrong in their premises and deductions. A central electric-light station is by no means a necessity for a service of, say, half a dozen electric motor-vehicles, such as would be used by a Vestry.

Assuming, for the sake of argument, that such a vehicle would consume per day of 9 or 10 hours 10 kilowatts—this is really an outside figure—then it is easily seen that a gas or oil motor of 8 B.H.P., working 10 hours per day, would supply all the necessary current. The motor and batteries could be placed in any ordinary stable, and no expensive fittings would be necessary. We trust Mr. Yarrow Baldock will not be disheartened in his praiseworthy attempt to instruct his colleagues in this matter.

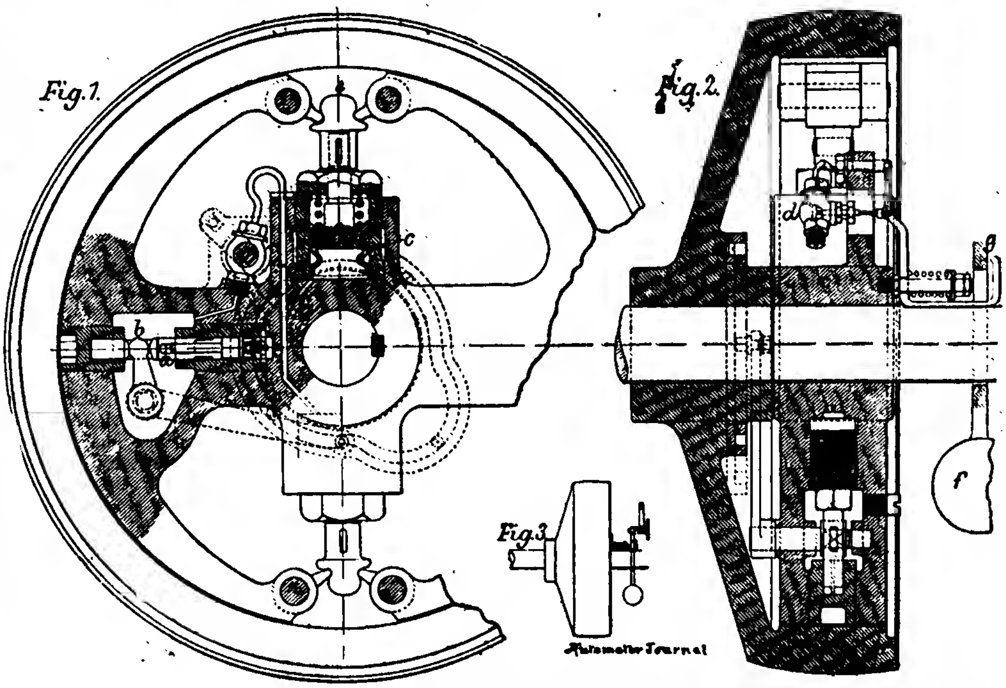
Lights for Vehicles: County Council Bye-law.—In the new bye-law passed at the recent meeting of the London County Council it is provided that every carriage, cart, wagon, or other vehicle which shall be driven or be upon any highway during the period between one hour after sunset and one hour before sunrise shall be provided with a lamp or lamps, which shall be so constructed and placed (such lamp or one of such lamps being on the right or off-side of the carriage, cart, wagon, or other vehicle) as to exhibit a white light in the direction in which the vehicle proceeds, and shall be so lighted and kept lighted as to afford adequate means of signalling the approach or position of the vehicle. This bye-law shall not apply to any carriage which is required to carry lights by any statutory enactment, or by any rule, regulation, or order made under any statutory enactment, and for the time being in force.

HERSCHMANN'S HYDRAULIC CLUTCH.

Although there are a great number of friction clutches in the market everybody who has had experience with such pieces of mechanism knows that they are often found troublesome after little use, and will "slip and heat" when required to engage, and "grip and bite" when required to be out of gear.

Nothing more positive acting than a hydraulic means of operating such pieces of mechanism could well be devised, and with this end in view Mr. A. Herschmann, of 1, Bexley Road, Erith, has designed a clutch which we illustrate herewith.

As will be seen, the engagement is automatic, *i.e.*, the driving side *itself* engages its companion by actuating a little force-pump of simple design, which, as long as there is relative motion, or even slip only, between the two halves, forces oil under leather cups, inflating them like a pneumatic tyre, until they press sufficiently on the toggle joint and so expand the inner parts as to grip the outer half firmly, when pumping action ceases and a most powerful engagement is maintained.



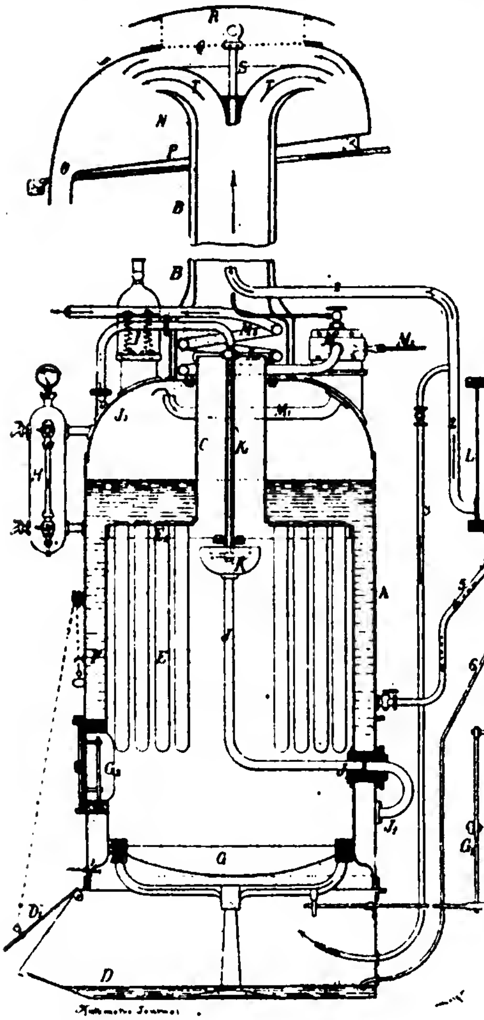
Referring to the drawings, there is an oil pump, shown at *a* (Fig. 1), the plunger of which is operated by a long cranked lever, the other end of which has a pin running in a cam groove formed in the other part of the coupling, as shown. Should the two constituents of the coupling rotate relatively to each other, this pump is worked, and drawing from the reservoir, *b*, it sends oil through a hole in its ram, closed with a valve, and delivers it into a discharge pipe. This discharge space has three branches, two of which communicate with two leather cups, of which one is shown at *c*, whilst the third branch leads back through a spring-mounted valve, *d* (Fig. 2), to the oil reservoir, *b*. Should this valve be closed, the oil is forced underneath the leather cups, and presses outwards the plungers above them. These plungers are connected by a toggle arrangement to the friction arms, as shown at *e*, thus putting the clutch into gear. As soon as this is effected, and the two portions of the clutch rotate together, further pumping action ceases. To release the clutch the valve, *d*, is opened, and the pressure in the cups being thus relieved, the friction arms spring clear of the opposing pulley surface. The valve, *d*, is controlled by the pendulum weight shown at Fig. 2 and also in Fig. 3. When this is moved away from the pulley it catches on the point, *g* (Fig. 2), and pressing it outwards, opens the valve, *d*. The pendulum normally hangs quite free of the clutch and shaft, so that there is no friction and no side thrust whilst the pulley is running. To throw the clutch out of gear a small relief valve is so arranged that when pulled from its seat it releases the hydraulic pressure, and allows the oil to run back into the tank in the inner half. The disengagement, therefore, is as powerful as the engagement, being simply the reaction of the latter.

The clutch is self-contained, dust-proof, and balanced, and requires no heavy shifting levers or anchorage. A centrifugal weight is arranged for special cases which disengages the clutch when a maximum and adjustable speed limit is exceeded.

The clutch is made by Messrs. Alldays and Onions, of Birmingham.

THE SCOTTE MOTO-VEHICLE.

We have in previous articles described the salient features of this very successful type of motor-vehicle. On the present occasion we



The Scotte Boiler.

propose to describe the later improvements that M. Scotte has made, and more particularly his boiler. In the Scotte omnibus, numbers of which have been running in various parts of France with uniform success, the driving wheels are behind, the steering wheels in front, and the intermediate shaft parallel to and between the two axles.

The boiler and engines are in front of the compartment for the passengers, the driver's platform is between the two latter, so as to leave his view unobstructed and to place him close to the various controlling levers. The available space is carefully parcelled out and utilised for coal, tools, oil, &c. Water is carried in two tanks, placed under the seats of the passengers, fore and aft.

The boiler is of the "Field type," and supplied with feed-pump and injector; a recent modification makes it possible to lower or raise the fire-grate for the purpose of keeping fire low when at rest; a rotary movement may also be imparted to the grate disc for the purpose of cleaning it.

Ashes may be damped with the condensed steam from the feed-heater, which entirely prevents the scattering of glowing fuel on the road. This is a matter which we would particularly call the attention of constructors to, as hot ashes on a road would cause much harm to horses and pedestrians. It is by a careful attention to these details that much of the success of M. Scotte is due. He, in his design, does all he can to avoid possible objections.

The boiler has a cylindrical shell dished at the top, to which latter is attached the double-barrelled funnel; it is vertically traversed by the uptake which conducts the burnt gases into the chimney. Below this shell is the ashbox, which has handholes giving access for cleaning.

The well-known Field tubes, which are of the priming or quick-generating type, are suspended from the crown of the firebox, which latter accommodates the circular grate at its connection with the main shell of the boiler.

The grate has fixed as well as jointed firebars, the latter, when rocked by means of a hand lever, effectually prevent clinkering.

A circular band is arranged over the grate so as to protect the rivet heads and the seams from being burnt by the flames.

The usual gauge glasses, pressure gauges, and safety valves are conveniently fitted on the top of the boiler. A water circulator, an exhaust-heater, and a superheater are also provided. The former consists of a strong pipe coupled to the annular water space at the bottom of the boiler, from here the pipe starts and returns with a double bend (so as to leave the connections outside) into the firebox, rising centrally and vertically amidst the Field tubes, and returning and delivering into the crown of the boiler. Where this circulator pipe passes through the uptake a suitable cup protects its joint; the latter, being suspended from a cross on the top by means of screwed rods, allows of adjusting the draught by lowering or raising.

The cup, of course, acts as a deflector, and leads the upgoing gases off and around the Field tubes.

The feed-heater is also intended to act as a water softener; it is simple and easily inspected, and we may add that the exhaust steam from there goes into the chimney, and the condensed steam into the ashbox, a bye-pass pipe branches off from the chimney connection and allows of blowing the fire to vary the draught. Superheating is effected in a coil exposed to the hot gases before they enter the chimney.

The emission of sparks is prevented by bending down the top of the chimney and making it bell-mouthed and enclosed within another protecting hood which has a sloping bottom, wherefrom the cinders drop in a fall pipe and into the ashbox. It will be seen that great attention has been given to these details, many of which exhibit great ingenuity. In conclusion, we congratulate M. Scotte upon the great engineering skill he has displayed in perfecting the motor-vehicle.

Reorganisation of the London Fire Brigade.—At the last meeting of the London County Council the Fire Brigade Committee recommended the adoption of a scheme submitted by the chief officer for the better organisation of the brigade. Captain Wells points out the rapidly-increasing strength of the brigade, and urges the appointment of another superior officer, to be styled "chief superintendent," who should be in charge of a central district to include the following stations:—Headquarters, Watling Street, Bishopsgate, Tooley Street, Waterloo Road, Scotland Yard, and Whitefriars. The "dangerous areas" are principally comprised in the localities protected by these stations, and in order to afford better facilities for mobilisation Captain Wells suggests that they should all be directly connected by telephone with the chief station. Under the new arrangement, whenever the chief officer and second officer were absent at a fire, the chief superintendent—the next senior officer—would be present to take charge, and to arrange for the disposition of men and appliances, a duty which at present devolves upon a foreman.

The Royal Lancashire Agricultural Society.—Among the exhibitors at this popular show were Messrs. T. Coulthard and Co., of Preston, who showed their motor-wagon, and obtained the Society's medal for their water-tube boiler. We congratulate Messrs. Coulthard on their success. In our next issue we hope to describe and illustrate their engines and boilers for motor-vehicles.

NOTES OF THE MONTH.

At a recent meeting of the Middlesex County Council, on the motion of the Chairman (Mr. R. D. M. Littler, Q.C., C.B.), the General Purposes Committee were asked to consider and report what steps could be taken to identify cyclists and drivers of motor-cars guilty of recklessness in the driving of their machines.

From some statistics furnished by the United States Consul at Berlin respecting the carriage pavements of that city, it would seem that wood pavement does not find much favour there. The area of pavements is 6,500,405 square yards, and of this area a little less than 74 per cent. has stone pavements, about 25 per cent. asphalt, and a fraction over 1 per cent. wood. The Consul states that the proportion of asphalt is steadily increasing. The soil consists of coarse, gritty sand, forming apparently an excellent foundation for the heavy 8-inch layer of gravel and cement over which the 2-inch covering of asphalt is spread.

On the last Sunday in July Prince Christian travelled with Mr. H. E. S. Holt from Aldershot to London on a Daimler motor-car. Mr. Holt left town in the morning, and returned with the Prince after lunch; the journey back, a distance of about 35 miles, being covered in a little over two hours. The following Tuesday Mr. Holt went down to his old school, Eton, on the same car, accompanied by the Lord Chancellor and Lady Halsbury, covering the distance there and back at a high average speed. *En passant*, we may remark that Mr. Holt had the honour of taking the first motor-car to the House of Commons last year, the other occupants being Mr. A. J. Balfour and Mr. Chaplin.

Some months ago we described a new departure in nautical automobilism—the Bazin roller boat. We predicted its failure, which duly happened. The vessel is now in Hull for sale. It will be remembered that the "Ernest Bazin" consists of a flat rectangular deck, made of steel, 130 feet long by 44 feet broad, and this rests on six huge floats or rollers 30 feet in diameter. Her boilers and engines are warranted of the very best, the work having been done by the engineers who have the French Government torpedo work. She cost £20,000, and her failure to give the results expected both in regard to speed and motion completely broke the spirit of her designer. Nearly 20 years ago the twin boat "Bessemer"—built, like the "Ernest Bazin," to overcome the effects of pitching and rolling at sea—was also taken to Hull after she had proved a white elephant.

Oil fuel was tried at sea for the first time in the British Navy at Portsmouth on the 29th ult. Some months ago the Admiralty sanctioned an experiment with the system invented by Mr. Holden, of the Great Eastern Railway, on board the "Surly," torpedo-boat destroyer, and in the interval various trials have been carried out in one of the dockyard basins. At these the chief difficulty was to furnish a sufficient feed of oil, but this has been overcome by the provision of an overhead feed tank. There are four boilers on the "Surly," two of which are still retained for coal fuel, but the others have been adapted for oil. In lighting the latter series the elements of combustion are oil and coal, but as soon as a sufficient heat has been generated, bricks replace the coal and are heated from the oil spray. At the trial no difficulty was experienced in obtaining a sufficient spray, and the heat was so well maintained that at times the thermometer indicated 150° F. in the stokehold. Three runs over the measured mile in Stokes Bay were made, and while a speed of 16 knots was hoped for, the runs gave a mean of 14 knots; but as this was only a preliminary trial, the result was regarded as satisfactory. The oil used had a flash-point of 280° F.

We have received from a correspondent a long and interesting account of a tour recently undertaken by himself and friends through North Wales in a motor-vehicle—one of those owned by the Motor Touring Company, of Llandudno. This Company seems to have more work than it can do; the popularity of its tours making great demands upon its resources. To view some of the finest scenery in the country from a well-appointed motor-vehicle is undoubtedly one of the best means of enjoying a holiday we know of. One has all the advantages of any desired speed, safety, certainty, and comfort, together with the knowledge that these are not obtained at the cost of animal suffering. We congratulate our friends, the Motor Touring Company, on the success which has deservedly attended their enterprise. We understand that the motor-vehicles used by the firm are fitted with Benz motors.

The following appeared in the *Daily Telegraph* in a recent issue:—"This season automotors have entered largely into the amusements provided at several fashionable watering-places, but the march of science in this direction has no attraction, it seems, for the inhabitants of Westgate-on-Sea. On the contrary, the invasion of the town by motor-cars has evoked many protests. At a meeting of the Parochial Committee several members urged that the private road of the Westgate Estate should be closed to the cars, which were described as an abominable nuisance. It was stated that some of the vehicles travelled at the rate of 25 miles an hour, and that the noise they made seriously disturbed public worship at the churches and chapels. One member of the committee urged that loose gravel should be sprinkled on the inclined roadways, as he believed the cars could not get over this. The committee adopted the suggestion, and decided to take legal advice as to their powers to exclude or regulate the objectionable visitors."

The Clacton-on-Sea Municipal Council is apparently not impressed with the desirability of encouraging automobilism, and so it forbids an enterprising local firm that has established a service of motor-vehicles to places of interest outside the town from enjoying the same facilities as the local cab and omnibus proprietors; doubtless these latter are large employers of labour and large ratepayers, and as such deem themselves entitled to a kind of "favoured trade treatment." They evidently possess and exert a good deal of "influence" on the local Council sufficient to cause that body to discriminate in a most unjust way against automobilists. From a letter that Messrs. Johnston and Seward, the firm who are running the motor service alluded to, wrote to the local Press, it would appear that the drivers of the motor vehicles are daily requested by visitors to pick them up on the road, and many grumble because they, the drivers, do not stop when requested to do so. Messrs. Johnston and Seward desire to make it publicly known that they are unable to pick up passengers on any of the public streets or country roads until the Clacton-on-Sea Council give them a license to do so. Why a license should be necessary is not very clear. One thing, however, is very clear, and that is the necessity for the existence of an association which will take up such cases of harshness and discrimination on the part of local interested bumbles, and determine the legality of the action of the latter in the High Court. A few lessons in common law are sadly needed by these administrators of municipal law.

A valuable and interesting Paper, entitled "Some Notes on the Disinfection and Deodorisation of Sewage with Chlorine," recently appeared in the *Journal of the Society of Chemical Industry*, the authors being Mr. E. Shrapnell Smith, Hon. Organising Secretary of the late Liverpool Heavy Trials, and Mr. Max Muspratt. The subject is well summarised and clearly set forth by the authors, and in a short space the article conveys a large amount of valuable information upon this very important subject.

DOINGS OF PUBLIC COMPANIES.

National Cycle and Motor Car Insurance.

An extraordinary general meeting of the National Cycle and Motor Car Insurance Company (Limited) was held on July 20th, at the offices, 33, King William Street, E.C., for the purpose of considering the financial position of the Company and other matters. Mr. C. H. Tindal presided.

The Chairman said he desired to put the position of the Company fairly and frankly before the shareholders. When the Company was formed the policy adopted by the directors was that in conjunction with the cycle insurance business they should do a general insurance business, because they considered that while they were getting together a cycle connection they might, by means of a carefully-managed general insurance business, obtain a satisfactory premium income to show to the shareholders at the first general meeting. When the balance-sheet was submitted up to 30th September last year, the premium income, as shown, represented £4,000 odd, and that the Board considered a very satisfactory state of things. After the meeting quite a different phase came over the business. They began to receive claims in a most extraordinary manner, one or two being for large amounts. A number of these claims had arisen before the date of the balance-sheet, but they had never been presented to the directors. While the audit was proceeding, the directors complained, with a considerable amount of vigour, as to the large amount of the secretary's travelling and other incidental expenses, and the auditors suggested that there should be a general float of £100 upon which the secretary (Mr. Wilson) should draw. This general float was arranged, but the secretary went beyond it and overdrew to the extent of £500. Further than that, certain account books were ordered by his colleague, Mr. Ravenscroft, and himself, to be kept and periodically produced by the secretary, but that official would not carry out their instructions. Both he (the chairman) and Mr. Ravenscroft resigned their positions because they could not get their orders obeyed. Colonel Wilson also complained of the secretary's inattention to his duties, and dismissed that official. The secretary was permitted to take risks up to a certain amount. If there were any of an extraordinary character he had to communicate with certain of the directors and get their sanction. The risks selected by the secretary did not justify confidence in him at all. On one occasion Mr. Wilson waited upon him at his private residence as to a special risk, and he (the chairman) said he would only take it if Mr. Sydney Lee, another director, should agree; instead of going to Mr. Lee, the secretary went to Mr. Carmichael, and the risk was taken. In view of the advertising which was done, a large number of applications were expected at the head office, quite apart from the business done by agents. It was true they allowed their clerks, out of office time, to obtain insurers, and a commission was paid them for so doing. In signing the policies, it came to the knowledge of the directors that there were very few head office applications, a bookkeeper in the office, named Ponsford, being apparently a very large introducer of business. After the secretary was dismissed, they found there were a large number of cheques, signed by directors, for the payment of claims, which had been left about and never presented, and that the claims-clerk had been carrying about in his pocket cheques which ought to have been given to insurers. This state of things set them inquiring; so they took 20 policies at random and wrote to the insurers, whereupon they ascertained that in every case, although Mr. Ponsford claimed commission, they had applied direct to the Company by letter. Mr. Ponsford, by the way, was brother-in-law to the secretary, and it was the duty of the latter to open letters. There was commission also being taken to the extraordinary extent of 40 per cent. in the name of Copping, a person whom the directors believed to have no real existence, unless he was another brother-in-law of the secretary. In view of such proceedings, how could the business be expected to go on satisfactorily and show profits? The directors claimed that they had not been remiss in the discharging of their duties. It was with infinite satisfaction that they announced that that day they were instituting proceedings against Mr. Ponsford, which they hoped would clear things up. The cycle business to September, 1897, showed an income of £791, but, of course, in the first year a great deal of time was spent in getting the agents together. Since September, up to May last, the income had amounted to £720, and on the authority of Mr. Jeffries, their present able manager and secretary, he was able to say they anticipated an income for the current year of £3,000. Their claims were comparatively insignificant, and they had proved that the business for which the Company was originally established was a paying one, and with proper management could be made to pay handsomely. Since the dismissal of the late secretary they had had hundreds of applications coming in by post to the head office; and they had lately had an offer—which was still open—of 1,100 policies in one batch. These they hoped to arrange for, and if the business were accepted this would form a groundwork for future operations. They would now, moreover, be able to make a considerable reduction in their working expenses. If the shareholders would come forward and provide the Company with money—rateably in proportion to their holdings, or in any other way—the Board would be able to render a very good account of it, and be able to show that the business was a very profitable one. He would move: "That the directors be empowered to issue £5,000 6 per cent. shares, preferential both as to capital and dividend."

In reply to Mr. Parry, the Chairman said the original nominal capital was £25,000. They went to allotment on a subscription of £12,000. The Board had no reason to think the secretary was acting as he was, and without sufficient reason it would have been impossible to dismiss him. He did not suggest that the secretary used the £500 overdrawn other than for the purposes of the Company, but he did say that official was very extravagant.

Mr. Wilson, the late secretary, then addressed the meeting. He thought investigation was necessary, and would therefore move the appointment of a committee to inquire into the directors' management of the business. He denied that he was discharged from office, stating that he resigned. He then proceeded to ask several questions as to whether certain of the directors derived any profit from the promotion of the Company, whether they were in arrear with their calls, and whether interest had been paid on overdue calls. He declared that Sir Edward Lee sat on the Board for 16 months without qualifying, and that he did not pay for his qualification until he had received his fee cheque. He (the secretary) had worked up a solid business for the Company, and was prepared to justify his position before any Court of Justice in the world. As to the £500, although the directors passed these overdrafts and drew cheques in his favour, there was never sufficient money in the bank for those cheques to pass through. He was compelled to overdraw his account, and every penny was spent legitimately.

The Chairman, in reply, said he had close business relations with one of the promoters of the Company, and might have made some profit indirectly out of the promotion; but he would point out that he and Colonel Wilson subscribed for 3,000 shares to make up the required capital, and they did this on the distinct understanding that they should only pay the money as and when required. He, personally, had paid every shilling due on his shares. It was not likely that they would pay interest on the balance which remained; they could hardly be expected to take a risk and pay interest too.

After further discussion of various details which the shareholders present felt were really matters for a committee, Messrs. Stenning, Liddell, and Davis were, with the concurrence of the directors, appointed a committee, with power to add thereto, to inquire into the affairs of the Company, and the resolution passed further provided that the meeting should stand adjourned until a balance-sheet was forthcoming.

The meeting accordingly stood adjourned.

Electrical Power Storage Company.

The ninth ordinary general meeting of the shareholders of this Company was held on the 14th ult. at the offices, 4, Great Winchester Street, Mr. John Irving Courtenay presiding.

The Chairman, during his speech, said: The balance-sheet which has been sent to you shows, after payment of debenture interest, a net profit for the year of £4,389 6*s.* 5*d.*, which, together with the sum of £242 0*s.* 2*d.* carried forward from last year, makes a total of £4,631 6*s.* 7*d.*, out of which the directors recommend a similar dividend to that of last year, viz., 5 per cent., carrying forward £356 10*s.* 7*d.* During the year buildings have been erected on part of the new premises mentioned at our last meeting, at a cost of £2,028 8*s.* 9*d.* New plant has been provided for this and other portions of the works, at a total expense of £1,910 0*s.* 11*d.*, and we have maintained existing buildings, plant, and tools at a cost of £2,610 12*s.* 1*d.*, so as to keep the whole of these in thoroughly good order. Notwithstanding the severe competition which now exists, I am pleased to tell you that there has been a very considerable

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increase in the amount of business transacted over that of any previous year, and the increased space at our works has enabled us to cope with the demand. Since our last meeting we have received the Royal Warrant of appointment as storage battery makers to Her Majesty the Queen. As you are doubtless aware, the obtaining of these warrants is a matter of considerable difficulty, and the Electric Power Storage Company is the first and only firm to which a Royal Warrant has been granted for any electric appliance. The chief development in traction during the past year has been the starting of a service of cabs by the London Electrical Cab Company, which cabs ply for hire in the streets and carry passengers at the usual fares of horse vehicles. The whole of these are equipped with our Faure-King cells, and each cab carries a battery capable of taking it a distance of 50 miles without re-charging. We have been unable to find any other storage battery at present manufactured commercially in this country or abroad from which a run of more than 30 miles can be obtained from the same weight and dimensions of battery as ours. The service, which was started in August of last year, has been continued successfully ever since, and we have at present in hand for this Company large orders for extensions. The Compagnie Générale des Voitures in Paris and its allied Company have ordered several sets of these Faure-King batteries for their electrical cabs, and they are at present running some four or five experimental vehicles with them, and with great success. With regard to improvements in secondary batteries and patents therefor, it has been the aim of the directors to ensure that this Company shall always retain its premier position in the storage battery industry, and with this object every invention which is brought to its notice is fully investigated, and where samples can be made or obtained, they are carefully tested in the Company's laboratory, and no trouble or expense is spared in order to thoroughly investigate the merits of each particular case. Whenever there is reason to believe that the Company's manufactures would be improved by the adoption and use of an invention, it is our policy, wherever possible, to make such arrangements as to ensure the Company obtaining the sole right for its use. It is a matter of considerable satisfaction to your directors that, notwithstanding the increase in price of raw materials, especially of our staple article of consumption, lead, they are able to recommend the same dividend as paid for the last six years, and for this they are indebted to the steadily increased output of the works and constant attention of the staff to economy in production. I now move the following resolution:—"That the directors' report and balance sheet to May 31st, 1898, be and are hereby approved and adopted, and that a dividend of 5 per cent. on the paid-up capital be declared payable forthwith."

Sir James Pender seconded the resolution, which was adopted unanimously.

New Electricity Supply Syndicate.

The statutory general meeting of the New Electricity Supply Syndicate (Limited) was held on July 25th, under the presidency of Lord Lurgan (the chairman of the Company), who during his speech said:—This Syndicate was formed for the purpose of acquiring Mr. Rowbotham's patents in connection with his primary generator or battery. We are all aware that so far primary batteries have been tried by the thousand, and thousands of pounds have been spent in vainly trying to produce one which will supply electric light or power at a commercial price. I am glad to be able to tell you that by Mr. Rowbotham's invention the difficulty has been overcome. Mr. Harrison has practically had one of these generators or batteries under his control and immediate supervision for several months past, and if you study his report you will find it is quite as satisfactory as that of Professor Thompson, if not more so. Professor Thompson's original report on this generator, which was made months ago, contained some preliminary observations, in which he says, referring to primary cells or batteries:—"I have found no cell that would give one Board of Trade unit at a lower cost than 1s. 3d. per unit." He concluded that report by bringing down his figures to 6¾d. a unit, which he certified to be the cost. I asked him the other day why he did not give the original people a report sooner? He said:—"I could hardly believe the results of my own tests, and I was anxious to be perfectly certain before I issued a report on the subject." Subsequently he brought the price down to 6¼d. per unit, but we have every reason for stating that we shall get it considerably below that when certain improvements and alterations as suggested and designed by Mr. Rowbotham and also by Mr. Harrison have been perfected. If you refer to Mr. Harrison's report you will notice he says:—"If we add this to the cost of 3·25 lbs. of iron, we obtain a total cost of under 5d. per Board of Trade unit." The advantages of this generator are so numerous that I should weary you if I went into details. I will content myself by drawing your attention to some of the most important points and facts connected with it. In the first place the cost of the installation of this generator is less than half that of the present system of installing accumulators, dynamos, and engines. We require less than half the space occupied by engines, dynamos, and accumulators. The action is automatic, and neither engineers nor skilled labour of any sort is required to supervise this battery and keep it in working order. We shall possess the only generator that can efficiently generate electrical energy without the use of moving machinery. The active materials of our generator are cheap, and can be obtained in unlimited quantities. No doubt you will realise the numberless purposes to which this generator can be applied, and the demand that is bound to ensue for it. As I said before, the poorest as well as the richest will be able to have electric light, for the smallest as well as the largest houses can be supplied with these generators; they will work equally well on a small as on a large scale. Then they are applicable to the lighting of ships, and for electric launches, in which latter respect our battery will do away with the necessity of supplying or charging stations. By a very slight alteration in the construction of this generator it will apply to the propelling of all carriages by electricity. It will come in use for electric trams just as well, and do away with the enormous expense of laying the lines with copper as at present. Altogether, I think you will agree with me that the future of this Company is beyond calculation.

The proceedings then terminated.

The Daimler Motor Company (Limited).

An extraordinary general meeting of the above Company was held in the Throne Room, Holborn Restaurant, on Monday, the 8th inst., for the purpose of considering and, if thought fit, passing a resolution for the appointment of a Committee of Investigation in relation to the statements made by Mr. Sturmey in two circulars bearing his name and dated July 21st, 1898, and all such other powers as to the meeting may seem necessary. A fair sprinkling of shareholders attended, and Mr. J. H. Mace (chairman *pro tem.*) presided over the meeting. The objects of the meeting were fully discussed by various shareholders, and from the statements made by several of the directors, including Mr. Sturmey, Mr. Holt, and the Chairman (Mr. Mace), it appeared that the entire bother was more of a personal disagreement among the directors than anything actually wrong in the affairs of the Company itself. After a great deal of discussion as to the appointment or non-appointment of a Committee of Investigation, it was decided not to go into any of the details of the disagreement at the public meeting but to appoint a Committee of three.

The following resolution was then passed:—"That a shareholders' Committee of three members be appointed to investigate the statements made by Mr. Sturmey in his two circulars, such Committee to be endowed with full powers to employ any professional assistance they may require, and to have access to all the books and records, and to call the assistance of the Company's officials and servants; to report fully to the shareholders as to the past management of the Company, and to make such suggestions as they may think necessary for the conduct of the Company's business in the future, such proper expenses as the Committee may incur to be defrayed by the Company."

Under this resolution Messrs. Rawlinson, Avery, and Leake were appointed to act as a Committee, and the meeting then terminated.

The London General Omnibus Company.

The London General Omnibus Company have issued their report for the last half-year's working. The gross receipts for the half-year were £553,223, against £539,438 in the corresponding half of 1897. The increase of £13,785 in the receipts is more than counterbalanced by the increase of £32,473 in working expenses, making the net profit £18,679 less. The chief part of the increase in expenditure is due to higher prices for provender and bedding for the horses, the average cost for each stud having been £128, as against £123 in the corresponding halves of the two preceding years. The average number of omnibuses running was 1,190, against 1,100 last year, and the average receipts for passengers per omnibus per day were £2 10s 1¾d., against £2 12s. 11½d. The total number of passengers carried in the half-year was 89,569,124, against 83,277,814 last year. The total expenses on revenue account in the half-year were £512,194, and in the corresponding period of 1897 they amounted to £479,720. The expenditure on land, stables, and buildings in the half-year amounted to £55,436. The total number of horses owned by the Company on June 30th last was 14,991; on June 30th, 1897, it was 13,740. The omnibus stock has been well maintained, and 67 new omnibuses were built at the Company's coach factory in the half-year and placed on the road. The profit and loss account is as follows:—Amount brought from last account, £15,053; profit on working for half-year ended June 30th last, £41,029; interest and dividends on investments, £4,950; premiums received on 4 per cent. mortgage debentures, £4,458; unclaimed dividends for 1892 forfeited, £147; total, £65,638. Interest on debentures to June 30th, £3,038; carried to general reserve fund, £10,000; dividend for the half-year after the rate of 8 per cent. per annum and bonus of £1 5s. per cent. (equal to 10¼ per cent. per annum), free of income tax, £38,290; leaving balance to be carried forward to next account, £14,309.

New Companies Registered.

[Under this heading we give a full list of new Companies registered which take power to make, deal, or become interested in any manner in automotor vehicles.]

Automobile Association (Limited).—Registered by Cutler and Co., 15, Duke Street, St. James's, S.W. Capital £10,000, in £1 shares. Object, to carry on the business of dealers and proprietors of motor and other carriages, vans, wagons, cycles, and other vehicles, jobmasters, carriers, motor-car builders, carpenters, joiners, engineers, machinists, rubber manufacturers, &c. Offices, 1, Princes Road, Holland Park Avenue, W.

Bell Hall Tyre Syndicate (Limited).—Registered by Hudson and Kearns, 83, Southwark Street. Capital £50,000, in £1 shares. Object, to adopt an agreement; to acquire the letters patent No. 27,225 of 1896, granted to Robert Bell and W. T. Hall, in respect of an invention for improvements relating to pneumatic tyres for cycles and other vehicles; and generally to carry on business as manufacturers of and dealers in cycles, motor-cars, fittings and accessories for the same, &c.

Crewdson, Hardy, and Co.—Capital £55,000, in £5 shares. Object, to acquire and take over as a going concern the business carried on at Middlesborough, Yorks., under the style or firm of Crewdson, Hardy, and Co., and to carry on the business of tube manufacturers, fitting and mechanical and general engineers, cycle and motor-car manufacturers, &c. The first directors are: Sir Raylton Dixon, J.P., John Livingston, and William H. Hardy.

Patent Wheel and Axle Company.—Capital £25,000, in £1 shares. Object, to adopt an agreement with Scott's Patent Wheel and Axle Syndicate (Limited), and to carry on the business of patent wheel and axle manufacturers, motor-car builders, &c. Registered office, 50, George Street, Newport (Mon.).

Pneumatic Direct Propulsion Syndicate (Limited).—Registered by Van Sandau and Co., 13, King Street, E.C. Capital £5,000, in £5 shares. Object, to adopt a certain agreement, and to acquire, work, and develop certain patents and other rights for a system of pneumatic propulsion, belonging to Mr. L. Hopcraft.

Railway Developments (Limited).—Registered by Leggatt and Co., 5, Raymond Buildings, W.C. Capital £100,000, in £1 shares. Object, to carry on the business of railway and tramway proprietors and carriers, to construct and supply motor-carriages, locomotives, or other vehicles, &c.

THE Vallée Motorette, which took part in the recent motor race from Lille to Calais, is likely to be seen shortly in England in goodly numbers, as a Company has been formed, entitled the Vallée Motorette Company, 131, Gloucester Road, Regent's Park, N.W., for the purpose of introducing it to England on an extensive scale.

JEZELI Pan zechcisz oglaszac w pismie naszem prosze podac nazwe THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

President	Sir DAVID SALOMONS, Bart.
Secretary	ANDREW W. BARR, Esq.
President of the Liverpool Centre	The EARL OF DERBY, K.G., G.C.B.
Hon. Local Secretary	E. SHRAPNELL SMITH, Esq.
Semi-Official Journal of the Association	THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL.

SELF-PROPELLED TRAFFIC ASSOCIATION

(INCORPORATED).

LIVERPOOL AND DISTRICT CENTRE.

Liverpool Trials of Moto-Vehicles for Heavy Traffic.

MAY 24TH TO 27th, 1898.

THE following are the unanimous awards of the Judges:—

Official No. 5.—First prize, £100. The Lancashire Steam Motor Company, Leyland.

Official No. 1.—Second prize, £75. The Liquid Fuel Engineering Company, East Cowes, I.W.

Official No. 4.—Third prize, £50. The Steam Carriage and Wagon Company (Ltd.), Chiswick.

DAVID L. SALOMONS.
BOVERTON REDWOOD.
S. B. COTTRELL.
H. S. HELE-SHAW.
HENRY H. WEST.
E. SHRAPNELL SMITH,
Hon. Organising Secretary.

The full report will be issued later in the year.

Those Terrible Moto-Vehicles!—At a meeting of the Leamington Town Council on the 8th inst., Councillor Molesworth referred to the lack of regulation of traffic in Leamington, and said he had been obliged to bring the matter before the Watch Committee. If the traffic was not better regulated there must soon be a serious accident. Alderman Wackrill said any moto-car could be stopped by a person holding up his hand. Alderman Thursfield (deputy mayor) said moto-car drivers ignored requests to stop. He was nearly run over the other day by a moto-car. His horse went dancing all over the place, and when he requested the people in the car to stop they refused and laughed at him. Several members of the Council expressed the opinion that more stringent regulation of the street traffic in Leamington was desirable, and even necessary, and the Mayor said the Chairman of the Watch Committee would see the Chief Constable on the matter.

NOTICES.

Contributions and articles likely to prove of interest to our readers will receive due attention, but in all cases the name and address of the writer must be given, not necessarily for publication.

All matter intended for publication should reach us not later than the 10th of each month, and be addressed to The Editor of "The Automotor and Horseless Vehicle Journal," 62, *St. Martin's Lane, London, W.C. Stamped envelope must be sent if the manuscript is required to be returned. The Journal is published the middle of each month.*

All Advertisements should be addressed to F. King and Co., Limited, 62, *St. Martin's Lane, London, W.C., where Advertising Rates may be had on application.*

The Annual Subscription is 7s., including prepaid postage to any part of the world. Single copy 7d., post free.

Cheques and Post Office Orders should be made payable to F. King and Co., Limited, *and crossed London and County Bank; otherwise no responsibility will be accepted.*

Special Notice.

The Automotor and Horseless Vehicle Journal *can be obtained from all* Messrs. W. H. Smith and Son's *bookstalls, and the following Agents :—*

London: Wholesale—Brett and Co., 5, Pilgrim Street, Ludgate Hill, E.C.; Munton and Co., 7, Red Lion Court, Fleet Street, E.C.

Birmingham: J. McCann, 37, Union Street.

Manchester: John Heywood, Deansgate.

Newcastle-on-Tyne: C. C. Ross, 35, Side.

Paris: Homère Moreau, 97, Rue Nollet.

Victoria (Australia): Phillips, Ormonde, and Co., 169, Queen Street, Melbourne.

When any difficulty is experienced in procuring the Journal from local newsvendors, intending subscribers can obtain each issue direct from the Publishing Office, by forwarding remittance of 7s. for 12 months' subscription, post free (or at the rate of 7d. per copy).

Proprietors and Publishers— F. KING & CO., LIMITED, 62, St. Martin's Lane, London, W.C.

The Automotor and Horseless Vehicle Journal.

A RECORD AND REVIEW OF APPLIED AUTOMATIC LOCOMOTION.

AUGUST 15TH, 1898.

DIARY OF FORTHCOMING EVENTS.

Notices to be included under this heading should reach the Office not later than the 12th of each month.

1898.	
August 22 to Sept. 3	Engineering, Machinery, and Motor-Car Exhibition. Royal Agricultural Hall, Islington.
Nov. 18 to 26..	Stanley Show of Cycles, Motor-Carriages, &c. Royal Agricultural Hall, Islington.
1899	Race from Paris to St. Petersburg, under the auspices of the Automobile Club of France.
„	Motor-Car Exhibition at Tunbridge Wells.
„	Heavy Motor-Vehicle Competition at Liverpool.
„ October..	Concour des Poids Lourds at Versailles.
1900	Paris International Exhibition — Great Display of Automotor-Vehicles and Allied Trades.

ANSWERS TO CORRESPONDENTS.

J. T.—Yes. The "Joy" valve gear is well known to us, and you can apply it with confidence to your steam vehicle. Let us know how it works.

S. Smith.—The Lundell motor has two separate magnet poles and one winding.

Petrol.—"Tea Rose" oil, as sold by the Anglo-American Company, has a flash point of 82° F. (Abel close test), and a boiling point of 304° F. Its specific gravity is ·797.

Oil Motors.—Yes. New and Mayne, of Woking. Roots and Venables, of London, make oil motors, using ordinary burning oil of 73° flash point. These are eminently well suited for vehicles.

Student.—In the New York trials of electric cabs 1 effective H.P. was obtained from 300 lbs. of battery, and 1 H.P. from 100 lbs. of battery.

E. S. (Bromley).—(*a*) We shall republish the Petrol List from time to time with additions, and it will also be published in very complete form in our next Pocket-Book. (*b*) We shall be always glad to know of any adulteration as mentioned by you, so that we may record such firms on a black list.

B. L. (Herne Hill).—(*a*) We hardly think so. (*b*) Apply to the Southern Motor-Car and Cycle Company, 59, Brixton Road, London. They can carry out what you want and they also supply Benz vehicles on much improved principles. See our July number, p. 399.

T. R. D. E. (Kelso).—Regret impossible to supply you with No. 1, Vol. I, separately; should be very glad to have some ourselves. We have still two or three bound in volume form complete at one guinea.

Petrol (South Shields).—You can obtain a Benz motor-vehicle from Friswell's, 18, Holborn Viaduct, London, or a "Richard," which is an improved Benz, of the Southern Motor-Car Company, 59, Brixton Road.

Guardsman at Play.—A battery of storage cells is quite free from any risk of explosion so long as they are placed in well-ventilated situations. If, however, confined within boxes, the nitrous oxide fumes are liable to accumulate, and these form with air an explosive mixture which might be exploded by contact with a naked light.

THE THREE-TON LIMIT.

The unanimous resolution of the Liverpool Centre of the Self-Propelled Traffic Association at their last meeting to exert the whole force of the Association in order to obtain an amendment of the Locomotives on Highways Act in the direction of removing all restrictions upon the weight of vehicles will, we think, be generally approved of, and supported by all those who see, as we do, in automobilism on common roads, the solution of those economical problems that at present beset the farmer, the railway carrier, and the legislator. We do not intend to discuss the reason why eggs, flowers, and butter produced in France are carried over our railways at a fraction of the cost that is charged for the same commodities produced but a few miles from our own doors. We may revise rates, and talk glibly enough about our 5-ton and 10-ton consignments and the rebate on them, and we may bewail that the British farmer is hopelessly conservative. All this does not alter the fact we have stated. During its existence the S.P.T.A., or rather the Liverpool Centre, has by means of discussions, papers, and practical trials demonstrated the possibilities of the 3-ton limit, and has concluded that it is desirable to remove all restrictions upon weight. On the other hand, many automobilists think that the possibilities of the 3-ton limit are not yet exhausted. Thus Mr. F. Simms, in a letter to us, deprecates any alteration in the Act at present, and we have reason to know that his views are shared by a good many other gentlemen. For ourselves, while believing it is possible to produce a vehicle weighing not more than 3 tons that shall carry at least two and a half times this, we strongly advocate raising the limit to at least 4 tons, because this permits heavier scantlings and a larger factor of safety in the boiler, and generally greater endurance; it also means less damage to roads. Of course, this remark applies more strongly if all restrictions on weight are removed, but in the latter case the result would be the construction of vehicles that would be like miniature tramp steamers on wheels, and we should find a somewhat analogous state of affairs obtaining on land as prevailed at sea some years ago—low engine powers associated with great weight of load carried. At the same time, the view of the S.P.T.A. is a perfectly logical one, and we do not see how it can be seriously contested. They, in fact, point out a serious anomaly under which motor-vehicles labour as compared with horse-drawn vehicles. This will be seen by taking a few instances.

Suppose a mass of machinery some 10 to 12 tons has to be moved. A trolly weighing certainly over 3 tons and drawn by 10 or 12 horses would be employed, the weight of the vehicle unladen and its hauling power being not less than

8 tons. A light motor-vehicle could not be employed because the weight of such is limited to 3 tons unladen, and it would not at present be possible to get the power and strength of structure into vehicles on this limit. Why should it in effect be unlawful to build or employ a self-propelled vehicle for this purpose? Taking a more usual and more moderate load we see the same anomaly; the horse-drawn vehicle can be of any weight and drawn by any number of horses; the motor-vehicle must still be strictly limited to 3 tons. Moreover, too, it has to be licensed, and is taxed. Why should this be? Why should a heavy railway goods van weighing unladen 2 tons, or with its three horses 4·6 tons, be a legal means of transport and be free from taxation, and motor-vehicles not only be taxed but, if over 3 tons, be an absolutely illegal means of transport?

Let us retain the 3-ton limit by all means, but let us be logical. Let us say that *no* vehicle with its motive power shall weigh more than this, and that *all* vehicles shall be licensed and taxed; or, better still, let us say that ALL vehicles weighing, with their motive power, over 4 tons, shall be specially licensed and shall be taxed. We would, however, urge upon all parties, no matter what be their views, the desirability of approaching this subject in a judicial spirit of pure logic.

Those who, thanks to their position and influence with the Government, assisted in getting us the Locomotives on Highways Act, against some very cordial and truly British opposition in both Houses, naturally regard that measure, even incomplete and illogical as it is, with feelings of affection, and would like to see its possibilities tried further yet before considering amendment. The fact is, however, that the progress of heavy automobilism in France, and the great scope for it in this country, have so forced themselves upon the attention of commercial men, that an early amendment of the Act in the direction of at least an increase in the tare weight of a vehicle unladen, leaving for the moment other considerations, is imperative.

SIR DAVID SALOMONS ON AUTOMOBILISM.

WE publish in our present issue a translation of a most interesting letter that Sir David Salomons, the President of the S.P.T.A., has addressed to M. Paul Giffard, the editor-in-chief of our well written and excellent contemporary *Le Velo*. Sir David makes a most effective comparison between our and Continental methods in dealing with automobilism. In England we complain of too much law—too much restriction. In France one finds nearly every transaction in life minutely regulated by law. We are seeking to place motor-vehicles on the same legal footing as horse-drawn ones, and with every prospect of success; in other words we are seeking to remove restrictions. In France an elaborate bureaucratic system is being built up which Englishmen would not tolerate for a moment. Fancy having to produce one's birth certificate before being licensed to drive a motor-vehicle! We do this thing, at any rate, much better on this side of the channel. Thanks to our law-abiding instincts, automobilism in England is a gradually growing social and economic influence of the most far-reaching possibilities. In France it is mostly a pastime for the leisured classes. In England the law relating to automobiles can be written on one page of this journal. Anyone who has the means can own a motor-vehicle. Anyone who likes to take the task can drive one. Our law does not say a word about the qualifications of either owner or driver, but it says a lot about the rights of those who are run over. In France the law says the owner and driver must comply with a long series of regulations; it takes little thought of those who may be injured by reckless driving. Hence, automobilism in France is likely to be a public nuisance; in England it will be as great a benefit as railways, and the reason is to be found in the difference in the characteristics of the Latin and Anglo-Saxon races. It is this self-reliance, this respect for wise laws, that has made this country what it is.

There is an increasing party among us which seeks to imitate the French method, and would regulate all affairs of life by law. One constantly hears these feeble-minded folk say "there ought to be a law" for this, that, and the other.

We entirely share the view of Sir David Salomons on this matter of the law of automobilism. A number of regulations such as they have in France would effect no practical good, but would retard the progress of the industry. We may safely rely upon the natural good sense and law-abiding instincts of the majority of English automobilists to render the imposition of any further legal restrictions quite unnecessary.

We would recommend a perusal of Sir David Salomons's letter to our provincial magistrates, horsy J.P.'s, and to those amœbic folks one finds on county councils, and on similar bodies, who are always seeking to impose a new law upon their neighbours, and who see salvation in an Act of Parliament.

We observe with pleasure that Sir David Salomons is an individualist. In these days of frothy declamation a few utterances, such as the letter we have referred to, do much good.

LIVERPOOL TRIALS OF MOTO-VEHICLES FOR HEAVY TRAFFIC.

MAY 24TH TO 27TH, 1898.

THE following are the unanimous awards of the judges:—

First prize, £100	..	The Lancashire Steam Motor Company, Leyland (Official No. 5).
Second prize, £75	..	The Liquid Fuel Engineering Company, East Cowes, I.W. (Official No. 1).
Third prize, £50	..	The Steam Carriage and Wagon Company (Limited), Chiswick (Official No. 4).

As we shall publish the judges' report in our next issue, we need only remark on the above that their finding is, we think, a proper one, and as such it will be generally accepted. Those who might be inclined to entertain different views as to the relative merits of the vehicles must remember that the judges had full particulars and data of each vehicle, which others had not, and in arriving at any opinion many factors other than those apparent at trials have to be considered. In describing the trials we gave a preliminary analysis of the performances* of the vehicles, and from this it will be seen that our inferred conclusions have been generally supported by the above finding. Another remark that we may permit ourselves to make is that the first and second prizes have been gained by vehicles using petroleum as fuel, notwithstanding the extra cost of the latter as compared with coal or coke. It must, however, be remembered that ease of manipulation, freedom from dirt, sparks, &c., are important considerations which, if all conditions are known, can be expressed as having certain money values, and these no doubt influenced the committee a good deal. The exclusion of the official No. 3 from the awards is, we think, clearly due to mechanical features of that vehicle, such as the low evaporative power of the boiler and the adoption of an articulated joint, together with a want of sufficient adhesion on the drivers.

AUTOMOBILISM AND SOCIALISM.

MUNICIPAL bodies are very extensive users of horse-drawn vehicles for various purposes, and once the superiority of the motor-vehicle from the mechanical, sanitary, and economical points of view is demonstrated we may be sure that a very large business will be done in the construction of such vehicles. Already Chiswick and Liverpool have set an example that may well be imitated, and to our knowledge several firms are acquiring premises, laying down plant, &c., for the purpose of building municipal motor-vehicles. It, therefore, becomes a question of some moment to consider the terms upon which municipal bodies enter into contracts with manufacturers. In general these contracts are of a purely business nature, but of late years it has been customary to insert clauses which ensure the payment of the standard rate of wages to the workmen, the prevention of sweating, &c. This is as it should be; large and wealthy customers, as municipal bodies are, can properly set an example in these matters and create a healthy public opinion in the matter of the treatment of workers. The London County Council—the largest municipal body in the world—however, adopts a proletarian attitude

* *Vide* THE AUTOMOTOR for June, p. 333.

and insists upon terms in its contracts which seem to go far beyond what is justifiable either from a legal, moral, or business point of view. It seeks, in effect, to carry out principles of advanced Socialism—not that we say such principles are wrong in themselves, but they are certainly not yet practicable in our present very cosmical society. A very remarkable instance of this has lately been furnished by the publication of some correspondence that has passed between the London County Council and the very eminent firm of nautical automobilists, Messrs. Yarrow and Co., of Poplar. Readers of THE AUTOMOTOR will know that we have taken considerable interest in the question of motor fire-engines and have repeatedly pointed out the inefficiency of the Fire Brigade plant both afloat and on land. Our remarks have not been without effect, but of this we speak elsewhere. In THE AUTOMOTOR for April of this year we gave particulars of a new fire-float that Messrs. Yarrow had designed for the London County Council and which the Fire Brigade Committee had recommended the Council to adopt. This the Council did and sent on its contract for Messrs. Yarrow to sign.

Messrs. Yarrow naturally expected that this document would be an ordinary shipbuilding contract, such as they were accustomed to. They received a volume of some 17 or 20 pages, containing, *inter alia*, the following clauses, which we especially commend to the notice of those of our readers who are manufacturers:—

Clause 16.—"The foreman shall not be changed without the consent of the chief officer, but may be objected to or dismissed by the chief officer if and when he shall see fit, and thereupon the contractors shall cease to employ such foreman or foremen, and employ another or other good and competent foreman or foremen in his or their stead, and so on from time to time so often as occasion shall require."

It further on says:—"The chief officer shall be at full liberty to object to or dismiss any person employed by the contractors who shall, in the opinion of the chief officer, misconduct himself," &c.

Clause 34: *Para.* 1.—"The contractor shall pay all workmen—except a reasonable number of their legally-bound apprentices—employed by them in and about the execution of this contract, or any part thereof, wages, and wages for overtime respectively, at rates not less than the rates stated in the second schedule hereto; and for each and every breach by the contractors of this stipulation, and notwithstanding the condonation of any prior or other breach, the contractors shall, on demand, pay to the Council as liquidated damages, and not as a penalty, the sum of £5.

Para. 2.—"The contractors shall observe and cause to be observed by all such workmen, hours of labour not greater than the hours of labour stated in the said second schedule, and for each and every breach by the contractors of this stipulation, and notwithstanding the condonation of any prior or other breach, the contractors shall on demand pay to the Council as liquidated damages, and not as a penalty for each day on which any such breach shall be committed, and for each workman in respect to whom it shall be committed, the sum of 5*s.* per hour for every hour during which on each day each workman shall be employed by the contractors beyond the maximum number of hours stated in the said second schedule, provided that this stipulation shall not be construed to prohibit overtime, if such overtime be in accordance with the rules of the trades unions concerned."

Para. 3.—"The contractors shall at all times during the continuance of this contract display and keep displayed upon the site of the works, and in every factory, workshop, or place occupied or used by the contractors in or about the execution of this contract, in a position in which the same may be easily read by all workmen employed by the contractors in or about the execution of this contract, a clearly printed or written copy of the said second schedule hereto."

Naturally Messrs. Yarrow hesitated to accept such onerous clauses, and finally declined the business. They pointed out that the insertion of such clauses by the Council "will undoubtedly be that the firms executing the highest class work will be prevented from accepting such contracts, and that the cost of the work will by natural processes be greatly increased, not only to the detriment of the Council itself, but also to the injury of those public interests that it is intended to preserve; while the harmonious relations existing between employers and their employés, which it should be the desire and effort of all public bodies to maintain, would be seriously jeopardised."

The Council reply to the effect that after consideration they could not vary the contract, and "as the matter is urgent must reluctantly seek tenders from other firms." A debate on the matter ensued subsequently, and notwithstanding that many members pointed out the grave consequences that would ensue if the policy as exemplified in this precious contract were adhered to it was decided to proceed no further in the matter. In the meantime we trust, for the reputation of the Council, that a more common-sense view of what is essentially a business and not a philanthropic transaction will obtain.

Our view of the matter is this. As the prospective purchaser, the Council has the undoubted right to insert any clauses in its contracts, no matter of what kind, so long as these are not in themselves immoral, illegal, or opposed to public policy. The determination of the propriety or legality of any contract rests with third parties, viz., the judges. Opinions may well differ as to the propriety, legality, or even morality of the clauses in the contract referred to. Their legality is, at any rate—we have authority for saying—very doubtful. Be this as it may, the effect of such clauses is to enhance the ordinary contractor's risk. Supposing the official of the County Council insisted upon the dismissal of a foreman, who was a member of the A.S.E. or I.S. and B.M. unions, the works would be at once "struck." The dismissed workman could possibly even maintain an action for damages. Unless, too, the contractor in his other contracts had protected himself by the "Strike clause," he would be liable to other parties, he might even become bankrupt. That, however, is a detail; our point is that the insertion of these clauses by the County Council merely creates an additional risk, which, like all other risks, may be underwritten. In the present case the risk of a partial or total stoppage was very real, and by no means a remote contingency, and before the firm in question could have accepted the business from the County Council, their quotation for it would have to be increased by at least some five per cent. In short, the insertion of these clauses means that the public pays the premium of the inevitable and necessary underwriting. Even when a contractor is thus insured he is not fully compensated for the loss of time, worry, and trouble he incurs, and so it comes about that the better class of firms do not care to tender for County Council work. This fact is rather ruefully admitted by the County Council semi-official organ, *London*, which in a recent issue says:—"The contractors are not very keen to obtain work under the County Council just now. Only two tenders, it may be remembered, were obtained for the Greenwich Tunnel—a passenger tunnel on the same lines as the Blackwall Tunnel, and the tenders were much in excess of the engineer's estimate."

Naturally; the risk of loss is so great that, as a matter of prudence alone, it is necessary to charge more in order to cover the premium of insurance. The question for the ratepayer is, Is it necessary to pay this higher price, or, in other words, is it worth while to retain these clauses in the London County Council contracts?

It will be noticed that we regard the matter as a purely business one, and express no opinion on the political influences at work on the Council, but which bid fair to make it a "machine," compared to which Tammany Hall, of New York, is a seat of enlightened municipal government.

Personal.—Mr. W. Worby Beaumont left England on a visit to the United States on the 12th inst., to inspect and report on a special class of machinery, electrical working of machine tools, and on certain manufactures. Motor tramcar and carriage questions will at the same time occupy his attention. He will return at the end of September.

The Liverpool Corporation and Automobilism.—Under this heading we published in our July number a paragraph referring to the placing of an order by the Liverpool Corporation for a steam motor-vehicle for municipal purposes. Our remarks on this were, we admit, of a slightly sub-acid nature, but written in good faith and without malice. Unfortunately, they have given some offence to some gentlemen concerned, who see in them some reflection imputing a want of enterprise on their part in not placing such an order earlier. We hasten to take this first opportunity of expressing our regret that our remarks should have occasioned this most undesirable result. We willingly state that, so far from intending or wishing to reflect in any way upon any gentleman connected with the Corporation, we recognise that in placing this order so soon after the late trials the Corporation was well advised, and showed a most public-spirited enterprise in acting upon that advice. We trust that this explanation will be accepted in the spirit it is made, and that an incident that we deplore will now be regarded as closed.

THE AUTOMOBILE CLUB OF GREAT BRITAIN AND IRELAND,

With which is incorporated the Self-Propelled Traffic Association.

AN extraordinary general meeting of members of the above-named Club was held on Tuesday, August 9th, at 1 p.m., at the premises of the Club, 4, Whitehall Court, London, S.W.

Among those present were:—Mr. Roger W. Wallace, Q.C., Chairman of the Club (in the chair), Mr. Frederick R. Simms (Vice-Chairman), Mr. Frank H. Butler (Hon. Treasurer), Mr. C. Harrington Moore (Hon. Secretary), the Right Hon. the Earl of Galloway, K.T., Sir Douglas Galton, Bart., K.C.B., F.R.S., Sir David Salomons, Bart., J.P., Messrs. W. Worby Beaumont, Herbert Capel, Thos. Clarkson, C. Cordingley, T. W. Staplee Firth, A. S. Gilbertson, Berger Graham, R. Gray, Julius Harvey, H. Hewetson, J. H. C. Hewett, Chas. Heyermans, E. M. C. Instone, E. Lefébure, H. C. Marshall. J. McManus, P. McManus, H. Melvill, H. J. Mulliner, Arthur Paget, R. Phillips, Bernard B. Redwood, J. D. Roots, Lyons Sampson, O. Scholzig, Alexander Siemens, Stanley Spooner, Alfred Thompson, E. Townsend, Andrew W. Barr (Auditor), and C. Johnson (Secretary).

The Secretary having read the notice convening the meeting, it was moved by the Chairman, seconded by Sir Douglas Galton, and resolved: "That in accordance with the recommendations of the Club Committee the following members be, and they are hereby appointed members of the Club Committee:—Sir David Salomons, Bart., J.P.; Mr. Alexander Siemens; Mr. John I. Thornycroft, F.R.S.; the Hon. C. S. Rolls; Mr. Andrew W. Barr; Mr. Alfred Bird; Professor Vernon C. Boys, F.R.S.; Mr. R. E. B. Crompton; Mr. Walter Hancock; Mr. Bayntun Hippisley, D.L., J.P.. Mr. J. T. Hopwood, D.L., J.P.; Mr. Alfred L. Jones, J.P.; Mr. E. Macrory, Q.C.; Mr. Harry Melvill; Mr. E. Shrapnell Smith; Mr. E. R. Shipton."

Prior to the above-named meeting the following were elected ordinary members of the Club:—Messrs. J. W. Amps, F. P. S. Harris, Bayntun Hippisley, D.L., J.P. (Junior Carlton Club), C. Vernon Pugh (National Liberal Club), Alberto Randegger (Arts Club), John Stirling (Hamilton, N.B.); and among the members of the Self-Propelled Traffic Association who have joined the Automobile Club are:—Sir David Salomons, Bart., J.P. (Whitehall and City of London Clubs and Automobile Club de France), The Hon. C. S. Rolls (Automobile Club de France), Professor C. Vernon Boys, F.R.S. (Savile Club), Dr. John Abercrombie, M.D., F.R.C.P.; John I. Thornycroft, F.R.S.; Messrs. Francis E. Baron (Blackpool), Andrew W. Barr (New Club), H. Percy Boulnois, John Brown (Ulster Reform Club), Fred. J. Burrell, J. G. Carew-Gibson (Junior Constitutional Club), Thos. Clarke, W. A. Darbishire, D.L. (Devonshire Club), Henry T. Davis; Captain H. Murray-Dunlop (late R.A.); Messrs. Walter Hancock, J. T. Hopwood (Carlton Club), Alfred L. Jones. J.P., H. F. Julian (Teignmouth), T. Dove Keighley, Walter N. Landor, B.A., J. P. Lea (Hulme), Washington Lyon (City Liberal Club), Edmund Macrory, Q.C., J. Stewart Mellam (Sports Club), Harry Melvill (Bachelor's Club and Automobile Club de France), E. A. Mitchell, H. A. Naismith, J. A. McNaught (National Liberal Club), F. C. Nunn (Constitutional Club and Royal London Yacht Club), M. R. Pryor (Athenæum and Oxford and Cambridge Clubs), J. Graham Reece (Liverpool), Alexander Siemens, E. Shrapnell Smith, J. E. Thornton (Altrincham), Wilfred Le P. Webb.

ON the 23rd ult. a very enjoyable entertainment took place on the house boat, the "Dolce far Niente," at Shiplake, when Mr. Frank Butler, the Hon. Treasurer of the Club, had invited members owning moto-cars and their friends riding with them as his guests for a day. A magnificent marquee had been erected on the bank, where about 300 had lunch, Signor Bocchi's band discoursing music throughout the day. Among the guests were Mr. Roger Wallace, Q.C., and Mrs. Wallace, Sir John Tyler, C.I.E., Mr. Munton Jaffray, J.P., and his daughters, Mrs. Hiram Maxim, Mr. Herbert do Stern, Mr. and Mrs. Louis D'Egville (who gave a very excellent piano and violin recital on the house boat), Mr. and Mrs. Hodges, Mr. Foster Pedley, Mr. and Mrs. Randegger, Mr. and Mrs. Lyons Sampson, Mr. E. G. Brewster, Mr. Berger Graham, Dr. Leadam, Mr., Mrs., and Miss Mulliner, Mr., Mrs., and Miss W. P. C. Wills, Mr. Instone, Dr. Lehwess, &c., &c. As already announced, two of the Daimler Company's wagonettes and two wagonettes lent by the London Motor-Van and Wagon Company conveyed a number of the members from the Club premises to Shiplake, whilst quite a number of private owners came from various places in their moto-carriages, which included vehicles of the Daimler, Benz, Mors, Le Blon, De Dion, and Bollée types. The weather was fortunately all that could be desired although a little bit windy, and some excellent photos were obtained of the gathering, which have appeared in the *Lady's Pictorial* of the 30th ult. Altogether Mr. Frank Butler may claim the credit of having given one of the most successful functions of the season in connection with the Automobile Club. On the Sunday several of the guests had a run to Oxford and back, *viâ* Streatley, Pangbourne, Tilehurst, Caversham, and Shiplake to the Royal Hotel at Henley, the main body of the company making this excellently-managed hotel their headquarters, whence on Monday the party returned to London by about 11.30 a.m.

DR. C. E. SHELLY, a member of the Automobile Club, has made a suggestion—which has been adopted by the Technical Sub-Committee of the Club—"that if every member owning a motor-vehicle were to contribute to the Club, photographs and reliable particulars of his motor-vehicle or motor-vehicles, these would form a useful album of reference for use by members, and if duplicate copies were presented to and kept by the Club they would constitute an invaluable permanent chronological record of the early stages of the automobile movement." Members are therefore particularly requested to kindly supply to the secretary two copies of a half-plate photograph of their motor-vehicles, printed by a permanent process. The photographs should be taken from a point of view showing the vehicle broadside-on or nearly so, and not more than one adult figure should be introduced into the picture, and this figure should be so placed as not to obscure a view of the vehicle. The information desired, which is very full, is indicated on a proper form supplied by the Club.

Electric Power from Sea Waves.—A company has been making a series of experiments at Los Angeles, in which the force of the waves of the ocean was used to generate electric power for light and other purposes. A wharf made of metal was built, extending 350 feet out into the ocean, and the generating plant was placed at the end. It included three floats connected with vertical hydraulic compressors, which, in turn, were connected with a storage pressure tank. The movement of the waves alternately raises and lowers the floats, pumping fresh water from the reservoir into the storage pressure tank, where the water is subjected to sufficient pressure to drive it out with great force through a water-wheel. This water-motor operates the dynamo, and the water which has passed from the motor flows into the reservoir to be used again. The machinery is almost self-governing, as in case of storm or heavy sea the accumulated pressure in the storage tank exerts itself against the pump pistons and affects the action of the floats. A thorough test of the apparatus was made during the winter, when all kinds of weather were experienced, and the plant is now to be enlarged to a capacity of 200 H.P.

Cork as a Paving Material.—It may not be generally known that cork has been somewhat extensively tested in different parts of the kingdom for some years past as a material suitable for road pavements. Ground up into small particles mixed with bitumen and a suitable fibrous material, when compressed into blocks under a high pressure—600 lbs. per square inch—this material has been found to produce a medium for road pavements which has given excellent results under different conditions. The material is tough, cohesive, and elastic, without being too easily compressed or indented. Not only does it afford a good foothold, but it is practically non-absorbent and noiseless. It is laid in cakes, very much in the same manner as wood blocks, that is, on a cement concrete foundation of a depth suitable to the traffic to be encountered, and the jointing material is bitumen. The Cork Pavement Company (Limited), 21, St. Mary Axe, E.C., have applied a large amount of this pavement, not only in the metropolis, but also in other parts of the kingdom, with, it is claimed, highly satisfactory results. At Liverpool Street Station, London, several roadways have been in use for a number of years paved with cork, and the results are said to have been all that need be desired.

THE LIQUID FUEL ENGINEERING COMPANY'S LATEST TRADE VAN.

The illustration below shows the latest type of the now well-known "Lifu" vans, which has been specially built to the order of Messrs. Spiers and Pond. This vehicle is practically identical in principle with the steam lorry which we announce in our current issue as having been awarded the second prize in the Liverpool Heavy Traffic Trials, and which we fully described in our issue of May 15th last, the only difference being that it is not fitted with sand boxes, and has a covered body as well as accommodation on the roof for parcels. The clear space inside for the accommodation of goods and parcels is 8 feet by 4 feet 8 inches. The vehicle is capable of a speed of 12 miles per hour, and of climbing grades of one in six when fully loaded, the engines working compound. In order to ascend steeper grades, or to propel the vehicle through extremely soft or bad roads, the engines are so arranged that steam may be let into the lower pressure cylinder, which nearly or quite doubles the power.

The engines and boiler are both of 25 H.P., and both the systems of gearing and steering arrangements are identical with those of the Liverpool steam lorry. Band brakes are fitted as usual to the rear wheels and work by means of a foot lever by the driver.

INSTITUTE OF BRITISH CARRIAGE MANUFACTURERS.

The eleventh annual autumnal meeting of this Incorporated Society will be held in Edinburgh, commencing on Tuesday, September 6th, for the reading and discussion of papers, &c. The President for the year is Wm. Angus, Esq., J.P. On the first day a paper will be read on "Application of Motors to Carriages (Private and Public)," by Mr. T. Coward, which is to be followed by a discussion. A special prize competition has also been organised for carriage manufactory employés or the accessory trades, whilst the arrangements for special tours, &c., have been very judiciously provided for. Mr. Barr, accompanied by Mr. John Croall, the honorary local secretary, has arranged on the week previous to the meeting to visit the Trossachs to see that everything is in order, and on the day preceding the meeting will be present in Edinburgh to arrange for the exhibition by the accessory members and the prize competitions.

Owing to the unfortunate illness of Mr. Northey, who was to have delivered a paper on "The Possibilities and Uses of Aluminium in the Construction of Carriages," the programme has been unavoidably altered. The Secretary has stepped into the breach, and will devote a part of his holiday to preparing a paper on "Coachmakers' Accounts." Mr. Barr received a unanimous requisition from the Council to give such a paper, but, owing to his recent election as President of the Society of Accountants and Auditors and the enormous demands upon his time, asked to be excused until next year.

It is unfortunate that Mr. Barr has so little time to devote to the preparing of a paper which, from his knowledge of the coachbuilding industry and his professional experience as an accountant, will be of such infinite advantage, but we trust that it will be the groundwork of his more important publication, "A Treatise on Coachmakers' Accounts," shortly to be issued.

The Edinburgh meeting is exceedingly popular throughout the trade, and the members of the Institute from London, the South and West of England, Ireland, and the extreme North of Scotland have expressed their intention of being present, and quite a number of applications from coachbuilders throughout Scotland to become affiliated with the Institute have been received to enable them to take part in the proceedings.

Notification has been received that the Carriage-Builders' National Association of the United States will be represented, and, although it is not officially announced, we have reason to believe that the members will be received on the second day of the meeting by the Lord Provost of Edinburgh.

LIVERPOOL AND MANCHESTER LIGHT RAILWAY SCHEME.

As we go to press the report is just to hand of the Special Committee on Light Railways, appointed by the Incorporated Chamber of Commerce of Liverpool. The object of the Committee was to inquire into the schemes for the reduction in the cost of transit of merchandise between Liverpool and Manchester and the adjacent districts; the Committee appointed, which includes Mr. E. Shrapnell Smith, the Honorary Secretary of the Self-Propelled Traffic Association, Liverpool Centre, being as follows:—Mr. G. H. Cox (Chairman of Committee); Messrs. F. C. Danson (President of Chamber), Alfred L. Jones, J.P. (Vice-President of Chamber), Charles McArthur, M.P. (Ex-President of Chamber), Sir W. B. Forwood, J.P. (Ex-President of Chamber), Colonel G. H. Morrison, J.P., Messrs. E. W. Bindloss, Danson Cunningham, and *G. F. Ransome, representing the Chamber of Commerce; *Mr. J. T. Wood, M.Inst.C.E., and the Town Clerk (Mr. Harcourt E. Clare), representing the City Council; Mr. Alderman J. Webster, J.P., representing the Bootle Corporation; Messrs. A. G. Lyster, M.Inst.C.E., and J. Barkeley Smith, J.P., representing the Mersey Docks and Harbour Board; Mr. S. B. Cottrell, M.Inst.C.E., representing the Liverpool Engineering Society; Mr. W. D. Heyne, M.Inst.C.E., representing the Cotton Association (Limited); Mr. R. Griffiths, M.Inst.C.E., representing the Corn Trade Association (Limited); Mr. J. Wilson, M.Inst.C.E., representing the Cartowners' Association (Limited); Mr. E. Shrapnell Smith, Hon. Sec. of the Self-Propelled Traffic Association (Incorporated); *Mr. Alfred Holt, M.Inst.C.E.; *Mr. E. R. Calthrop, C.E.; *Colonel A. H. Holme, Assoc.Inst.C.E., J.P.; and Mr. Thomas H. Barker, Secretary of the Chamber.

The steps leading to the appointment of this Special Committee, which has been sitting at the Chamber since February, 1896, practically began with the appointment of the Manchester Shipping Canal Special Committee, on January 15th, 1894. After the most exhaustive inquiries the following are the recommendations unanimously arrived at by the Committee:—

The Committee are unanimously of opinion that Colonel Holme's scheme for a goods railway between Liverpool and Manchester contains greater promise as a thoroughly economical and otherwise satisfactory means of conveying merchandise between those centres, as well as between other places in the vicinity of the line, than any of the other schemes submitted to them.

The cost of construction, equipment, working, and maintenance of such a railway, intended for goods only, would undoubtedly be much less than that of the existing lines, which were constructed and are used for passengers and goods jointly; and it appears perfectly clear that goods could be conveyed on such a railway at rates not only far below those now charged, but which, it is authoritatively stated, would leave a loss to the present lines.

The Committee have already pointed out wherein Colonel Holme's scheme might be improved to meet the requirements of local trade; they understand, however, that Colonel Holme is further considering the matter, and will issue a revised scheme, which the Committee hope to publish as a supplement to this Report.

The Committee finally recommend:—

(1) That Colonel Holme's revised scheme should be carefully examined, and, if approved of, should be adopted; and that steps should then be taken to obtain the effective support of the commercial community to such undertaking, or to any further modification thereof which it may hereafter be found desirable to adopt.

(2) That in order to ensure the success of the undertaking it is important not only that the necessary capital should be obtained at the lowest possible cost, but also that the railway should not, when completed, fall into the hands or under the control of the existing companies; and, to this end, the scheme adopted should be placed before the Liverpool and Bootle Corporations and the Mersey Docks and Harbour Board, and their co-operation obtained in guaranteeing the interest on the necessary outlay, and in taking measures to ensure the maintenance of the line as an independent concern.

Note.—*The Lurry Platform Carrier Railway.*—Notwithstanding the result of the interview with the railway managers, the Committee are still strongly of opinion that considerable economy might be effected by the use of the Lurry Platform Carrier, especially upon a goods railway such as that recommended above.

Approved by the Committee, Friday, 22nd July, 1898.

George H. Cox, *Chairman of Committee.*
Thomas H. Barker, *Secretary.*

After the Committee have had an opportunity of considering Colonel Holme's revised scheme, a supplement to the Report will be issued which will contain that scheme and the final recommendations of the Committee thereon.

* Proposers of schemes.

MESSRS. TOWARD & CO.'S MOTO-TRACTOR.

We take the following interesting account of this vehicle from the *Newcastle Daily Chronicle* of the 9th inst.:—

At the recent show of the Northumberland Agricultural Society in Newcastle, Messrs. Toward and Co. exhibited a steam moto-tractor, entirely designed and constructed by them. It was finished somewhat hastily for exhibition at the show—where it attracted much attention—and, though it had been tried on the road, its full capabilities were not adequately tested till Saturday, the 30th ult., when, attached to one of the Stanhope Street buses in daily use in this city, carrying a load of 30 passengers and the driver, it went through from Newcastle to Durham without a single stoppage for water or anything else, performing the journey of over 14 miles in two hours, and returning after a most satisfactory run. This Toward tractor, which is of 25 I.H.P., is one of the first vehicles of this description built under the (Light) Locomotives on Highways Act of 1896. The rear end of the tractor can act as the fore-carriage of any four-wheeled vehicle, so long as the combined weight of the tractor and the vehicle does not exceed a maximum of 4 tons unladen. The turntable is adjustable in height, being raised or lowered as required by a hand-wheel and screw. The tractor is built of steel, and is capable of drawing a load of 3 tons on a good average road. The steam is raised in a horizontal water-tube boiler, coke-fired, the working pressure being 200 lbs. and the test pressure 400 lbs. per square inch. The engines are compound inverted, reversing, and run at about 400 revs. per minute. They are geared on to the driving wheels at 6 to 1 and 3 to 1 respectively for the two speeds of four and eight miles an hour. The tractor is fitted with two powerful independent brakes, one a pedal band-brake acting on the intermediate shaft and the other a screw brake of spoon pattern acting on the driving wheels. With this brake power the tractor can be brought to a stand with a full load on any hill. Differential gear is fitted for turning the vehicle, the front axle being pivoted at each wheel, thus dispensing with a fore carriage and turntable. Coke lockers are at each side of the boiler and tool lockers in front, a shelter being provided over the driver's seat. The water is carried in a tank underneath the platform at the rear of the tractor, and sufficient water is carried to take the vehicle 20 miles without a stop.

This tractor has been purchased by Mr. George Handyside, of Newcastle, for the purpose of running a passenger vehicle in the country, and the journey on the 30th ult. referred to, over the hilly road to Durham and back with the large bus carrying 20 passengers inside and 10 outside, was in the nature of a trial trip.

Drawing its full load, the tractor left Newcastle shortly before four o'clock, and, the weather being fine, and the journey being made in good time, the run through the country was much enjoyed. The population *en route* turned out in large numbers to witness the novel sight as the tractor drew its freight through the villages. All the banks were tackled without the slightest trouble being experienced in mounting them, and the machinery acted splendidly throughout the journey. At Durham a fresh stock of water was taken aboard from the fountain in the Market Place, where large numbers of people congregated around the vehicle, and submitted it to a close and curious inspection. Durham had been reached shortly before six o'clock, and after a stay in the Cathedral city of about two hours, the passengers once more took their seats. The spectators seemed to be delighted to see the huge vehicle turned round in almost its own length, and as the tractor steamed out towards Newcastle down the narrow street and over the bridge which crosses the Wear, there was a perfect sea of faces on all sides. The crowd appeared to be intent on seeing how the vehicle would surmount the steep and long incline leading out of Durham with such a load. This task, however, was accomplished with ease, and then the tractor headed at a smart pace for Newcastle. A stoppage was made at Chester-le-Street on behalf of the human freight, the mechanical part of the concern needing no attention, and Newcastle was reached about 10.15. It was found on the journey that the tractor could and did travel for a short distance—which might have been prolonged —at a higher rate of speed than that allowed by the Act. On the termination of the journey it was the unanimous verdict of the passengers that the motor-car is coming to stay, and is now coming very fast.

Messrs. Toward and Philipson were of course delighted at the realisation of their anticipations in this trial, for the Durham road is one well calculated to test the capabilities of the tractor; and it may be added that Mr. George Handyside, who has bought the vehicle, is also enthusiastic about its promise for the future. He, we understand, proposes to run it attached to an omnibus which Messrs. Atkinson and Philipson are to build—on the road between Newcastle and Hull, *viâ* Sunderland and Stockton, carrying passengers between the different towns and villages *en route*, at the rate of ½*d*. per mile. Should the experiment justify Mr. Handyside's hopes of success, a very large number of tractor vehicles will be ordered from Messrs. Toward and from Messrs. Atkinson and Philipson, and the service will be extended to other districts of the North of England.

AUTOMOBILISM v. DEAR FORAGE.

In an instructive leading article on the 10th inst., dealing with the figures of both the London General Omnibus Company and the London Road Car Company, the *Financial Times* draws attention to some very pertinent points in both Companies' balance sheets. In the course of some critical remarks, our contemporary says:—"At the present juncture, when the motor-car and the motor-cab have become recognised as permanent institutions on the streets of London, when they no longer excite the jeers of the gutter urchin or the sarcasm of those ultra-conservatives, the cabby and the bus driver, we are reminded by the reports of the two great London Omnibus Companies that the horse still holds the field as the main factor in street vehicular locomotion, though this monopoly has certainly been slightly trenched upon in these latter days. . . . . From 1893 to the first half of 1895 the London General Omnibus Company paid dividends at the rate of 8 per cent. per annum. The next three distributions were at the rate of 9½ per cent. per annum, while lately the return has been at the rate of 10½ per cent. The London Road Car Company distributed at the rate of 6 per cent. from the first half of 1894 to the second half of 1895; in the following half-year 8 per cent. was paid, then 7 per cent., 10 per cent., and 8 per cent., while 8 per cent. was also the announcement for the last half-year." The article concludes with the following well-timed warning:—"The record for both is, therefore, very satisfactory, but we doubt if the progress in distributions will be maintained in the future. On the contrary, we are inclined to think that, whatever may be the course of gross receipts, the high-water mark of dividend-earning power has been nearly, if not quite, reached for the present. Much of the extra expenditure recorded in the last report or two is of a permanent nature, while it is extremely unlikely that the cost of forage will fall again to the figure of two years ago. As regards competition, the Companies need not fear the rivalry of Mr. Lawson's steam-omnibus, but they will certainly have to take into consideration the growing vogue of self-propelled vehicles. A year or two ago a London General Omnibus director, in reply to a question put to him at a general meeting, remarked that he "had his eye" on these motors. It is to be hoped that he has not relaxed his vigilance, for it is from that quarter that competition is most likely to arise."

We hope for the sake of their shareholders these Companies will not, like the Fire Brigade Committee of the London County Council, "wait and watch" too long, but wisely invest some of the present profits in trying for themselves what automobilism can do to solve the difficulty of "cost of forage."

These remarks should with greater force commend themselves to the notice of the Glasgow Tramway and Omnibus Company, whose affairs appear to be in a very unsatisfactory state—simply on account of "dear fodder." The report of this Company for the past half-year states that although the gross receipts were £73,300 for the period, it only managed to secure £9,916 in net revenue. There is, of course, no dividend, and the directors attribute this lamentable result to the high price of provender.

REVIEWS OF BOOKS.

"On an Autocar through the Length and Breadth of the Land." By HENRY STURMEY, London and Coventry.

THIS is a capital account of a tour made last year through Great Britain by the author on a Daimler motor-vehicle, which he prefers to call an autocar. Mr. Sturmey's account of his experiences form most interesting reading; he has acted as a kind of automobile apostle carrying into remote districts the gospel of automobilism, and showing to farmers and others how much quicker, safer, and more comfortable is a well appointed motor-vehicle than the ordinary horse-drawn carriage. To undertake such a long journey was a feat requiring considerable courage and self-reliance, as in many districts the local public opinion, or, as we prefer to call it, bucolic instinct, is opposed to all change, and would as readily smash up a motor-vehicle as the Chinese destroyed the Wosung Railway—from sheer angry ignorance. Mr. Sturmey seems to have had one or two hostile demonstrations to contend with, but happily without anything serious resulting. As a record of the first long distance journey undertaken in this country, his work will have a distinct historical value. Mr. Sturmey writes in a plain style of good English, and being an expert cyclist and, let us add, automobilist, his account is not alone interesting, it is also instructive. We have pleasure in recommending the work.

The Engineering Magazine for August is before us and, as usual, its contents are of a high class character, but not of much interest to automobilists. Pressure on our space forbids any extended notice.

La Revue de Méchanique.—The July number contains an excellent and useful article on pumps by M. Maase, which may be read with advantage by automobilists, and one on the condensation of steam in steam engines, by the distinguished English engineer, Mr. Bryan Donkin, one of the judges of motor-vehicles at the late Birmingham Agricultural Show.

WE have also received:—*Science Abstracts*, *The Journal of the Society of Arts*, *The Indian Engineer*, *Industries and Iron*, *The Practical Engineer*, *Transport*, *Coach-Builders' and Wheelwrights' Art Journal*, *The Journal of Acetylene Gas Lighting*, *Knowledge*, *Machinery Market Review*, *Phillips' Monthly Machinery Register*, *The London Chamber of Commerce Journal*, *Indiarubber World*, *Cyclist*, *Scottish Wheel*, *Irish Field*, *The Yachting World*, *The Engineering Magazine*, *La Revue de Méchanique*, *La Locomotion Automobile*, *La France Automobile*, *L'Industrie Velocipédique et Automobile*, *L'Automobile Illustré*, *La Moniteur Automobile*, *La Revue des Transports Parisiens*, *Les Sports*, *L'Energie Electrique*, *Der Motorwagen*, *Samokat*, *Horseless Age*, *American Wheelman*, *Transactions of the American Society of Mechanical Engineers*, *Transactions of the American Institute of Electrical Engineers*, *Journal of the Western Society of Engineers*, *The Motocycle*, *The Scientific Australian*, *The Austral Wheel*, *Australasian Coach-Builder and Saddler*, &c., &c.

LAW REPORTS.

Lamina Accumulator Syndicate.—Before Mr. Justice Kekewich, in the Chancery Division, on July 22nd, Mr. Warrington, Q.C., mentioned the matter of the Lamina Accumulator (Elieson's British Patents) Syndicate (Limited), and the Elieson Lamina Accumulator Company (Limited), in which he had a motion on behalf of the Earl of Galloway for the appointment of a receiver. It stood over to enable arrangements to be made by the Company in the terms of the agreement to issue to the Earl of Galloway debentures in place of the debentures he held in the Syndicate. He understood that the new debentures had been sealed the previous night, and had now been handed over to the Earl, who had given his undertaking to hand in the old debentures. Under these circumstances he now proposed to stay further proceedings in the action. He understood it was arranged that defendants should pay the costs. Mr. Bramwell Davis, Q.C., on behalf of the defendants, said the assignment to the new Company had been completed only the previous day, and arrangements for the exchange of the debentures were at once made. He was not instructed to agree that defendants should pay the costs. Mr. Warrington: Then all I can agree to is to take no order, except that costs be costs in the action. Mr. Justice Kekewich: I think Mr. Warrington is right, and then whoever is wrong in the action will have to pay the costs. Order made accordingly.

Police Court Proceedings.

A Bank with £7 Capital.—Edward Alexander Bremner, 31, clerk, pleaded guilty, at the Central Criminal Court on July 26th, to stealing cheques belonging to the Motor Manufacturing Company (Limited), of Holborn. Mr. Sherwood, who prosecuted, said that Bremner, who was clerk to the secretary of the Company, opened an account with a bank, called the Bank of Great Britain (Limited), through which he passed the cheques. This bank had a paid-up capital of £7, with power to extend to £1,500,000. The nominal shareholders were clerks in the office. The Recorder: Does this bank still exist? Mr. Sherwood: I do not know, my Lord; the premises were being changed when this case was before the magistrate, who used some strong observations respecting the bank. The Recorder: I do not wonder at that. Prisoner was sentenced to 12 months' hard labour.

Furious Riding.—Frank Cundy, of Great Portland Street, was before Mr. Curtis Bennett, at the Marylebone Police Court on July 28th, on a summons for furiously riding a motor-quadricycle to the common danger, at the Inner Circle, Regent's Park, on the 17th ult. The defendant pleaded guilty, and in reply to the magistrate said he was going at the rate of 12 miles an hour. Mr. Curtis Bennett (to the constable): What rate do you say he was going at? Constable: A good 19 miles an hour. I timed him. Defendant: I didn't think it would go so fast. Mr. Curtis Bennett: It was better than you thought for. The defendant was fined 10*s.*, with 2*s.* costs.

Sweet are the Uses of Advertisement.—At the Bradford Police Court, Albert Farnell, cycle dealer, was prosecuted for riding without a light. The defendant did not appear. It was, however, stated that he told the police that they would do him a kindness if they would summon him, as it would be a good advertisement for him. He was fined £1 8*s.*

Bankruptcy Court.

Re Fleet Cycle Company (Limited).—In the same Court Mr. Eustace Smith, on behalf of the Perfecta Seamless Steel Tube Company (Limited), presented a petition for the compulsory winding up of this Company. The petitioners were judgment creditors for £995 12*s.* 1*d.* There was no opposition, and his Lordship made the order asked for.

Re Cycle and Motor Accessories Company (Limited).—Mr. Ashton Cross, on behalf of Mr. F. T. Mawby, a judgment creditor, applied for an order on July 20th for the compulsory winding up of this Company. Counsel stated that his client's debt was for £106, and he had made frequent demands for payment, but without result. The Company had passed a resolution for voluntary winding up, and one of the liquidators supported the present petition, while the other had stated that he would do nothing until he saw what his Lordship did. Mr. Justice Wright made the usual compulsory order.

FOREIGN NOTES.

At Liège a Company has been formed with a capital of two millions of francs to undertake the manufacture of moto-vehicles.

The Paris Exhibition of Moto-Vehicles realised a net profit of 40,000 francs. Similar exhibitions in London have uniformly been run at a loss.

The Société des Industries Electriques is preparing a map of France upon which will be indicated the electrical stations where charging can be effected.

The Daniel Augé Company has been formed at Levallois with a capital of £4,000, in order to manufacture moto-vehicles using a light oil-motor known as Le Cyclope.

The Société des Transports Automobiles de Chalon sur-Saone has been formed with a capital of 200,000 francs. A company is also being formed called Le Société d'Études d'Omnibus et des Voitures Automobile.

It is said that the Paris Omnibus Company, which has a monopoly of the omnibus traffic in Paris, is about to contract a loan of £1,000,000 for the purpose of transforming its present rolling stock, and introducing motor traction.

On the 21st inst. there will be a race for motocycles, not exceeding 440 lbs. weight, organised by L'Union Vélocipèdique Tourguennoise, from Tourcoing to Béthune, and on the same date and the following day there will be a race from Bordeaux to Biarritz.

It is said that the Paris Omnibus Company has decided to establish two electric generating stations—one at Vincennes, of 4,000 H.P., and one at Billancourt, of 5,000 H.P., and they intend trying every form of electric traction known before adopting a general system.

From Berlin we hear that a large number of electric cabs are to be put in service by the Berliner Fuhrwesen Gesellschaft. A large building is being erected to serve the purpose of a cab shed and accumulator charging station; the current being taken from the mains of a neighbouring electricity supply station.

It is said that the Paris Cab Company has paid £47,000 to the London Electric Cab Company for the French patent rights of the latter. We have not been able to verify this statement, and think it a very doubtful one. It is also said that this same French Cab Company has placed an order for 200 cabs. This is also doubtful.

Les Poids Lourds Competition will take place at Versailles from October 6th to 12th next. The routes and general arrangements will be the same as those followed last year. M. Forestier will conduct the trials. Being limited to vehicles carrying as a maximum but 1 ton of useful load, these trials will not be of much interest to those engaged in heavy traction.

A serious accident marked the opening of the season at Trouville. A lady, Madame Bonnevaux, and her two children, were driving along the Route de la Corniche when their horse took fright at a moto-vehicle driven by M. Bizet, a son of the famous composer of "Carmen." The carriage was upset, and Madame Bonnevaux sustained injuries from which she died in the course of the night.

A French automobilist was recently convicted of the offence of furious driving and fined 50 francs. He appealed; the Court, finding from the evidence that the appellant had failed to provide himself with suitable sound signals and while thus improperly equipped had run over a man, rejected the appeal, increased the penalty to a fine of 200 francs, and condemned the appellant to eight days' imprisonment—and we are not at all disposed to say that justice was not done.

In the recent race for moto-cycles from Tours to Blois and back the winner was M. Jamin, who did the distance of 62 miles in 1 hour 53 minutes, or at the astonishing rate of 32·63 miles per hour. M. Jamin was the winner, it will he remembered, in the Paris-Dieppe race last year. The next hest time was made by M. Marot in 2 hours 14 minutes, while Carhuratuer was third in 2 hours 21 minutes. There were 15 starters, and 12 did the whole distance.

A tramway is at work in Denver, Colorado, which possesses a feature of novelty in passenger transport. The line is about a mile in length, and has a gradient averaging about 3½ per cent. Horses are employed to supply the tractive force on the up journey, and gravity supplies the means for returning the cars and passengers, the horse riding on the platform. The company owns one car and five horses, and the daily mileage is about 40. The horse is able to draw the car up the grade at an average speed of about 2½ miles per hour, and the car descends by gravity at a rate of about 15 miles per hour.

There was an automobile contest at Lille in the early part of the month, when 15 competitors entered for a race to Calais and back. Nothing remarkable in the way of speed was accomplished, owing to the bad state of the roads, which caused some competitors to abandon the contest. The winners were M. Kreutler, in a Peugeot; M. Marcellin, on a De Dion moto-tricycle; M. Giradot, on a moto-bicycle; M. Barden, on a De Dion moto-tricycle; M. Deschamp, on a Panhard voiture; M. Vallée, on a Vallée voiture; and M. Rossel, on a Rossel voiture. The contest was inaugurated by the Société Industrielle de Lille, and was, on the whole, a successful function.

The Paris police have recently received many complaints against a man who has invented a system of taking advantage of the comradeship which exists among hicyclists on the road. The man in question is a tall, strong fellow, who speaks with a slight foreign accent. His costume—cycling, of course—is always a model of elegance. Cyclists find him sitting disconsolately by the roadside with a punctured tyre, and are appealed to for assistance on the plea that he has forgotten his repairing outfit. Good Samaritans alight, and while they are examining the injury to the hroken-down old machine at the roadside the elegantly-dressed person butts them violently with his head, and by the time they have recovered he is far away on his would-be benefactor's hicycle.

Automobilists in France, or rather that section that finds a delight in furious driving, are just now much exercised at the severe attitude adopted towards them by the civil authorities. In the late Paris-Amsterdam race the competitors who exceeded the eight mile per hour limit in the Seine department were much harassed by the police, and much ill-feeling has heen engendered therehy. Baron Rogniat, who made arrangements for the race, has even gone to the length of addressing a remonstrative letter to the Prime Minister, begging him in the first place to cause his subordinates to assume a less aggressive attitude towards the drivers of moto-vehicles, and in the second to give orders for an adequate series of rules to he drawn up regulating motor traffic in France. In the meantime existing regulations are being stringently put into force.

Says the Paris correspondent of the *Daily Chronicle* in a recent issue:—In Paris the municipal body is still much exercised about the regulation of street traffic, which undoubtedly presents difficulties even greater than those we have to contend with in London. Not only do lively duchesses and exhilarated men of fashion drive autocars at a pace dangerous to the public safety, but the tram companies link three or four carriages together and launch them in the thoroughfares with a speed that puts to shame many French express trains. Moreover, the desire for minute legislation, so familiar a weakness of our neighbours, has given rise to bye-laws enough to fill a thick volume. Nor can any cabman or carter he expected to have this portentous code at his fingers' ends. The latest suggestion is to erect at all crossways a sort of kiosk, on the top of which shall he seated a policeman in a revolving chair. He is to he provided with signboards, on which are painted "Halt," and other words of command, and these he will exhibit in different directions as occasion may require. The idea is by no means had, but one doubts whether Paris jehus will he controlled by a method so simple and reasonable.

In order to cope with the extension of automobilism in Paris, and to see that the moto-vehicles and drivers conform in all respects to the law, an inspector is to he appointed, and the examination of candidates will take place on September 3rd next. It is indicative of the intensely bureaucratic methods of French officialism to consider the qualifications, &c., required of these candidates. An application has to be made by a candidate to the Préfect of Police, accompanied by a hirth certificate, military good conduct certificate, certificate from the judge of the district as to character, &c. A medical examination has to be gone through, any trace of heart disease being a disqualification, and then a technical examination in various branches of applied science connected with automobilism. The candidate has, in fact, to pass an examination quite as stiff, if not more so, as is required by our Board of Trade for the rank of chief engineer. He has to he practically conversant with the use and handling of steam, oil, and electric motors, and the repairs to them. In order to obtain this extensive course of knowledge the candidate must have worked hard hoth in the shops and at the technical schools. The fortunate winnor of this municipal appointment will receive the truly munificent salary of £120 per annum.

HORSE AND MOTO-VEHICLE ACCIDENTS.

Killed by a Runaway Horse.—On the 5th inst., at the Camberwell Coroner's Court, the Deputy Coroner held an inquest on the body of Herbert George Ladhrook, aged 11 years, the son of a hoot finisher living at Peckham, who was killed by a runaway horse. The father said that about half-past four o'clock on the 2nd inst. he was walking along Church Street, Camberwell, accompanied by his wife and two children. He stopped to look in a shop window when he heard shouts. As he turned round a horse and trap came full gallop along the pavement and knocked them all down. Witness, who was somewhat dazed, picked up deceased, who was bleeding from the mouth, but some gentlemen took the boy from him and carried it to the police station, which was opposite, where it was seen by a doctor and pronounced to he dead. His wife and daughter were also examined by the same medical man and taken home. F. Sheppard, a tar pavior, of 17, Melton Road, Southend-on-Sea, said that the horse and trap was his property. On that afternoon he left the animal in charge of a boy outside Bright's Coffee House, Church Street, while he went inside to partake of some refreshment. While seated there he heard the horse scrambling on the pavement. He rushed out, seized hold of the reins, but the animal hroke away. Witness was knocked down and one of the wheels of the vehicle passed over his shoulder. He saw nothing of what afterwards took place. When he entered the shop he removed the hit from the horse's mouth so that it could eat hetter. The jury, in returning a verdict of "Accidental death," added that there ought to be some regulation with regard to leaving horses in the streets without the bit in their mouth.

A Motor-Vehicle Turns Over.—On the 20th ult. as Mr. Hutton, of the firm of Hutton and Walker, electrical engineers, of Scarborough, was riding in a motor-vehicle in the direction of Whitby, accompanied by one of the employés of the firm, the wheel of the car came off as the descent of a hill about a mile from Scalby was heing made. The vehicle was going at a good speed at the time, and it turned over completely two or three times, and then Mr. Hutton and his man were seen to crawl out from underneath the machine. Fortunately, beyond being bruised and shaken, neither of them was seriously hurt, and Mr. Hutton borrowed the hicycle of a visitor, who witnessed the accident, and rode into Scalby for a dray to cart off his broken vehicle.

The Vagaries of the Horse.—An extraordinary accident lately occurred in Paris at the Pont de la Concorde. A horse, while dragging a heavy load of wood along the hank of the Seine, had shied, and in its fright had rushed over the stone roadway bordering the stream. Instead, however, of falling into the river, it hung suspended in mid-air, kept in position by the weight of the cart to which it was attached. For a long time all the efforts made to rescue the animal from this strange predicament were unavailing. The firemen, who in Paris are appealed to in all sorts of emergencies, were called to the scene, hut just as they arrived the horse hroke the shafts by its frantic struggles and fell into the water. A fireman at once lassoed it and it was at last landed, apparently not much the worse for its somewhat exciting bath.

CORRESPONDENCE.

**** *We do not hold ourselves responsible for opinions expressed by our Correspondents.*

**** *The name and address of the writer (not necessarily for publication)* MUST *in all cases accompany letters intended for insertion, or containing queries.*

**** *Correspondents are particularly requested to write on one side of the paper* ONLY, *to place the subject of their letters as a headline at the top of the sheet, and their names and addresses at the foot. Attention to these matters saves much time and ensures the insertion of the letter.*

THE LOCOMOTIVES ON HIGHWAYS ACT.

To the Editor of THE AUTOMOTOR.

SIR,—I presume it is needless to assure you that I have followed your account of the Liverpool Heavy Motor Trials with the keenest interest. I notice, as the outcome of the trials, that it is advocated to approach Parliament as to a revision of the Highways and Light Locomotive Act of 1896, with a view to either putting no restriction on the total weight of a light locomotive or increasing the maximum weight of the vehicle from 3 to 4 tons.

Although it would appear from the recent Liverpool trials that the maximum carrying loads and speeds in these tests demand the increase of the weight of the vehicles in order to satisfactorily comply with the conditions, I hardly see that these trials should be considered as conclusive, and I certainly think, before any decisive step is taken to bring about an alteration in the recent Act, that some time should elapse in which to gain more experience on the subject.

So far, I think, one has but little complaint to make about the various conditions contained in the new Act, which, whether by fluke or otherwise, is certainly all that one could have desired from legislators, considering the knowledge, experience, and advice then at their command.

I think I should also frankly confess that I myself am partly responsible for the 3-ton clause, knowing by experience that oil-driven vehicles, for instance a Daimler lorry such as illustrated in your June issue, can easily carry a load of 5 tons at an average speed of eight miles per hour, with a tare weight well under 3 tons, and yet give general satisfaction.

The Act, as it exists at present, will certainly be a stimulant to steam power when applied to heavier vehicles on common roads.—Yours faithfully,

FREDERICK R. SIMMS,
Consulting Engineer.

FERRY RATES ON MOTOR-VEHICLES.

To the Editor of THE AUTOMOTOR.

SIR,—We think it well to warn motorists to avoid the ferries at Granton and Queensferry. One of our cars crossed at Granton about a week ago and we were charged 10*s*., the boat taking 20 to 30 minutes to cross, and at Queensferry—half the distance—5*s*. We have had the matter up with the railway company and they refuse to give us any redress. The matter should be referred to the Board of Trade, and if you can help us, and say how to proceed, where to write to, we shall esteem it a favour.—Yours faithfully,

EDINBURGH MOTOR CAR COMPANY,
John Love, Manager.

[There is no doubt that the charge is excessive and illegal, because Parliament, in granting powers to railway companies, never contemplated the possibility of the construction of light road motor-vehicles, and certainly never intended that these latter should be discriminated against by a company that runs heavy motor-vehicles. To obtain redress is, however, another matter. You might lay the case before the Railway Commissioners, the Board of Trade Railway Department, and the Local Government Board, but we doubt whether these bodies can or would do anything. You might, however, do some good by laying the case before the Automobile Club. Sooner or later this body will have to take steps to fight the railway companies on this very important point. You could by litigation compel the company to justify their charge, but unless you are backed up by the bodies referred to this course would not be advisable, unless you were prepared to take the case as far as the House of Lords, and we fear that this will have to be done before the railway companies will place motor-vehicles upon the same footing as ordinary ones. We shall be glad to know what action you take.—ED.]

THE CONSUMPTION IN SPIRIT MOTOR-VEHICLES.

To the Editor of THE AUTOMOTOR.

SIR,—I read in your interesting July number, under "Notes of the Month," about the serious doubts you entertain concerning Messrs. Sutton Brothers' motor-cycle having accomplished 400 miles on 4 gallons of oil.

Although this statement concerning the consumption of oil seems pretty low, I do not think it is impossible for a motor-bicycle fitted with a motor of about ¾ H.P.; but your conclusion that Messrs. Sutton's motor-cycle should consume 40 gallons of oil for 400 miles I am afraid is entirely wrong, and the French minimum consumption of spirit (benzine, petrol, or naphtha) of ·8 pint, as quoted by you, cannot possibly refer to a motor-cycle.

An ordinary De Dion motor-tricycle will cover about 100 miles with 2 gallons of oil, according to my experience, and I believe it is possible to do even more under favourable circumstances.—Yours faithfully,

FREDERICK R. SIMMS.

[We have made a clerical error. For ·8 read ·18. The consumption in spirit motors varies from ·12 to ·2 pint of petrol per mile for motor-tricycles, and is about ·6 pint per mile for vehicles of 4 H.P. —ED.]

"SIX-WHEELERS."

To the Editor of THE AUTOMOTOR.

SIR,—By your courtesy I have at various times urged the adoption of *six* wheels for heavy motor-vehicles, instead of the usual four, and I have now the pleasure of enclosing a very rough sketch of the general appearance of such an arrangement, which at any rate cannot be described as "horseless." As a work of art, and in the matter of technical details, the picture has, I am aware, many

defects, but it will, I think, serve the purpose in hand. A heavy motor-vehicle should in fact, as it seems to me, be built on the lines, not of a cart, but of a railway locomotive, for which the original four wheels were soon found quite insufficient.

The advantages of the proposed adaptation are:—

1. Increased accommodation, the vehicle remaining as flexible and easily steered as one of half the length;

2. A reduction in load per axle (which item, by the way, should be considered of more importance in legislation than the gross weight);

3. Probably increased safety, as the loss of a wheel would not prove so disastrous as in the case of an ordinary omnibus, for instance; and last, but perhaps not least,

4. Absence of patent rights, vendors, &c.—I am, &c.,

ALFRED J. ALLEN.

London Institution, E.C., *August 5th.*

FOUR OR SIX WHEELS?

To the Editor of THE AUTOMOTOR.

SIR,—In reply to your correspondent, *re* the Liverpool Trials, it would be interesting to know why he singles out the "Lifu" lorry to compare with Thornycroft's six-wheeler. Is he ignorant of the fact that every other lorry competing had four wheels only?

He says the six-wheeled lorry is obviously superior to the "Lifu No. 1," in its steering capabilities, whereas everyone who was present at the trial knows that the four-wheeled lorries went through their steering tests more satisfactorily than did the six-wheeler.

With regard to trailing steerers, where is the *practical* engineer who would think of fitting a motor-vehicle with a combination of gear to attain a very doubtful advantage of trailing steering wheels? Is Mr. J. Allen copying locomotive practice when he mentions trailing steerers? If so, it shows how little he understands that class of engine.

Perhaps he would advocate wheel coupling rods. A motor-vehicle must be built to turn in comparatively narrow roads, whereas a locomotive has its course made.—I am, yours truly,

GEO. COOMBS, *Engineer.*

60, Cobden Road, Brighton, *July 30th.*

Motor v. Horse-drawn Omnibuses.—Every single experience so far, both in France and England, even with inferior systems, has demonstrated the superiority of motor-vehicles, from the financial point of view, to horse-drawn ones. When we see that the London General Omnibus Company can pay over 10 per cent. dividend with its obsolete means of locomotion and dear fares the conclusion is obvious that given well designed, comfortable motor-vehicles and cheap fares, a constant and high dividend is beyond doubt.

The Motor Carriage Supply Company (Limited).—We understand that this Company, whose offices are at Donington House, Norfolk Street, Strand, London, W.C., are prepared to take orders for motor carriages and motor cycles of all descriptions, their speciality being Daimler motor carriages of special type and latest development, made at the works of the inventor, M. Daimler. These latter, we are informed, they are empowered to deal in under a special arrangement with the holders and the licensees of the English Daimler patents.

Automobilism and the Fire Brigade.—Our recent utterances on the question of motor fire-engines seems to have attracted a good deal of attention in various quarters, and the public is slowly grasping the idea that in large cities, at any rate, every purpose served by the horse can be much cheaper and more efficiently performed by the motor-vehicle. In some apparently inspired criticisms we are assured that the Fire Brigade authorities are "playing a waiting game. They are watching closely everything that is being done, and are ready at all times to examine, enquire into, and experiment with any practical vehicles presented to them." Exactly; we know that all officials always do play a waiting game. They are always "watching." Yes, but the public pays them to originate, devise, and improve. We can all watch and play a waiting game, and if we all did so no improvement of any sort would take place. If we carried this principle of watching and waiting into practice we should have no inventions of any sort. Watching and waiting was the excuse of the man who hid his talent in the earth. *He* was waiting for the grand opportunity. It is poor philosophy to watch and wait; it is nobler to *do*, as Carlyle would say. Why, if we had watched and waited for the perfect railway locomotive, the perfect sewing machine, the perfect typewriter, the perfect battleship, we should still be without these useful articles. This watching and waiting policy on the part of the Fire Brigade has been carried on for years with the result that plant that was out of date a quarter of a century ago is still faithfully copied. Thus high-pressure steam (according to modern ideas), modern pumps, liquid fuel, petrol and electric motor-pumps, worked off leads taken from the nearest street junction box, chemically charged streams, are all things of which the London County Council Fire Brigade has not the remotest conception or experience of. Yet the brigade is watching and waiting—naturally! What else could it do? Do let us see the Fire Brigade justify itself by examining the question and not watching and waiting. Two of our most worthy novelists in the *Golden Butterfly* relate how two men were always watching and, of course, like the Fire Brigade, "playing the waiting game." They alas! watched and waited so fervently that when the time to work arrived their night had also arrived, in which we are told "no man can work." *Verb. sap.*

NÄMN denna tidskrift "THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL" när ni tillskrifver annonsörerne.

NEW INVENTIONS.

Claiming particularly to apply directly or indirectly to Motor Vehicles, &c.

Compiled for "THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL" by HERBERT HADDAN and Co., Registered Patent Agents, of 18, Buckingham Street, Strand, W.C., London.

Patents Applied For.

Abbreviations: Impts., Improvements in; Relg., Relating to.

1898.			
July	1.	14,506.	J. U. RIDLEY. Ratchet gearing.
,,	1.	14,563.	H. H. LAKE. Impts. in moto-vehicles.
,,	4.	14,711.	E. H. CLIFT. Impts. in moto-vehicles.
,,	6.	14,843.	B. J. MALONY. Impts. in ball bearings.
,,	6.	14,872.	J. WITTENBERG. Means for preventing vibration.
,,	6.	14,877.	J. CORDINGLEY. Starting gear.
,,	6.	14,890.	E. LATHAM. Impts. in moto-vehicles.
,,	7.	14,978.	A. J. BOULT. Impts. in moto-vehicles.
,,	7.	14,986.	Z. MAERSKY. Impts. in power motors.
,,	7.	14,987.	Z. MAERSKY. Impts. in power motors.
,,	7.	14,988.	Z. MAERSKY. Impts. in power motors.
,,	8.	14,992.	T. P. BUCKTON. Speed changing gear.
,,	8.	15,045.	C. V. BURTON. Impts. in balancing engines.
,,	11.	15,180.	J. R. RICKARD. Friction gearing.
,,	11.	15,183.	G. TAYLOR. Impts. in moto-vehicles.
,,	11.	15,205.	G. F. BULL. Driving chains.
,,	12.	15,231.	Z. MAERSKY. Under frames.
,,	12.	15,239.	W. R. PIDGEON. Method of driving moto-carriages.
,,	13.	15,417.	T. MYERS. Means for subduing odours from oils used with engines.
,,	14.	15,487.	E. H. HODGKINSON. Impts. in moto-cars.
,,	15.	15,635.	W. SOUTHEY. Impts. in moto-carriages.
,,	18.	15,700.	H. PARSONS. Impts. in engines for moto-cars.
,,	19.	15,746.	J. A. WILSON. Mud and safety guards.
,,	19.	15,798.	A. J. BOULT. Impts. in moto-vehicles.
,,	20.	15,820.	C. BINGHAM. Impts. in moto-vehicles.
,,	20.	15,892.	J. W. MILLIGAN. Adjustment of driving chains.
,,	21.	15,968.	L. BENIER. Impts. in moto-vehicles.
,,	22.	15,985.	R. W. MACCULLOCH. Impts. in hubs of wheels.
,,	22.	15,994.	H. S. WHETSTONE. Impts. in driving mechanism.
,,	25.	16,206.	C. MARTER. Improved gearing.
,,	26.	16,319.	W. PECK. Impts. in moto-vehicles.
,,	26.	16,331.	A. CRAIG. Impts. in moto-vehicles.
,,	27.	16,380.	W. S. SMITH. Impts. in application of mechanical power.
,,	28.	16,473.	G. R. BLOT. Impts. in gearing.
,,	28.	16,485.	J. W. HEADLAND. Impts. in axles and steering gear.

Specifications Published.

THE following is a List of Specifications recently published, and obtainable at the Patent Office, 25, Southampton Buildings, London, W.C., at the uniform charge of 8*d*. per copy. Owing to the enormous pressure upon our columns it has been found impossible to deal in any other form with the accumulation of patents now being taken out in connection with automobilism. As far as possible, a selection for special mention is made by the Editor from the more prominent inventions:—

Applied for during 1897.

12,046. J. J. ELLIS, 5, Hargreave Terrace, Rathgar, co. Dublin. Motor cycles.

12,158. G. KIRBY, 50, Myddleton Road, Bowes Park, London. Variable speed gear.

12,199. C. M. JOHNSON, Broad Street House, London, E.C. Fluid pressure apparatus for generating, storing, and transmitting power.

12,443. A. WERNER and P. DE KILDUCHEVSKY, 49, Bernard Street, London, W.C. Electric accumulators.

15,348. F. R. SIMMS, 12, Norfolk Street, Strand, London. Exhaust valves.

16,977. W. J. H. JONES, 134, Gladstone Road, Sparkbrook, Birmingham. Ignition device.

12,553. E. ROSSEL, 82, Rue des Sarrazins, Lille (Nord), France. Petroleum motors.

12,783. J. H. BLAKESLEY, 53, Victoria Street, Westminster, S.W. Gearing.

12,942A. M. JOHNSON, 22 and 23, Laurence Pountney Lane, London. Electric igniting apparatus.

13,161. C. E. CALLOCH, La Fleche (Sarthe), France. Internal combustion engine.

14,535. J. WATKINS, 120, St. Aldate's Street, Oxford. Oil or spirit vaporising apparatus.

17,258. G. W. Mohrstadt, 44, Bradford Street, Birmingham. Locking arrangement.
17,533. G. R. Blot, 16, Rue Drouot, Paris. Differential gear.
17,839. W. Hornsby and R. Edwards, Spittlegate Ironworks, Grantham, Lincoln. Explosion engines.
13,097. J. Hoare, 317, City Road, London. Brake.
17,226. H. A. Lamplugh, 61, Wellington Road, Birmingham. Motor carriages.
17,317. E. Petreano and J. Bonnet, 95, Boulevard Beaumarchais, Paris. Gas and hydrocarbon engines.
18,804. E. Petreano, 95, Boulevard Beaumarchais, Paris. Reversing gear.
13,610. H. H. Lake (La Société Mari Giusli and Co., Padua, Italy). Motor-car for propelling road vehicles.
13,998. G. E. Whitney, 88, Falcon Street East, Boston, Mass., U.S.A. Gear cases.
14,150. W. W. Beaumont and H. P. Holt, Outer Temple, 222, Strand, W.C. Steam generators.
14,220. A. F. Scott, 27, Welbury Drive, Bradford, Yorks. Steam and other fluid pressure engines.
16,816. H. Leitner, 207, Piccadilly, London. Secondary batteries.
14,910. H. W. Headland, 77, Chancery Lane. Electric motors.
15,665. T. W. Drabble, 18, Hertford Street, Coventry. Autocars.
16,508. C. M. Turrell, 111, Hatton Garden. Starting cranks.
16,755. F. J. Burrell, 67, Corporation Street, Birmingham. Steam generators.
19,910. W. T. Rowden, Lenzie, near Glasgow. Internal combustion engines.
22,606. J. H. Rosenthal, 62, St. Vincent Street, Glasgow. Water tube steam generators.
15,914. J. H. Rosenthal, 62, St. Vincent Street, Glasgow. Water tube stesm generators.
18,176. A. Heil, 55, Chancery Lane. Accumulators.
18,780. W. Kay and W. H. Walker, 50, Cherry Street, Birmingham. Chain wheels.
19,918. A. Crossgrove, 6, Finkle Street, Stockton on-Tees. Fluid pressure motor.
21,738. O. Bomborn, 18, Southampton Buildings. Fuel feeding devices.
22,971. H. H. Leigh, 22, Southampton Buildings. Petroleum motors.
15,908. J. Katz, 57, George Street, Coventry. Explosion motors.
15,983. E. Uhlenhuth, 44, Rue du Bellay, Argers, France. Internal combustion engines.
17,776. E. J. Clubbe and others, 16, Elm Street, Gray's Inn Road. Wheels.
18,322. I. M. Collins, 70, Wellington Street, Glasgow. Crank driving mechanism.
20,389. W. Firman and A. Cave, 4, South Street, Finshury. Explosion engines.
20,446. A. A. W. Van Reede, 4, South Street, Finsbury. Steam or other fluid engine.
23,974. J. K. Carey, 33, Chancery Lane. Variable speed-gear.

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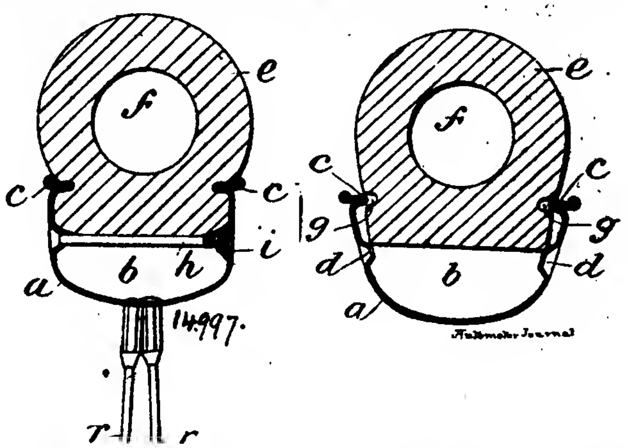
7,707. Norga. Carburating apparatus.
8,128. A. J. Boult (F. Hayot, 3, Rue de Coetlogon, Paris). Cylinder and piston motors.
6,394. R. H. Smith, Ellerslie, Brunswick Road, Sutton, Surrey. Generators of mixed gas and steam.
3,072. F. W. Meadway, 354, Bethnal Green Road, London. Mudguards and guards for machinery.
6,152. C. Caille, 53, Rue Rennequin, Paris. Rotary motors actuated by internal explosions.
8,785. S. Ballard, E. Ballard, and J. Goode, Colwall, Malvern, Worcester. Valve boxes of the vaporisers of oil-engines.
9,416. D. Timar, 27 and 28, Luisenstrasse, Berlin. Oil and gas motors.
10,134. A. Ball, Myrtle and Walnut Streets, Claremont, N.H., U.S.A. Direct acting fluid pressure engines.
4,677. E. Taylor, Pemberton Street, Warston Lane, Birmingham. Mode for making the junctions of motor-car and other frames so as to avoid brazing.
6,267. O. Obermeyer, Beatrice, Nebraska, U.S.A. Fluid pressure rotary engines.
7,955. V. E. Prétot, Avenue Philippe Auguste, Paris. Starting apparatus.

14,997. Rims and Tyres for Wheels. S. C. Davidson, Sirocco Engineering Works, Belfast, Ireland. June 21st, 1897.

Refers to rims and tyres for wheels, and particularly to wheels of carriages, bicycles, and other road vehicles, and the objects are to construct a light rim of great strength, and so that it will securely hold and support an indiarubber, leather, or other more or less elastic tyre, and to construct tyres specially adapted to fit within and be supported by the improved rims.

Referring to Figs. 1 and 2, *a* is the wheel rim curved outwards so as to form a continuous hollow or channel, *b*, around the outer face. *c c* are rim collars at the outer edges of the rim formed by flanging said edges inwards and then again outwards (the return or outward flange being optional). The inner edges of said collars, *c c*, are just sufficiently wide apart to allow the inner face of the tyre to pass between them (*see* Fig. 2). *d d* are a series of holes around both sides of the rim at about an inch apart, and preferably indented so as to form countersunk cavities as shown. *e* is the indiarubber or other tyre which may be formed either with a tubular air space, *f*, as shown, or with more than one tubular air space or solid. The inner face of the tyre is flat in cross section, or approximately so. In each side of said tyre is a continuous groove, *g*, to receive the corresponding rim collar or flange, *c*. *h* is one of the tightening-up bolts. When the tyre has been mounted on the rim, as shown in Fig. 2, the bolts, *h*, are passed through the rim from side to side and tightened up by the nuts, *i*; the outer edges of the rim are thereby forced inwards, and the collars or flanges, *c c*, are therefore gradually drawn in towards one another and become embedded in the grooves, *g g*, of the tyre. The tyre is thus securely and firmly attached to the rim, and its inner face is supported by the bolts, *h*.



Various modified forms are described and shown in the specification and drawings.

11,547. Hydrocarbon Motors. W. H. Casley, 97, Paris Street, Exeter, and A. F. Woodman, 2, Bartholomew Street, West, Exeter. May 10th, 1897.

This is an invention designed for measuring the oil charge for hydrocarbon motors.

A slide valve has a recess or small chamber the size of which may be adjustable. In one position of the valve this recess forms a portion of a passage or channel, by means of a port or ports in the surface or surfaces against which the valve slides, one end of which is in communication by any desired passages or valves with the explosion chamber of the motor, and the other end with any gas, preferably the atmosphere.

In a second position of the valve the recess forms a portion of a passage or channel, by means of a port or ports in the surface or surfaces against which the valve slides, in connection with the oil supplying the motor, and in this position of the valve a current of oil is caused to flow through the passage by gravity, or by having the oil in the tank and in the pipes leading to and from the passage in continuous circulation and heating one portion of the circuit and so causing a current, or by any suitable lifting or forcing device.

When in the first position the recess is cut off from the oil channel mentioned in the second position.

The slide valve is caused to move from one to the other position by any suitable gearing in connection with the motor, and is in the first position during at least a portion of the suction or out-stroke of the piston. The valve is kept tight up to its face by a spring, weight, or other suitable means, and is of sufficient size to always cover the ports of the oil channel.

6,342. Steam Motors. F. Lamplough, Glen Ridge, New Jersey, U.S. March 10th, 1897.

This invention relates to an improved motor system, consisting in the combination of a hermetically closed primary generator, a secondary generator into which water is pumped from the hot well; a feed-pump; a feed-water heater; a motor consisting of a pair of engines in which each engine controls its own lap and lead by a lever attached to its own cross-head, and controls the opposite engine's cut-off and reversing quadrant; a pressure-regulating valve which acts to divert the feed-water to the hot well when there is sufficient pressure in the secondary generator; a cylinder to contain compressed gas; a reducing valve connected to said cylinder; a gas-pressure regulating receiver; gas and oil supply regulating valves controlled by steam to regulate the supply of gas and oil to the burners in accordance with the steam pressure; a self-regulating oil burner and an air surface condenser provided with an air relief valve.

The construction of the generators consists of the combination of tubes provided with conical surfaces around their ends, end plates provided with conical surfaces fitting the conical surfaces of the tubes, passages in the end plates forming inter-communication between the members of the primary generator, between the latter and the steam spaces and between the steam spaces, said tubes and plates being bolted together by bolts having conical heads and nuts fitting corresponding conical holes in the end plates, and a tubular coil within each of such steam spaces.

It also relates to a condenser consisting in the combination of a number of hollow discs formed of corrugated plates connected together in pairs to form alternate steam spaces and air spaces, perforated connecting rings communicating with said steam spaces and with each other, bolts and a hollow central shaft for securing all the parts firmly together, an inlet, an outlet, and an air relief valve.

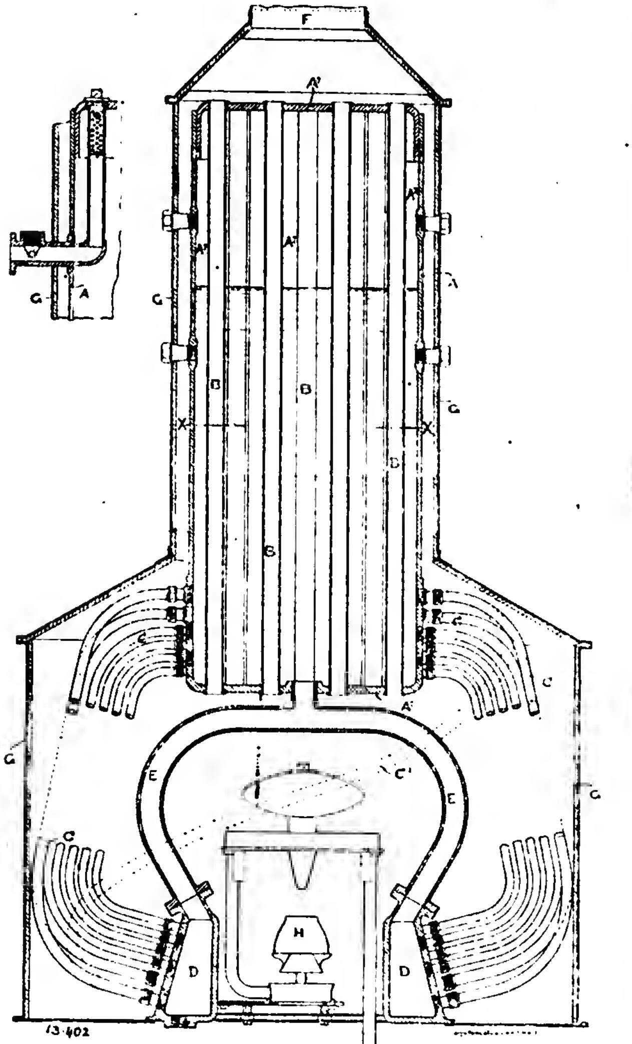
Also in the combination with the feed-pump of a valve operated by the steam pressure to regulate the supply of water to the secondary generator, and to divert it to the hot well when not required.

13,667. Acetylene Gas Plant. D. Whalley, 118, New Bank Road, Blackburn, Lancaster; J. Hacking, 53, Granville Road, Blackburn; and The Ideal Gas Company (Limited), 3, Taoketts Street, Blackburn. June 3rd, 1897.

A water cistern or tank is employed, connected by pipe and tap or valve with the gas generator, which may be of the form illustrated and described in Letters Patent No. 15,654 of 1896. The water supply tank is placed at such a height above the generator that there is sufficient pressure to allow of the latter being completely flooded before recharging, so as to ensure all gas being expelled therefrom. The generator is by single or double curved pipe connected with a condenser and cooler, consisting of a worm inside a vessel or tank of water, and the condenser or cooler is by a like pipe connected with an ordinary gasometer. Each of the single or double curved connecting pipes is carried to a point somewhat higher than the level of the water in the vessels to which they are connected, so that to whatever point the water in the vessels may rise it cannot rise as high as the bend of the single or double curved pipe, and so neither water nor water of condensation is able to get forward to the next vessel. At the lower part of each single or double curved pipe is a tap or valve, by means of which any water therein can be drawn off.

13,402. Tubulous Steam Boilers. R. R. Symon, 20, Abchurch Lane, London, and H. A. House, Junior, The Columbine Ship Yard, East Cowes, Isle of Wight. May 31st, 1897.

Relates to improvements in steam boilers of the kind known as tubulous—that is to say, boilers which consist of a series of tubes connected at their lower ends with a water chamber, and at their



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upper ends with a steam and water chamber, the water to be evaporated being contained partly in the said water chamber, partly in the tubes, and partly in the steam and water chamber.

The object is to so construct the steam and water chamber that it shall afford a considerable amount of heating surface available for the production of steam, and incidentally for drying or superheating the whole of the steam produced in the boiler.

The figure represents a vertical section of a boiler constructed in accordance with the invention, and adapted to be heated with the vapour of liquid fuel, such as petroleum.

The steam and water chamber, A, is made of a vertical cylindrical or other suitable shape, with a tube plate, A^1, at top and bottom, and fixed in these tube plates is a number of vertical tubes, B, so that the entire steam and water chamber, A, forms a multitubular boiler.

The upper ends of the water tube, C, are secured in the sides of the steam and water chamber, A, and their lower ends in a water chamber, D, as usual. Preferably, several rows of these water tubes are employed, those which are situated lowest acting as steam generators, in which the water circulates upwards from the water chamber, D, at the bottom of the boiler to the steam and water chamber, A, at the top, and those which are situated highest acting as down-comers, in which the circulation of the water is downwards from the steam and water chamber, A, into the water chamber, D.

In some cases the water tubes above described as acting as down comers do not act sufficiently well as such. In that case we employ additional down-comer pipes from the steam and water chamber, A, to the water chamber, D, such as those marked E.

The furnace is formed, so far as its sides are concerned, by the aforesaid water tubes, C, much in the usual well-known way; but its top is formed by the lower tube plate, A^1, of the steam and water chamber, A, and the hot products of combustion pass partly in a lateral direction between the water tubes, C, and thence to the chimney, F, round the outside of the steam and water chamber, A, and partly through the fire tubes, B, which traverse the steam and water chamber, producing a certain amount of steam in the latter; and as the upper parts of such fire tubes, B, pass through the steam space, A^2, the steam in such steam space is dried or superheated to a certain extent by the heat of such products of combustion as they pass through the tubes to the chimney.

The water tubes, C, are intended to be of a helical form, as shown by the helical line, C^1; but they may be straight, or of any other shape that may be found suitable or convenient, according to circumstances.

The boiler is enclosed in a suitable casing, G, as usual.

H represents a vapour burner for burning the vapour of petroleum or other suitable liquid fuel of the kind described in the Specifications of Patents dated September 7th, 1893, and June 2nd, 1894, and numbered respectively 16,864 and 10,702, and dated January 20th, 1896, No. 1,414.

A modification is described for the combustion of solid fuel, such as coke.

Automobilism and Street Noises.—No class of people suffer from and abominate street noises more than those engaged upon literary work, and hence we, for our part, cordially support the objects of the Society for the Suppression of Street Nuisances. When, however, the secretary, presumably writing upon instructions from the Society, goes out of his way to write to the Press such nonsense as the following, then he is doing, no doubt unintentionally, his level best to perpetuate the very nuisances that his Society is formed to suppress. Says this gentleman, in a letter to the *Westminster Gazette*, referring to the Steam Omnibus Company:—"If we submit to steam buses, it means the thin end of the wedge. I take it we are reconciled to the cable-car, the motor-car (private and public), and electrical traction generally, but steam buses? What next? Has the world gone mad? I thought we had sufficient dangers and nuisances in our streets already without steam-engines coming to blow their shrieking whistles to order pedestrians out of the way. As it is, steam rollers, which proceed at a snail's gallop with a danger-flagged man ahead, frequently frighten horses and cause them to bolt. What will steam buses do, then? It is not in the least likely that private people will altogether give up horses in a hurry—even to oblige a private exploiting company—but if this outrageous project is carried out, it means that they have got to clear out of the way of street steam-engines, and that pedestrians, young and aged, will have to run for their lives between steam-engines, runaway horses, bicycles, fire-engines, Pickford's vans, tramcars, and numerous other (and people) killing vehicles." This effusion is ridiculous enough in all conscience; it has evidently not occurred to the writer that a motor-vehicle is infinitely less noisy than a horse-drawn one, and, let us add, infinitely less dangerous. We may inform this gentleman, and others who share his opinions, that the increasing use of motor-vehicles is being eagerly looked forward to by municipal authorities as the only means of diminishing the present awful noise of street traffic. In fact, in some districts, especially in Paris, it is a positive complaint that motor-vehicles are so silent that they give no notice of their approach; owing, however, to the great control that a driver, if he be intelligent enough, can exercise over his vehicle, it is very rare that accidents occur.

THE AUTOMOTOR

AND

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CONTENTS.

THE MOTO-VEHICLE EXHIBITION AT THE AGRICULTURAL HALL.

UNDER the auspices of Messrs. Cordingley and Co., the proprietors of *Industries* and *Laundry News*, the Sixth Annual Exhibition of Laundry Machinery was held at the Agricultural Hall, Islington, London, from the 29th ult. to the 3rd inst. In the last two years moto-vehicles have formed a feature of the Exhibition. The *raison d'être* of the association of these two very distinct branches of applied mechanics is by no means apparent either to the professed engineer or to the casual visitor; in fact, the association constitutes an anomaly, but then this remark applies to so many human efforts that it would be ungracious to condemn the Exhibition because it does not comply with the law of the eternal fitness of things. If, however, the projectors of this Exhibition are going to continue to hold exhibitions of moto-vehicles, we would suggest the propriety of entirely dissociating them from any purely trade display such as the so-called Laundry Exhibition, because from the public point of view there is nothing in common between the automobilist and the laundry worker. The public cares not who "takes in washing," but the establishment of lines of moto-vehicles carrying passengers and produce is a matter of the highest municipal and social importance. The dobbie-wallah on the banks of the Hûgli alike with the haughty "clear-starcher" in London or Paris can follow their callings with no legal restrictions or liability, but before one can drive a cab in these cities a legal permit is necessary; and in Paris, before one can act as a *chauffeur*, one has to pass an examination little if at all inferior to that required by our Board of Trade for the chief engineer of a mail steamer, while the law relating to carriers and drivers in this country constitutes in itself a respectable library. Remembering these things, we then utterly fail to see how it is possible that any good can result to the cause of automobilism by the association indicated. Moreover, we are by no means satisfied that the time is at all opportune for exhibitions of moto-vehicles. It is not two years since the Locomotives on Highways Act was passed, and hence much progress is not to be expected.

As a mere trade display of vehicles the show at the Agricultural Hall was no doubt a success, but it was not an exhibition, as we understand that word. It was singularly deficient in the first essential of an exhibition, in that it was lamentably lacking in instructional and educational value. Our point will perhaps be better elucidated if we refer to the other part of the Exhibition, viz., the laundry section. This was—and we cordially congratulate the participants therein—a pronounced success. It was, however, a purely trade display. Manufacturers of mechanical appliances used in the levigation of textile materials met those worthy and indispensable workers engaged in that industry on common ground, to their, no doubt, mutual advantage. Similarly the so-called moto-vehicle exhibition was only of interest to the experienced automobilist who knows sufficient, or thinks he does, to make himself indifferent to details, whereas a proper moto-vehicle exhibition should be replete with details, so that the "man in the street"—who, after all, is the person to study—can profit thereby. In this so-called Exhibition there was much to be seen in the shape of carriage building and carriage furnishing, but little motor mechanism.

To enclose a motor in the bowels of a gaudily painted and varnished vehicle, and call the whole a moto-car (to employ the vulgar name) appeals after all to but a very limited section of the public. What the public want to see is the internal mechanism—to see the motor in operation, and how the various manœuvres of starting, stopping, or steering are effected. It is not sufficient in these days of dawning education to tell a person to pull a lever this way and something occurs. He wants to know why the lever is pulled that way, and he wants to see how it is worked. One can see plenty of handsome vehicles in any large city without going to the Agricultural Hall, but the Exhibition at that place was, after all, little more than a collection of gorgeous vehicles containing hidden mechanism—as a rule jealously guarded from inquisitive eyes. We think constructors would in future exhibitions do well to pay more attention to the engineering than to the carriage-building part of their

FIG. 1.—AUTOMOBILE ASSOCIATION STAND AT THE AGRICULTURAL HALL.

exhibits. A moto-vehicle in frame, blocked up with the mechanism in motion, and an intelligent mechanic in charge would have been a technic lesson of the greatest value—the public, or rather some of them, would, perhaps for the first time, have realised how these vehicles are propelled and managed. No English firm had any such exhibit, but the Automobile Association of Paris and London showed the frame of a vehicle with the motor and mechanism exposed to view. As regards the motors, no steam motors were shown, and the spirit (petrol) and electrical motors were all carefully concealed within the vehicles. In our opinion sectional models, such as Messrs. Tangye, the well-known engineers, exhibit freely in their show room window in Queen Victoria Street, have an enormous

FIG. 2.—THE LATEST RIKER ELECTRIC CARRIAGE.

educational value and should certainly form part of any mechanical exhibition. Yet parts and models of motors showing the method of carburation, ignition, &c., in the case of internal explosion motors; and the various methods of winding, insulation, commutation, &c., in the case of electrical motors would not only have done much to make the Exhibition interesting, but would have done more to promote an intelligent knowledge of automobilism. Yet there were no such things to be seen. We looked in vain, too, for models illustrating road construction, a matter not less important than mechanism; there was not even a granite sett, nor a block of pine or Jarrah in the place. As regards processes illustrating wheel manufacture, both in metal and wood, and for all kinds of vehicles, tyre making and setting, axle setting, testing materiel—nothing relating to these matters was exhibited. The Exhibition was, in short, little more than a display of finished vehicles such as might be seen in Long Acre, and as such it had little interest for engineers interested in automobilism. For the reasons above stated it was deficient in educational value. We asked an apparent office boy in charge of some batteries what was the capacity of a certain cell. He replied he "didn't know, but it looked as though it 'eld about a pint." We gravely intimated that we referred to watt-hours. "Wot's them?" he said.

It will be gathered that we do not approve of such exhibitions of the character indicated by that at the Agricultural Hall, because they do not instruct the public and hence cannot benefit the industry of automobilism. As regards the late Exhibition it was, however, a great improvement on the preceding one. The exhibits were more numerous, there being nearly 100 vehicles this year as against 12 or so of last year, but it was not sufficiently representative; and it was remarkable that not one of the competitors at the late Liverpool Trials exhibited. Before, in fine, a really representative exhibition of moto-vehicles can be held at the Agricultural Hall or elsewhere, a radically different system must be adopted. In concluding these remarks we must express our dissatisfaction with the catering arrangements at the Agricultural Hall; they are bad even for London, and that is saying a good deal. The system that is in vogue in London show places of charging for admission and then giving the visitor the option of either having very expensive and usually very inferior refreshments from one firm or else going without any at all is inherently bad and ought to be stopped forthwith.

As regards most of the exhibits the mechanisms relating to them have been for the most part described at various times in the columns of The Automotor. The largest and the most important, and at the same time the most novel exhibit, was the group of divers vehicles shown by the Automobile Association, but of this we speak at length elsewhere.

*The Daimler Motor Company had six vehicles, all identical as regards mechanism, all having 5½ I.H.P. motors, but differing as regards their bodies. They included a jaunting car to seat six persons, two victorias, a coupé brougham, a convertible van lorry, a Rougemont wagonette to seat six, and a Wyley phaeton to seat four. Needless to say that in workmanship and finish these vehicles left nothing to be desired.

*The Hewetson Motor Company had five vehicles—four "Ideal" voiturettes and one dog-cart; all have motors and mechanism on the Benz system, which is well-known to our readers. All these vehicles look exceedingly compact and not at all inelegant. A novelty with them is a water cooler in the form of an open annular tube exposed to the wind.

Messrs. F. Jackson and Co., of Oxford Street, showed two De Dion quadricycles built to carry two persons. The motor is stated to be of about 1¾ H.P. There is nothing novel in the details. The same remark applies to the two cabs shown by the London Electrical Cab Company.

*The London Motor Van and Wagon Company had a parcels van and a phaeton, both fitted with Daimler motors. The workmanship of these vehicles is very good and substantial.

*The Motor Manufacturing Company, of Coventry, had a large and interesting exhibit, comprising dog-carts, phaetons, wagonettes, and a parcel van; all, however, bad Daimler motors of 5½ I.H.P. There were also Bollée voiturettes, moto-bicyclettes, and De Dion tricycles. The Bollée voiturettes have been much improved, and are fitted with powerful motors. One motor was said to indicate 4 H.P. Considering the difficulties of "indicating" these small motors and the divergent results often obtained, we think it would be more satisfactory to state the actual power given off at the peripheries of the driving wheels—this could easily be ascertained. The Company is introducing the Werner moto-bicyclette, of which we have been furnished with the following description:—"The motor is of the Werner type, having one vertical cylinder, using petrol (doubly refined benzoline). It has two fly-wheels, which are arranged one either side of the crank chamber. The induction valve is on the right hand side of the cylinder, and is automatic, being opened by the suction of the piston, and closed by the extension of a spring on its shaft. The exhaust valve is worked by a cam on a small intermediary shaft, which is geared on to the crankshaft, and opens every two revolutions. The lubrication of the cylinder is effected by the crank splashing oil out of the crank case. The charges are fired by means of an incandescent nickel tube, kept at a white heat by a Bunsen burner fed by petrol under pressure. The tank supplying the burner forms a mudguard round the front wheel. The supply tank for the motor is fastened on the top tube of the frame, at the end of which is the carburettor. The amount of spirit entering the carburettor is controlled by having a very small hole in the tank, which is otherwise perfectly closed, the air resistance preventing too great a supply from passing into the carburettor. The carburettor is cylindrical, and comprises two cylinders, one within the other. The inner cylinder is about ½ inch smaller in diameter and 1 inch shorter than the outer. The inner cylinder is constructed with an air-tight chamber at the bottom, the sides above which are perforated, the top being plain; round the perforated part of the cylinder is wrapped two or three layers of very coarse cloth, up which the petrol soaks by means of capillary attraction; this, of course, induces vaporisation, which, however, does not take place quickly enough to keep up a constant supply for the motor, and to increase the supply an air inlet is fitted through the outside cylinder, which causes a rush of air to pass through the perforations and out into the feed-pipe, which causes the vaporisation to take place with sufficient expedition. The amount of air thus admitted is insufficient to form the explosive mixture, so another air inlet is fixed on the handle-bar, which is controlled by a valve actuated by a small lever near the left handle, which enables the rider to admit the correct quantity of air or cut it off at will, and so change the speed of the machine. By moving this lever in the opposite direction it holds the exhaust valve open, thus releasing the compression, and enabling the rider to exert the necessary force on the pedals to start the motor. The design of the machine is identical with that of an ordinary safety bicycle. The motor is fastened on to the front of the machine, being bolted at the bottom to a plate protruding from the front forks, supported by stays brazed on to the fork blades, and held by a single stud at the top passing through a clip from the steering tube into the top of the cylinder. On the outside of the left fly-wheel is a small pulley with concave face; this is connected to the driving pulley built on the same axle as the front wheel; a leather band transmits the motive power to the cycle. The pedals are fitted as a means of starting the motor, and assisting it up steep gradients, also at the same time forming a rest for the feet, and, being on a ratchet, immediately the motor starts remain stationary. The weight of the motor is equally balanced, and so assists in steadying the steering of the machine. A powerful hand-brake is fitted to the hub of the rear wheel, and is applied by the ordinary lever on the handle-bar."

*M. Carl Oppermann showed his electric victoria, of which we understand a good many will shortly be seen in the London streets.

*The Prétot Motor Syndicate showed examples of their fore-carriage or *avant* train attachment. The great merit of this is that it is applicable to a very wide range of vehicles.

*The Riker Electric Motor Company, of New York, represented on this side by Messrs. Shippey Brothers, showed a remarkably neat and well-built four-wheeled vehicle, having seating accommodation for four persons, but designed mainly for the use of commercial travellers. Its weight without batteries is only 650 lbs., and it can be worked by any of the better known types of battery. The present vehicle is actuated by a battery consisting of 40 Headland cells, which is placed in the rear compartment of the vehicle immediately over the rear (driving) wheels. The motor, which is an enclosed series-wound one, is hung in a similar way as on the motors of electric tram and railroad cars, and which we have no hesitation in saying is the only proper method. The motor is enclosed in a strong metal casing so as to exclude dust, &c., and is carried at its yoke end by the driving axle through a sleeve. The armature end is supported by springs, &c., from a transverse bar joined to the side rods. At the

* Previously described in The Automotor.

armature end is the armature pinion gearing into the driving wheel on the axle; to this driving wheel is also attached the differential gear, the whole being thoroughly enclosed, and looking extremely neat. By having the motor, its gearing, and the battery nearly over the driving axle, the adhesiou is very great, a point of no small importance in these light and fast vehicles. The frame is made of steel tubing, well socketed and stayed. The steering is effected by a modification of the Ackermann gear, by which it is claimed that the correct alignmeut of tbe wheels is always ensured. We at any rate could not detect any imperfection in the apparatus. Tbe wheels are pneumatic tyred and attached to the hubs with tangent spokes. Tbe method of fitting these bubs is novel and ingenious. It consists of an inner and outer sleeve, the inner one being on the axle and separated from the outer one by a series of ball bearings. The fore wheels, of course, are pivoted, and rotate between two coned surfaces.

The latest type of Riker controller is used in this vehicle, and is constructed for four speeds forward and two backwards, and arranged for driving at three, six, nine, and 12 miles an hour. The manœuvring and braking mechanism is very well thought out and arranged, and enables tho driver to obtain almost any variation in the speed. The foot brake is operated from the floor of the vebicle and is connected to a band running over a brake pulley fixed on the motor shaft. Another point is that the batteries cannot be charged unless the controller lever is in a neutral position, which cuts out the motor.

All the Riker vehicles are fitted witb an automatic cut out, so all that is necessary is to plug the street mains or source of supply, and when the batteries are fully charged tbey are automatically cut off from the charging current without any attention whatever, as the batteries take care of themselves, and by this arrangement just sufficient current is stored without waste of power.

Each vehicle is fitted with a searchlight head lamp, also two side lamps of ornamental appearance. It is fitted with a foot bell gong, also with a dead beat combined volt and ampère meter, which is scaled for cbarging as well as discharging, and with an overload switch which is combined with tbe brake switch. This special switch cuts out the motor at 300 per cent. overload before the motor can be injured by the overload. There is also a locking-up switch, so that current cannot be used by any unauthorised person. This vehicle is remarkable for its excellence of construction and its accurate fitting and finisb.

Messrs. Shippey Brothers report to us that they had a very successful fortnight at the Exhibition, having sold the motor on show there to the Rev. F. S. Laurence, of Birmingham. They also booked orders for two other vehicles of this type, one Riker victoria, one draper's parcels van, and one traveller's trap as above described. We learn that a limited company is being privately formed to purchase the "Riker Patents," and to manufacture the various Riker carriages and motors and gearings in England.

*The Elieson Lamina Company showed an electric carriage and a light parcels van, both fitted with motors and batteries and chain gear of their well-known makes. The chain is specially noticeable, as it entirely obviates the use of differential gear, and gives excellent results in practice.

*The Headlands Storage Battery Company had two vehicles—a brougham and a two-seated phaeton. The former is well-known as a reliable and practical machine. As will be seen, their latest vehicle is most substantially constructed, and of not unpleasing appearance. In all externals it resembles a rather favourite type of carriage much used in the country. It is mounted much in the same way, but the wheels have rubber tyres. It has a seating capacity for four persons, and can also carry a quantity of luggage. Its tare weight is 23 cwt. The fore part is made with a hood, and tbere is a light splashboard. The starting, steering, and brake levers are placed close by the driver, who thus has full command over the vehicle. The interesting part of the vehicle is, of course, tbe motor mechanism. This consists of a 4 B.H.P. series-wound motor placed longitudinally, and its frame is pivoted at one end to the axle; hence any motion in the carrying springs does not affect the running. At the end of the armature spindle is a steel bevel pinion which gears into a bronze bevel wheel, the velocity ratio being 9 to 1. This bronze bevel wheel is mounted on the driving axle, and a differential gear is interposed. The arrangement is very good and compact, and should wear well. Current for tbe motor is derived from a battery of 40 Headland cells, which are carried in the body of the carriage or "boot." These cells are arranged in four groups of 10 each, and by a special switch can be arranged in four groups in parallel or series, or in two groups in parallel, each with two groups in series. No resistances are used, the various speeds being obtained by the different groupings. The capacity of the battery is 150 ampère hours, and a single charge suffices for a run of about 45 to 50 miles. The cbarging current is 30 to 40 ampères, and the normal discharge is at the rate of 25 ampères. It has three speeds, viz., 3, 7, and 15 miles per hour. As regards the phaeton, we were not so favourably impressed. This vehicle is constructed to carry two persons, and is intended to run about 40 miles over ordinary roads witb one charge. It is fitted with a 4 H.P. series-wound motor, mounted on the front axle and driving the front wheels. The battery consists of 40 cells of the Headland patent type, having a capacity of 140 ampère-bours. The regulation consists of three speeds, obtained by connecting up the battery on the parallel series system, no resistance being used. Tbe battery is contained in a box at the back of the carriage, and thus the total weight of motor, gearing, and battery is distributed over the four wheels. The carriage is finished in the best style, aud is fitted with three brakes, namely, a band brake, a side brake, and an electrical brake; any one of these being capable of stopping the vehicle in a few yards. It is claimed to be an advantage to have the motor on the front axle. The early railway engineers entertained the same idea. Automobilists can learn a good deal from locomotive engines of to-day, and it will be noticed that in modern engines the drivers are placed as far as possible in the rear of the vehicle, aud as much of the available weight as possible is placed on them.

Fig. 3.—Headland Electric Brougham.

Fig. 4.—Headland Two-seated Phaeton.

* Previously described in The Automotor.

Mr. F. Simms, C.E., of Norfolk Street, Strand, exhibits an ingenious magnetic ignition apparatus which gives a very thick spark, and we should think renders a miss-fire an impossibility. We illustrate this in the accompanying drawing. Mr. Simms has furnished us with a full description, of which the following is an excerpt:—

"This electro-magnetic machine weighs about 7 lbs. for cycle motors and 18 lbs. for automobiles running at not less than 300 revs. per minute, and 28 lbs. for stationary gas and oil engines running at not less than 60 revs. per minute. An advantage is that a sufficient spark for ignition can be obtained at a comparatively low speed, although, as is the case with all such machines, the higher the speed within limits the better the spark.

"For cycle motors a very efficient machine has been produced, which does not exceed the gross weight of 8 lbs.

"As an addition to the alternating magneto-electric machine a timing device has been devised, which makes it possible to time the

"It will be obvious from this that, supposing the half-speed shaft to be stationary, as the Sleeve 2 is drawn forward its position varies relatively with that of the half-speed shaft in proportion to the amonnt it is moved, and the half-speed sha't being in constant position with the crank shaft the sleeve varies in this proportion with the crank shaft. Supposing, then, that the archimedean thread is of sufficient length to make one complete turn round the circumference of Sleeve 2, it will also be obvious that any one point in its circumference can be moved throughout the whole of the cycle.

"Referring back to Sleeve 1, on which Sleeve 2 slides, attached rigidly to it, or made in one piece with it, is a cam made in such a manner as to raise gradually the cam rod and suddenly allowing it to drop. On the same cam is fixed a small crank pin fitting into a solid block on an arm keyed on the spindle of the alternating magnets.

"It has been shown above that the Sleeve 2 can be moved readily to any point in the cycle, and the cam and the crank pin, rigidly

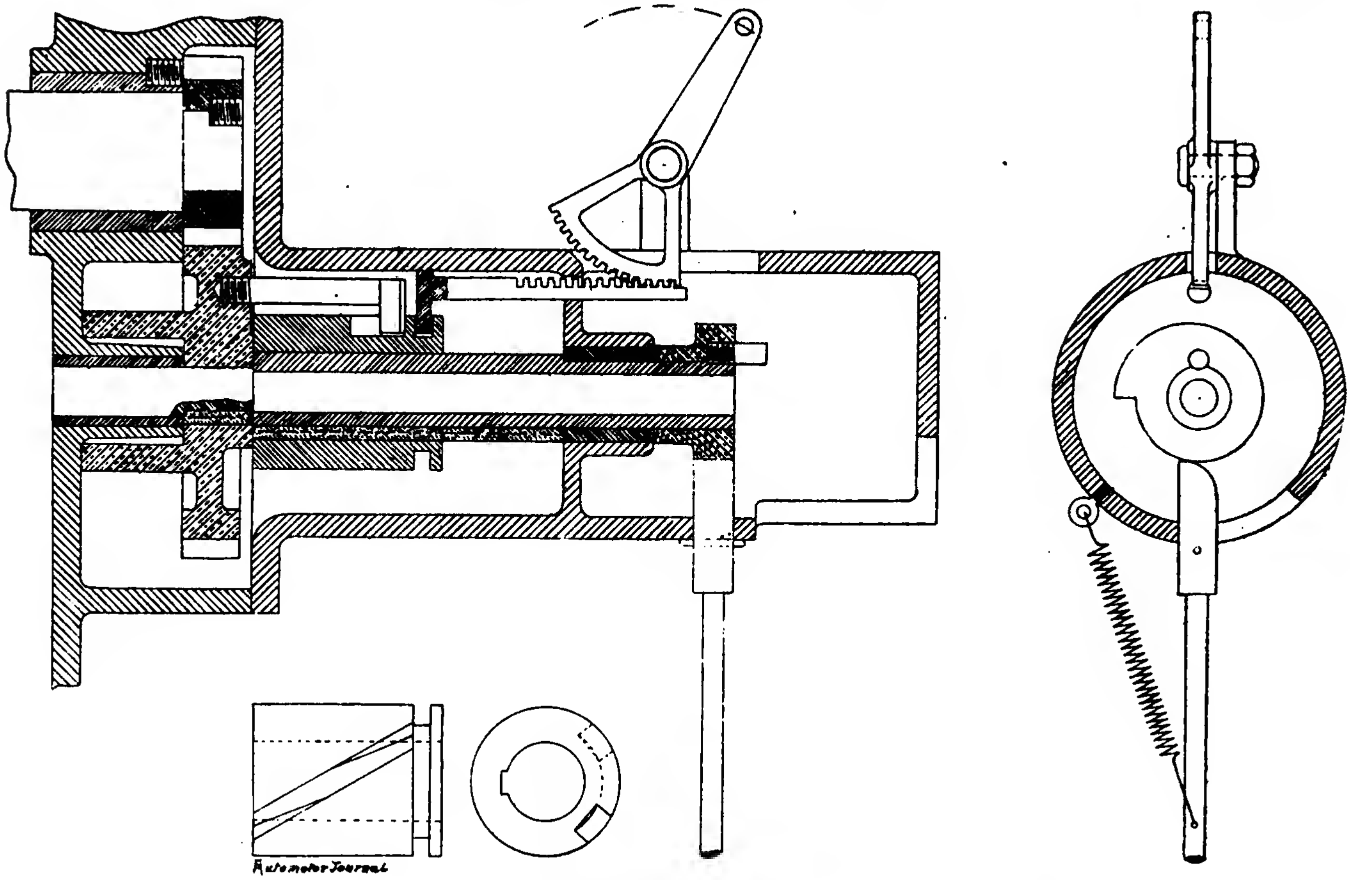

Fig. 5.—The Simms Magneto Igniter.

spark at any particular point in the stroke of the motor. The usual method adopted for applying this apparatus to small motors of automobile vehicles is as follows:—In a single-cylinder motor it is usual to enlist the services of the half-speed shaft carrying the exhaust cam; on this is fitted a loose sleeve (1) running throughout the whole length. Keyed to the Sleeve 1 is a second bush or sleeve, which we will call Sleeve 2, which, though rigidly fixed circumferentially to Sleeve 1, is enabled to slide thereon. There are two grooves in Sleeve 2, one of which forms an archimedean thread, from which the timing gear takes its name, the other running circumferentially round. These take two arms or lugs, one of which is attached permanently to the gear wheel or half-speed shaft itself, the other end of the same fitting in the groove forming the archimedean thread.

"The other arm is fitted to form the rack gearing with the quadrant moved by hand from any convenient position. When this quadrant is moved the arm is drawn backward or forward, as the case may be, and moves with it the Sleeve 2.

attached to the Sleeve 2, must necessarily move with it. As the crank revolves and works the half-speed shaft, this cam in revolving raises or revolves a rod which, by means of levers, taps the contact-breaker at the exact moment when the spark is required. This contact-breaker is constructed as follows:—A cast-iron plug is screwed or fitted so as to leave an open passage from the combustion chamber. Through the plug run two pins, one fixed and insulated, and connected directly by an insulated wire to the magnets, and the other constructed so as to revolve therein, having at either end a bell crank, the outer end being held in position by a light spring, and attached by means of levers carried on the revolving rod, and the inner end resting on the insulated pin.

"At the moment when the tension in the alternating magnets is greatest, the cam suddenly releases the rod, strikes the bell crank, and separates the point of contact between the insulated pin and the inner bell crank, thereby causing a spark.

"It will be obvious to all those acquainted with explosion engines that a variation in the timing of the explosion of the gas means a variation in the speed of the engine. More than that, however, can be accomplished by this device, for when a motor fitted to a vehicle is standing idle for a few minutes, the spark may be timed to take place during the suction stroke, thereby decreasing the speed to a minimum. Such reduction in the speed will be much appreciated under certain circumstances."

We may remark that in principle the method employed is the production of an alternating current of high E.M.F. by the rapid reciprocation of a wire wound bobbin between the poles of a set of permanent steel horseshoe magnets on what is in effect an open circuit, the ends of which are, of course, led into the cylinder ends. The method is really that used in magnet exploders and in some early forms of submarine mines of which we have had experience. By using a superior steel a permeability of 8,000 to 10,000 "lines" per square centimetre might be obtained leading to a considerable reduction in the weight of the magnets. At the same time this method of ignition is unquestionably the correct one to employ, and if Mr. Simms will slightly modify his design he will find a large demand for his igniter. Batteries are really the most unsatisfactory things about these electric ignition devices, and anything that will obviate their necessity is to be welcomed.

The Southern Motor Car Company, which represents the Georges Richard Company, of Paris, show the Richard Benz phaeton which we recently described, and a few second-hand vehicles. In addition they had a good stock of motor fittings on view.

Turning now to the Continental exhibits, as before stated those shown under the auspices of the Automobile Association will be dealt with separately.

MM. Daniel Augé et Cie. showed a petroleum motor termed the "Cyclope." This is one of that large number of petrol motors all of which work on the Beau de Rochas cycle, all of which are unidirection, and all of which are run at very high speed. They are differentiated from each other by the fact that some are vertical and others are horizontal, and also by their various carburation and ignition devices, all of which are essentially one in principle. The Cyclope motor is a two-cylinder horizontal one, and, as will be readily understood, an impulse on the shaft is imparted once every revolution. The principal feature about it is that the speed regulation is effected by varying the relative quantities of petrol and air admitted to the carburator, and it is claimed that the speed by this means can be varied from 300 to 1,200 revs. per minute. The normal speed is 600 revs. per minute, when 6 H.P. is said to be developed. We have not, however, seen any official tests of this motor.

Le Carbone Levallois Perret Compagnie, of Paris, had an interesting exhibit of ignition cells, induction coils, carbon brushes, &c.

The Fulmen Accumulator Company had a most interesting exhibit, consisting of their cells and accessories, now so well known since the late Paris cab trials, and of which full accounts of their capacity, &c., have appeared in THE AUTOMOTOR. To again describe them would be superfluous. This Company also had on view that type of cell they manufacture for railway work, and in addition several of the vehicles that took part in the recent Paris cab trials. These were much admired for their graceful lines and elegant appearance, although the Jeanteaud hansom, with the motor perched in front, came in for considerable criticism. We observe that a contemporary which discusses the amateur side of automobilism, waxes merry over the coiled rope brake fitted to the Jeanteaud cabs, and so universally employed on the Continent. Of course this is quite pardonable, and we make no complaint. In order, however, that no incorrect impression may obtain it may be as well to point out that the coiled rope brake, such as is used in the Paris omnibuses, is one of the most efficient mechanical brakes we have. It may not be generally known that a modification of it was exclusively used on railways till the vacuum and other pressure brakes superseded it. Still another modification of this coiled rope brake is the basis of the well-known Lindsay coil clutch. We strongly recommend the coiled rope brake for all moto-vehicles, as it is simple—a child can use it with as much effect as a strong man. It is cheap and easy to repair or replace.

As a finale to the Exhibition, Mr. Cordingley arranged a pleasant little outing on Sunday, the 4th instant, to Whitton Park Club, Hounslow. In consequence of some ridiculous paragraphs which appeared in the daily Press stating that some hundred motor-cars would take part in this run, and announcing the start from the Agricultural Hall at 2.30 on the Sunday, a big crowd was brought together, practically along the whole of the route, to see this wonderful procession, including "the specimens with very quaint devices." We do not know how this information was disseminated, but considering that only about 11 vehicles went to Whitton Park from Islington, we think the "inspired" source should be given. Amongst those vehicles which did start were a Mors carriage with six seats, driven by the Hon. C. S. Rolls; a Le Blon four-seated car, driven by Dr. Lehwiss; the electric Jeanteaud cab, driven by M. Jeanteaud; three Daimler carriages, one of which was driven by Mr. Hodges, of the London Motor-Van and Wagon Company, another being the property of the Motor Manufacturing Company; a Vallée racing car, driven by Mr. Frentzel; one of the Motor Manufacturing Company's "Werner" bicycles; two electric cabs, and a De Dion tricycle. The Mors carriage accomplished the journey from the Agricultural Hall to Whitton Park within a few minutes of the hour. Quite a number of guests sat down to dinner in the Club House, the return journey being made at about 9 o'clock.

FIG. 1.—8 H.P. HERCULES (Berret System).

THE AUTOMOBILE ASSOCIATION (LIMITED).

THIS is a company which has been established in England for the purpose of supplying every make of moto-vehicles, including all the best English types, and more especially the better class of French-built vehicles to those who, recognising the larger experience in automobile construction that has been obtained on the other side of the Channel, prefer Continental-built vehicles to those of home manufacture, and it must be admitted that, save in heavy moto-vehicle design, our French rivals are in many respects ahead of us. Even that motor most generally employed in Great Britain for vehicle propulsion is a Continental design. Of course the explanation is that this branch of mechanical engineering has not been in existence in this country for more than two years, and hence it is only to be expected that we should be somewhat behindhand. The Automobile Association is the agent in this country for many of the better known French and German firms engaged in moto-vehicle construction; and at their principal depôt in Holland Park Avenue they have a perfect exhibition of vehicles of all kinds suitable for light traffic. We recently inspected their collection and proceed to describe the more important of them.

The Hercules (Berret system) (*see* Figs. 1-5) is a comfortable and substantial moto-vehicle having seating accommodation for four persons and room for a reasonable quantity of luggage. It is specially intended for service in hilly country districts and is designed to climb gradients on fairly good roads of 12 to 13 per cent., fully laden, at a speed of 6 to 7 miles per hour; while on the flat the speed varies from 20 to 25 miles per hour, according to the state of the roads. The framing is of steel and the body of the vehicle is connected to it by ordinary plate springs. The axles are of mild

FIG. 2.—8 H.P. HERCULES—("Spider").

steel, the front one having jaws for the pivoted axles of the steering wheels. The wheels themselves are of wood, the spokes fitting into metal sockets riveted to the inner rim; outside of this are solid rubber or pneumatic tyres. The steering gear consists of a cross-bar mounted on a vertical spindle which by means of chain gearing attached to arms on the pivoted axles simultaneously turns these latter.

The motor, which is of 8 I.H.P., is placed on the framing and has no connection with the body of the car excepting through the springs, hence the vibrations imparted when it is running light are scarcely felt. It consists of two horizontal cylinders placed side by side and working on the usual Beau de Rochas cycle, with electric ignition. The carburator is of the self-feeding gravity type, and is practically automatic in its action, but the quantities of petrol and air admitted can be varied at will; thus the richness of the mixture and hence the speed can be regulated from 200 to 800 revs. per minute. A small circulating pump is attached to the motor and which cools the cylinder; the temperature of the water is kept low by forcing it through a series of coiled tubes placed in the upper part of the motor chamber and freely exposed to the air. The power transmission gear will be understood by a reference to Figs. 3 and 4. On the motor shaft are three pulleys for forward motion, g, g, g, and two fly wheels, g^1, g^1, the former gear, by means of leather belts, with corresponding pulleys, k, k, k, on an intermediate shaft, upon which are mounted the differential gear, j, and at the extremities, pinions, which by means of chain transmit the motion to the rear driving wheels. The leather belts for transmitting the motion are made a very slack fit, any particular one is put in gear by means of a jockey pulley, worked by a lever. Three brakes are fitted; two are of the coiled rope type working on the hubs of the drivers, and one working on the differential pulley. The petrol supply is carried in a tank underneath the front seat, while the water is carried in a tank under the rear end of the vehicle.

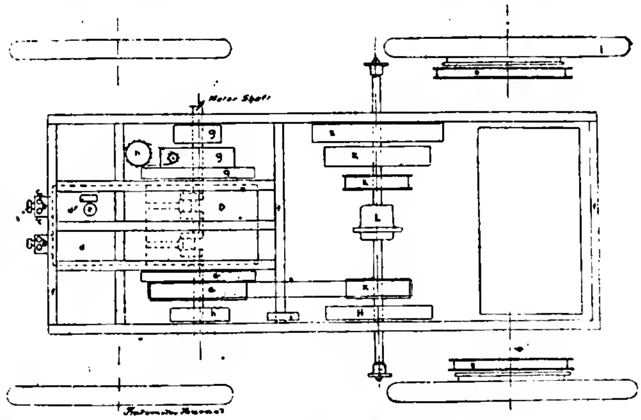

FIG. 3.—8 H.P. HERCULES (Plan).

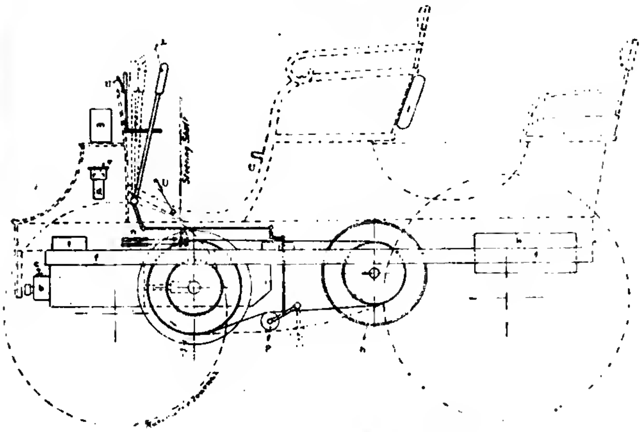

FIG. 4.—8 H.P. HERCULES (Side Elevation).

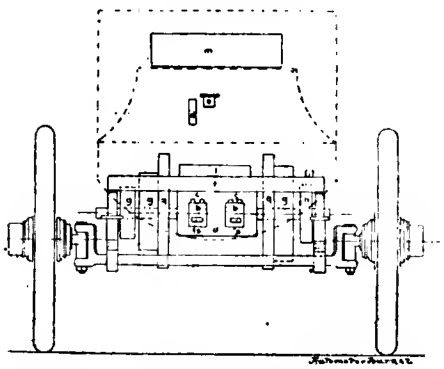

FIG. 5.—8 H.P. HERCULES (Front Elevation).

The Vallée racing moto-vehicle, shown in the accompanying drawing (Fig. 6), has made the extraordinary speed of 42 miles per hour on ordinary roads, thus showing what a well-built moto-vehicle can accomplish. Needless to say this speed was not attained in England. As will be seen, the construction of this vehicle proceeds largely on bicycle lines; the framework being of

2 P 3

Fig. 6.—Vallée Racing Car.

Fig. 7.—Vallée Racing Car (Plan).

Fig. 8.—Vallée Six-Seated Carriage.

Fig. 9.—Vallée Motorette.

Fig. 10.—Vallée Four-Seated Car.

Fig. 11.—Lynx Two-Seated "Duc" (Le Blon System).

steel tube, well braced together, while the wheels tangent spoked and pneumatic tyred, and, of course, run on ball bearings. Aluminium is largely employed in this vehicle with the object of reducing weight, and most of those parts not exposed to stress are of this metal. The seating capacity is limited to two persons, and their luggage is carried in the box casing behind the seat. Notwithstanding the small weight to be moved a 6 I.H.P. spirit motor is fitted. This is of the horizontal two-cylinder type, with cranks at 180° apart. The distinguishing feature of the motor is the very long stroke; this is no less than 15 inches. Of course, this greatly conduces to smoothness of running and permits of a comparatively low speed of revolution—always a desirable feature. The ignition is electrical, the cells being carried in a casing on the front platform. The water for cooling the cylinders is kept at a low or comparatively low temperature by circulating it through a long convoluted pipe fitted with radiating gills of aluminium. This pipe is placed in front of the vehicle just where the splash-board is usually, and so receives the full refrigerative benefit of the air. This pipe holds about six gallons of water and this quantity suffices to keep the cylinders sufficiently cool even on prolonged runs. Leather belting for the power transmission and speed regulation is used, and the general scheme will be gathered from the accompanying plan (Fig. 7), from which it will be

Fig. 13.—Lynx Parcel Van.

seen that the motor shaft drives an intermediate shaft at various speeds according to the gear employed, while the intermediate shaft transmits motion to the driving wheels through chain gearing, the differential gear being on the intermediate shaft. In this racing moto-vehicle there are but two speeds, but in the others three speeds are provided. The steering mechanism and the stopping and speed variation gear are of the ordinary type and call for no special remark. This vehicle is distinguished for simplicity and power, while the workmanship is very good.

Figs. 8, 9, and 10 show other designs of moto-vehicles on the Vallée system. The six-seated phaeton, or voiturette famille (*see* Fig. 8), is especially noticeable as being eminently suited for country use, for excursions, picnics, and the like. It is, so far as the mechanism is concerned, similar to the previous vehicle, and like it is fitted with bicycle wheels. The construction is, however, more substantial, and comfort rather than speed has been the point aimed at. It will be noticed a light aluminium roof with side curtains is fitted, thus making travelling in such a vehicle a distinct luxury.

Fig. 14.—The Longuemare Carburettor.

The "Lynx" (Le Blon system) moto-vehicles are shown in Figs. 11, 12, and 13. As will be seen, they include most of the usual types of light vehicle, and, so far as the bodies are concerned, do not differ greatly from other makes. In the mechanism, however, are some few important departures. The motor is of the two-cylinder inclined type, the power developed being about 4 H.P.

2 Q

The ignition is electrical and the combustion effected by the Longuemarre carburettor.

The power is transmitted by leather belts to pulleys on an intermediate shaft, and from thence to the driving wheels by chains in the usual way.

The carburettor (*see* Fig. 14) consists of a supply tank, a mixture regulating valve, and the carburettor proper. The supply tank is seen at Z; this consists of a chamber with a ball float, which actuates a needle valve. Spirit is supplied from another tank situated above this tank, and hence always tends to flow into the chamber and any falling of the ball float admits the spirit while its rising closes the cock; this occurs when the spirit is as high as shown by the line Y. From this chamber the spirit flows by gravity into the bottom of the carburettor and, of course, rises till it reaches the same level as in Z. It now flows outwards into W, but is here met by a current of air which causes rapid evaporation and the production of a saturated mixture of air and spirit vapour and, of course, highly explosive. The mixture passes through a series of gauze meshes, so as to intimately mix the particles, and through the valve to the pipe U. Of course the quantity of mixture can be regulated by the position of this valve. From U the mixture passes to the ignition valve and is burnt with explosion in the ordinary way. An advantage possessed by this carburettor is that it enables a motor to be worked either by ordinary coal gas or petrol.

The Barriere moto-tricycle is represented in the accompanying drawing (Fig. 15). This type of moto-vehicle bids fair to become very popular on both sides of the Channel, as it is light, very fast, easily managed, and by no means expensive. In its mechanical features it differs considerably from other moto-tricycles. In the first place the construction is such that it can readily be converted into a voiturette or motette with seats for two persons; for this purpose it is made exceptionally strong. The motor is of $1\frac{4}{5}$ H.P., running at 1,200 revs. per minute. It is enclosed in an aluminium casing, in which are also two fly-wheels. The ignition is electrical and is effected by a cam movement from the valve shaft. The spirit tank is also the carburator, and a change of power is effected by varying the relative quantities of spirit vapour and air on the mixture; this, of course, allows very great variation in the speed. All the valves, &c., are actuated by rods, and handles placed conveniently to the driver's hand, and a powerful brake gear is provided. The wheels are made of extra strength to withstand the wear occasioned by the high speed that is attained; this frequently reaches over 30 miles per hour on good roads.

The Cambier Moto-Vehicles.—Among those manufacturers who have established a reputation for substantial, comfortable moto-vehicles, MM. Cambier et Cie., of Lille, deserve special mention. The general type of their vehicle will be gathered from the accompanying illustration (Fig. 16). These vehicles are designed, not so much for speed, as for continuous running. They are distinguished as being very comfortable and well adapted for rough country roads. In the illustration, which represents a "Duc," it will be noticed that the body is hung rather low. The framing is tubular and is connected to the body by plate springs in the usual manner. The fore wheels are carried on pivoted axles. The wheels are of very substantial make and have heavy pneumatic Mechelin tyres. The motor is a 4 H.P. Benz, the transmission and speed gearing being on that well-known system. The power is delivered from the intermediate shaft to the rear wheels, the drivers, by sprocket chains. The steering gear, speed gears, &c., are all placed conveniently to the driver. In point of comfort and reliability in running these vehicles leave little to be desired. We may mention that the success of MM. Cambier et Cie. is to be attributed to the fact that long before the era of the moto-vehicle they were well established as engineers. Since the advent of the automobile they have laid down a large plant, consisting of the latest American machinery, for turning out moto-vehicles of all kinds. More recently they have brought out three types of motor, viz., 6, 8, and 12 H.P. with spur wheel transmission instead of belting, together with a noiseless speed changing device. We may mention that MM. Cambier et Cie. are the contractors for the famous diligence mail service in Algeria, which is carried on entirely by moto-vehicles of their make. They also manufacture fire automobiles and find these are much appreciated by French municipal authorities. We understand that MM. Cambier et Cie. are contemplating the establishment of a branch house in England, with which object a limited liability company will be formed shortly.

The Mors moto-vehicles (*see* Figs. 17 and 18), although resembling in outward appearance the generality of French vehicles is yet distinguished from them by a special type of motor. This consists of four cylinders inclined in pairs at an angle of 45 degrees, the pistons working on a single crank. While one pair of pistons is compressing the gas mixture the other pair is performing its active stroke, so that the crank receives two thrusts at each revolution. By this arrangement the motor is able to run very steadily, and there is said to be an almost entire absence of vibration when the transmission mechanism is thrown out of gear. Above the crank is a distributing shaft geared down to half the speed by pinions, and this shaft carries cams for actuating the valves, which are enclosed in the upper part of the ribbed cylinders, and the electrical igniters. Each cylinder has an inlet valve opened by simple pressure; the exhaust valve is operated by a rod, one end of which presses on a cam on the distributing shaft. As the piston makes its downward stroke a volume of air, which has been carburated in a special apparatus, is drawn through the valve, and is compressed by the piston making its upward stroke, and then exploded by electricity. The piston is

Fig. 15.—Barriere Tricycle.

thus driven forward again, and at the moment of returning the cam on the distributor opens the exhaust valve and allows the piston to expel the burnt gases. The electricity is provided by a small dynamo driven by friction by the fly-wheel, and generating enough current to explode the mixture and keep the accumulator permanently charged. The accumulator is only employed for starting the vehicle. The current from the dynamo passes through an extra-current bobbin, and is conveyed inside each cylinder, where a "breaking-spark" is produced by means of a couple of pallets and an insulated rod, the pallets being operated by cams on the distributing shaft. This spark is certain and instantaneous in its action, and all danger of erratic explosions is said to be avoided.

The carburator is of a special type invented by M. Mors, and is intended to provide a perfectly regular supply of gas mixture for the engine, so as to prevent the dangers incidental to such appliances, where the supply of mixture is liable to be in excess of the needs. The spirit flows by a pipe into a receptacle in which there is a float. When the spirit reaches a certain level, the float rises and shuts a valve, thus cutting off further supplies until the level of the spirit in the receptacle again drops, when the valve is, of course, opened. From this receptacle the spirit flows up through a pipe into an atomiser in the shape of an inverted cone, and a quantity of air equal to that represented by the downward stroke of the piston enters through a pipe and mixes with the spirit. The quantity of air admitted and the density of the mixture may be regulated with the greatest nicety by means of screws.

The crank of the motor is geared on to the counter-shaft by bevel pinions, one of which serves for the forward movement, and the other for reversing. Leather belting transmits the power from the counter-shaft to the driving axle, and the speed is varied by moving the belting on to one or other of the pulleys. The mechanism is thrown out of gear by a pedal, and another acts on the brake with such force as to stop it almost instantly. The carriage complete weighs only 570 kilos, and, running at from 300 to 1,600 revs. a minute according to needs, the motor will, it is stated, give nearly 8 H.P. on the brake. The vehicle will attain speeds of 19 miles an hour on the level, and will climb gradients of 12 per cent. at 6·5 miles an hour. It is claimed that once the carriage is started it will run for 10 hours without its being necessary to renew supplies of water or petroleum, or to pay any attention to the machinery. The oiling is done automatically; in fact, the whole carriage has been designed to avoid the necessity of any attention being given to it once the engine is started. Fig. 18 represents the type usually seen, and Fig. 17 is the latest type, specially fitted with the new reversing gear in accordance with British legal requirements.

The Klaus moto-vehicles comprise voiturettes or three-wheeled vehicles and phaetons. The former is a development of the moto-tricycle, the framing and wheels being carried in the usual tricycle manner. The motor is a horizontal single-cylinder one of about 3 H.P.; it drives by leather belting an intermediate shaft which gears directly on to a spur wheel on the rear axle. There are four speeds of 5, 8½, 13, and 17 miles per hour. The principal point of interest is the steering lever; this has a knuckle-joint and a spring; when it is released the spring lifts it up, at the same time a spring-loaded spindle is released and this opens the compression, with the result that the motor stops. Similar mechanism is found in the phaeton. These vehicles are well finished in every respect.

The Bergmann moto-vehicle (*see* Fig. 19) is of German origin, but does not differ materially from the usual accepted types. The one illustrated is a handsome enough vehicle, and is well upholstered and fitted. It is termed the "Orient Express." The motor is of 5 H.P., constructed on ordinary lines, and calls for no special notice. Magnetic ignition is employed, thus doing away with accumulators and induction coils. The cylinder is water-jacketed, the water from the storage tanks in the sides of the rear portion of the carriage circulating under the action of gravity. On the return to the storage tanks the heated water is made to pass through a condenser. Three forward speeds and one backward motion are provided. On the crank-shaft is a drum, which is connected to corresponding pulleys on a forward intermediary shaft, which is also provided with a differential gear. In front of the intermediary shaft is a short shaft, on which are keyed, but free to move longitudinally along, three different speed gears, any one of which can, by a lever on the steering pillar, be brought into gear with corresponding spur-wheels on the intermediary. The latter wheels and the fast and loose pulleys are carried on a sleeve on the intermediary, the power being thus transmitted through one of the pairs of spur-wheels to the second intermediary and back to the differential shaft by a pair of spur-wheels constantly in gear, and from the latter to the rear road wheels by the usual sprockets and chains. The levers controlling the variable speed gear are also in connection with the belt-shipper, so that by placing the handle in a certain position the belt may be put on the central loose pulley and the motor thrown out of gear with the power-transmission mechanism.

FIG. 16.—CAMBIER "DUC."

The Compagnie Francaise des Cycles Automobile have attained a great deal of success and popularity with their autometette, of which we give illustrations (*see* Figs. 20, 21, and 22). As will be seen, it is a three-wheeled vehicle, the rear wheel being the driver. The motor is a single-cylinder horizontal petroleum-spirit one, developing, at a normal speed of 450 revs. per minute, a little over 3 H.P. It is placed on one side of the centre of the vehicle. The oil is stored in

2 Q 2

a tank under the seat, from which it flows to the carburettor, V. The latter is of the constant-level type provided with a float, V′. The regulation of the proportion of air and carburetted air admitted to the explosion chamber is controlled by the handle, A. The ignition is effected by means of an electric spark, the accumulator being placed at G, the induction coil at H, the contact button at P, and the ignition cam at B′, the handle, B, controlling the latter, being placed in the fore part of the carriage. The exhaust valve is controlled by side gear driven off the motor shaft. The cylinder is partly water-jacketed and partially provided with radial gills. The water-cooling tank, K, is fitted in the front of the vehicle; this tank is pierced by a series of tubes through which the air is free to circulate. The

Fig. 17.—Mors Touring Car, with Aluminium Canopy.

exhaust gases pass through a silencer, N, before being discharged into the air.

Fig. 18.—Mors Ordinary Car.

Two forward speeds are provided—7 and 14 miles per hour, but by varying the ignition a speed up to 20 miles can be obtained. The motor shaft carries two expanding friction clutches working inside the pulleys, X′X″. The pulleys, X′X″, which are mounted on sleeves, and so run loosely on the shaft, X, have rigidly connected to them, on one of their sides, small sprocket wheels connected by chains to corresponding sprockets, Y′Y″, on the intermediary shaft, Z. A driving pulley on the latter is connected to a large pulley, O, attached to one side of the rear driving wheel, by a belt, the power being in this way transmitted to the rear wheel. The belt normally runs slack on the two pulleys, and is only brought into action by lowering the jockey, G′, by means of the handle, C, which also controls the brake, S, acting on the large pulley, O. Thus, whenever it is necessary to apply the brake, S, the motor is always simultaneously put out of gear with the transmission mechanism by the slackening of the belt. A second brake—a band brake—is also provided, actuated by the foot-pedal, F, the band gripping a drum, F′, attached to the rear road wheel on the side opposite to the large driving pulley, O. The motor may also be thrown out of gear with the transmission mechanism by placing the handle, D, in a central position, neither of the clutches, X′ X″, being then in operation. The connecting-rod and crank of the motor run in an oil-containing bath. The wheels are of the cycle type, and are fitted with pneumatic tyres.

The Hille moto-tricycles (Fig. 23, p. 473) are, we think, likely to be received with considerable favour in this country. They are of German make, and hence scientifically constructed. They follow the usual lines as regards the transmission of the power, but some differences are noticeable in the carburation. The general design of the vehicle is shown in Fig. 24, p. 473. The motor is suspended from the rear axle and is of about 1¼ H.P., running at 1,200 revs. per minute. The carburettor is shown in Fig. 25, p. 473, and this consists

FIG. 19.—"ORIENT EXPRESS" (Bergmann System).

FIG. 20.—AUTOMOTETTE (Compagnie Française System).

of a simple triangular tank placed between the rear members of the frame. The carburation is effected by the ingenious method of passing the exhaust through the spirit tank, thus heating the spirit and producing a large quantity of available mixture, and it is by the quantity admitted that the speed is regulated. These vehicles are extremely well made and are powerful enough to be attached to trailers.

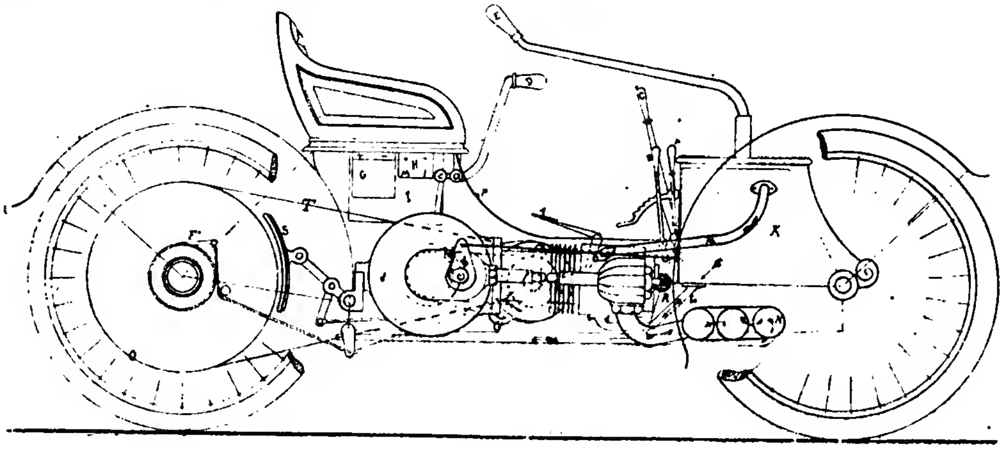

FIG. 21.—AUTOMOTETTE (Side Elevation).

THE INSTITUTE OF BRITISH CARRIAGE MANUFACTURERS.

THE eleventh annual autumnal meeting of the Institute of British Carriage Manufacturers took place on September 6th and 7th, at the Royal Hotel, Edinburgh, there being a large attendance of members. Bailies Sloan and Robertson on the first day welcomed the Institute on behalf of the Edinburgh Corporation. Mr. William Angus, J.P., Newcastle-on-Tyne, the President of the Institute, having returned thanks, gave his address.

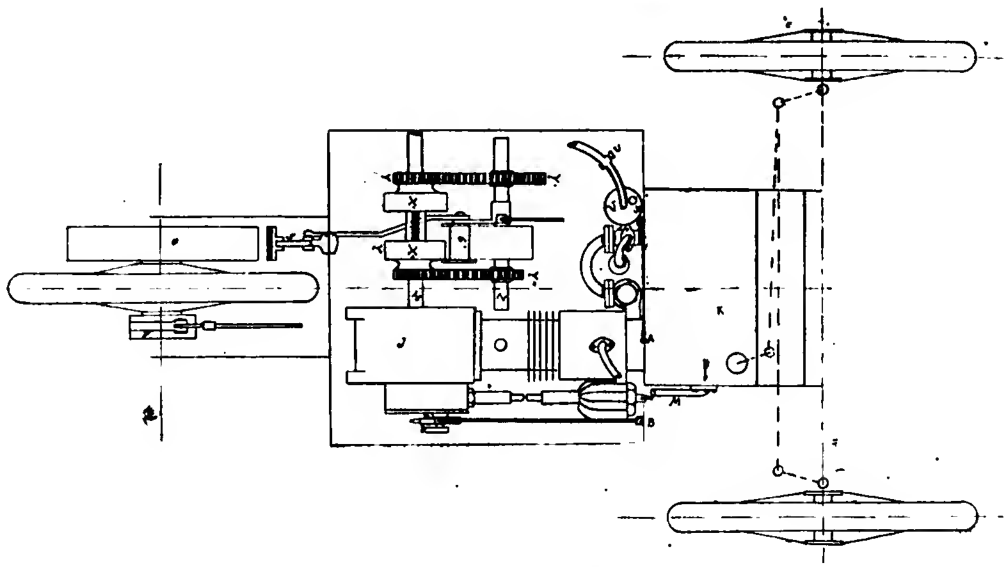

FIG. 22.—AUTOMOTETTE (Plan).

Choosing as his subject "Education in Coachbuilding," he said his thoughts had been guided in that direction by the important scheme which had been inaugurated by the Technical Education Board of the London County Council for the establishment of a higher technical day class for carriage-builders. They hoped that British coach-building might occupy the leading position which it had held in the past, that it might set and not follow the fashions. Among the subjects which a young coachbuilder ought to understand he would prominently put freehand drawing. The next stage should be to make drawings of every part of carriages, in plan, elevation, section, projection, and perspective. A knowledge of the principles of solid and plane geometry was also necessary for their trade. In their new higher technical class the link was being provided which would connect scientific mechanics with the actual work of their manufactories. The builder of a perfect carriage needed to be both a scientific man and an artist. On the motion of Mr. Percy Preston, London, seconded by Mr. Wm. Gilchrist, Lancaster, the President was cordially thanked for his address.

A paper was next read by Mr. T. Coward, London, on "The Application of Motors to Private and Public Carriages," which was illustrated by lantern views. After a historical sketch of the subject, he referred to several examples of steam moto-carriages—which form of power, in the opinion of independent and competent authorities, held the premier place to-day. The conclusions which were to be drawn from the competition organised by the Liverpool Self-Propelled Traffic Association last May and from previous experiences were, he thought, that steam for heavy work was superior to any other known force, and not only did he believe it to be the best available for goods traffic, but it was also available for large public vehicles, such as street omnibuses. There were some who were successfully applying steam to vehicles for lighter traffic. The great point of congratulation was the fact that the difficulty had been overcome by private enterprise. Electric propulsion for ordinary road vehicles in towns had now passed the experimental stage, the successful application of this force mechanically having been demonstrated. The serious drawback with regard to weight that had hitherto existed to condemn electrical road propulsion by accumulators was about to be removed, at least in a great degree, by the development in the art of accumulator manufacture. The facilities for electrical traction in America were much greater than here, because of the numerous

Fig. 23.—Hille Tricycle.

charging stations. Attempts, however, were now being made in London to render the electric car altogether independent of charging stations. His firm were building an electrical moto-carriage for Mr. Epstein, designed to be capable of self-charging. The motor was a dynamo also. A small oil-engine was carried

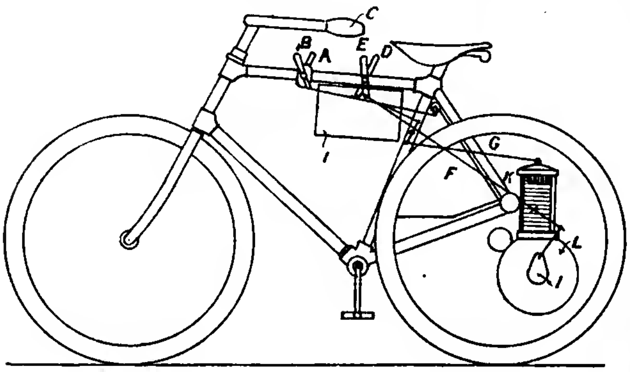

Fig. 24.—Hille Tricycle (Side Elevation).

on the car, so that when stopping at any time on the road, at an inn for the night, or for refreshment, the time could be utilised for recharging, by connecting the engine with the dynamo, for which suitable arrangement was made. Partial recharging could also be effected when running downhill. The form of motor which at present was the most popular and most in use was the oil-motor, of which there were various makers. He dealt with the principal features of the oil-motor, and with regard to its construction be thought that both the engineer and the coachbuilder should direct their efforts to the same object, and by a combination of their knowledge and skill no doubt the best results would be obtained. Of the three kinds of wheels that had been tried on moto-cars with more or less success—the ordinary carriage wheel wholly constructed of wood, the ordinary suspension iron wheel, and the one known as the artillery pattern—the latter had been more largely used by moto-car builders, and seemed best adapted for the purpose. For all moto-carriages running over five miles an hour a pneumatic or solid rubber tyre was most essential, and the objections that now existed in regard to ball bearings for heavy vehicles would, be thought, in a very short time be removed by the roller bearing. In conclusion, he remarked that though the moto-car industry had lately made considerable progress, it was still comparatively in its infancy, and though the application of motors to road carriages was beset by many difficulties (difficulties that were not encountered on the railroad), there was no doubt that the engineer, in combination with the coachmaker, would be able, by their united efforts, to make the autocar industry of this country an important branch of British manufacture. It was his opinion that there were great possibilities in store for the "application of motors to carriages" by all the forces that he had named: steam for heavy

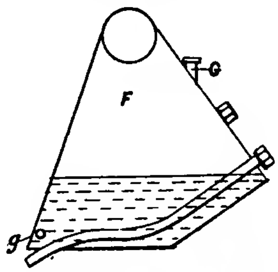

Fig. 25.—Hille Carburettor.

goods traffic and large public vehicles; electricity for smaller vehicles, public and private; petroleum for small goods traffic and private vehicles. But the direction in which the largest development of motor traffic would be likely to take place would be as a medium for more economically collecting produce from small towns and villages remote from railway stations, thus solving at once the problem of the light railway in an economical manner, and bringing about that which was so much desired, viz., cheap internal transport.

In the evening a dinner took place at the Royal Hotel, when the chair was occupied by the President. About 100 gentlemen were present.

Prior to the beginning of the second day's proceedings the Council of the Institute adjudicated upon the exhibits which had been sent in by workers in the trade, and for which prizes were given.

Mr. Andrew W. Barr, the secretary of the Institute, read a paper on "Coachmakers' Accounts," which was followed by a discussion.

Cells or Petrol Motors.—In a paper read before the Engineers' Club of Philadelphia, by Mr. Joseph Appleton, the latter makes a strong plea in favour of working moto-cars by storage batteries rather than by oil or gasoline motors. Briefly stated, he claims the following advantages for the electric vehicle over oil or gas motors:—Safety—a storage battery will not explode, nor is it inflammable, like gasoline or kerosene. Ease of handling and control—an electric motor, with its controller, is certainly the ideal method of control, and is distinctly not in the same class with the levers and valves necessary to operate an engine. Absence of noise and vibration—here, again, the electric motor is the ideal motor for the purpose, having a smooth rotary motion, instead of a reciprocating action with its noise and vibration. Absence of heat and smell—an oil or gas motor must, of necessity, be accompanied by considerable heat, and usually requires a water-jacketed cylinder. From the exhaust there is an objectionable odour, due to the unconsumed gases; but with the electric motor neither of these objectionable features exists. Cost of operation—there is no doubt, from independent tests made, that a vehicle can be propelled electrically with less consumption of energy than any oil or gas motor. There are many other points which might be touched upon, but these will suffice. For city use, the question of large mileage capacity does not handicap the electric vehicle in favour of the oil or gas motor, as the supply of electricity can be renewed as desired by recharging the batteries.

THE LUNDELL ELECTRIC MOTOR.

The following is a description of this motor, which is rather extensivoly used for traction purposes when the power required is small. It is the motor employed in the London electric cabs. Roferring to the drawings, Fig. 1 is a side elevation and Fig. 2 is a longitudinal section of the same, the section being taken on the line, x, x, Fig. 3, aud as seen looking in the direction of the arrows upou Fig. 3, which is an elevation of the right-band end of Figs. 1 and 2, the cap or end-plate of the oil chamber being removed. Fig. 4 is an elevation of the left-hand end of Figs. 1 and 2, with the journal bearing, the commutator, and detacbable parts removed. Fig. 5 is an end elevation of the left-hand end of Figs. 1 and 2, one of the commutator brushes and its means of support and the adjacent parts being shown in section. Fig. 6 is a central horizontal section taken through the body of tbe machine, the parts which support the ends of the field magnet cores being shown in plan, and the field coil, the armature, and its supporting shaft being omitted.

In the early machines of this type the structure is such that after the parts are once put together it is not possible to remove the armature without separating the field magnet cores and removing also the field magnet coil. This is because the field maguet cores are cast in semi-spherical form aud the field magnet coil inserted in position between these cores, tho journal bearings being integral with them. In the present machine the necessity of entirely dismantling it when it is desired to remove the armature and its attached parts is avoided by casting the two semi-spherical field magnet cores open at their outer ends and securing the journal bearings, commutator supports, and legs, or brackets, directly to the outer ends of the corea by bolts and nuts, the cores being secured together at their inner ends by bolts passing through lugs as before.

P, P^1, represent the semi-spherical field magnet cores, made preferably of cast magnetic steel, and such a shape that when put together, face to face, the pole-pieces overlap each other, and the cores form an annular space into which the field-magnet coil, M, fits, its axis being at an angle to that of the shaft, C, of the armature, A, such that the passage for tho insertion and withdrawal of the armature is not impeded by the coil. E E, E E, are lugs provided for receiving bolts, B^1, B^1, to secure the semi-spherical parts of the field magnet cores together.

The field magnet cores, P and P^1, are each cast from the same pattern, and are, therefore, duplicates, the extensions, I, being designed for the purpose of attaching to the upper part of the machine a screw-bolt or eye, H, for conveniently handling the machine in the shop. In the outer ends of the field-magnet cores are drilled holes to receivo bolts, B^1, and steady pins, B^5, for securing thoreto end-plates, R, R, or equivalent supports, these being preferably of magnetic material. They are shown as being so cast that their lower extensions constitute legs, L, provided with bolt holes to receive bolts, B^3, secured to slotted metallic supports, T, by nuts, B^2.

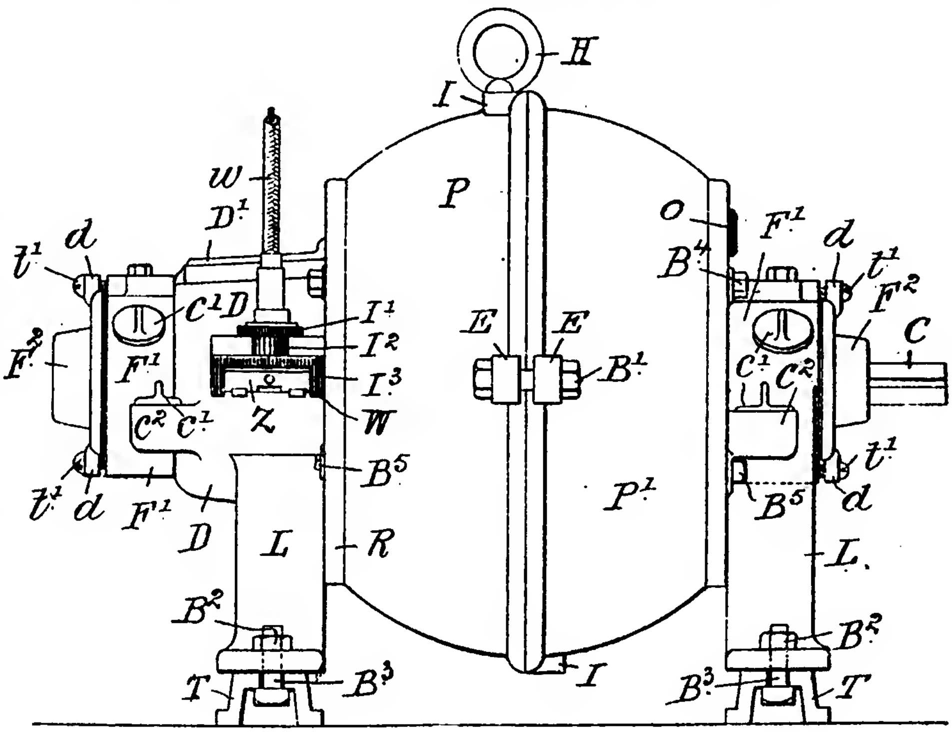

Fig. 1.

Fig. 2.

The end-plate or support, R, at the left hand of Figs. 1 and 2, is cast with a conical-shaped extension, D, provided at its lower side with an opening, O[1], for admitting air into the body of the machine, and an opening at the top, or upper side, to receive a door or cover,

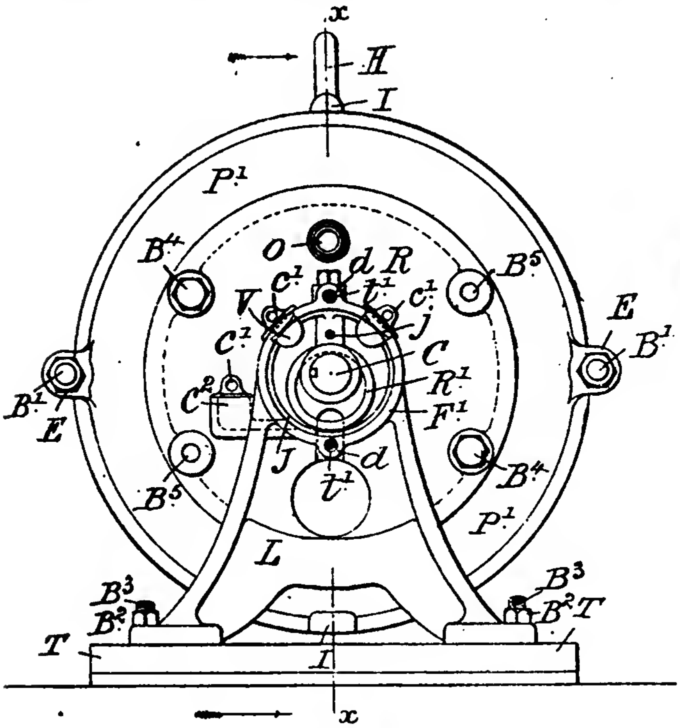

Fig. 3.

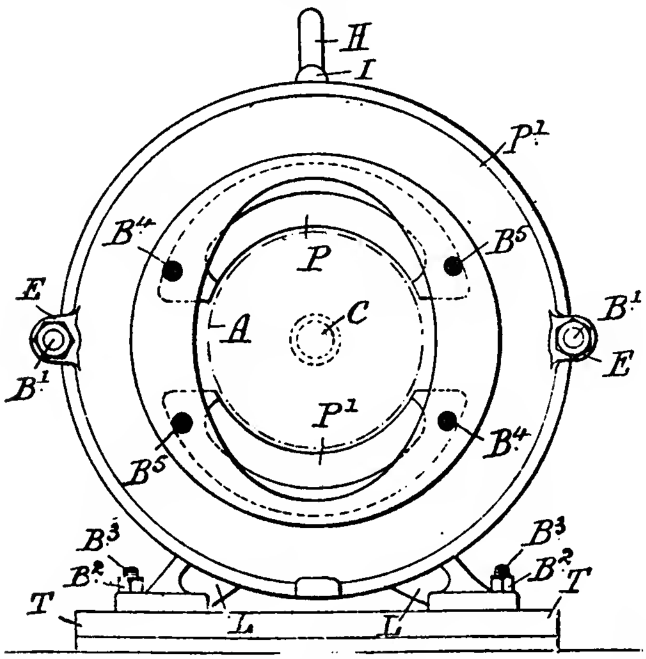

Fig. 4.

D[1], situated directly over the commutator for enabling it to be inspected. The commutator is supported by a cast metal sleeve, S, keyed directly to the armature shaft, C, the commutator strips, B, being insulated from this sleeve and secured by a disc, K, and screws, *t*, *t*, this disc and the opposite end of the sleeve, S, being undercut to receive the correspondingly-shaped strips, B. These strips may be connected to the windings of the armature, A, in the usual manner.

F[1] is a cylindrical extension cast with the other conical extension,

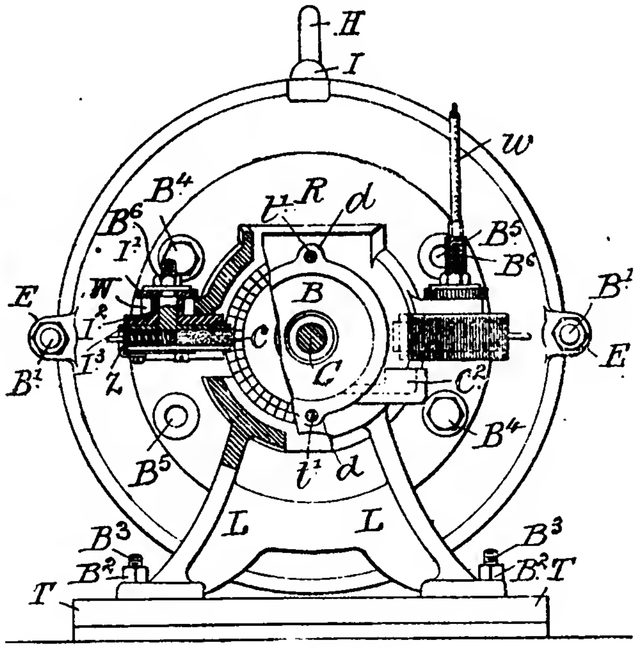

Fig. 5.

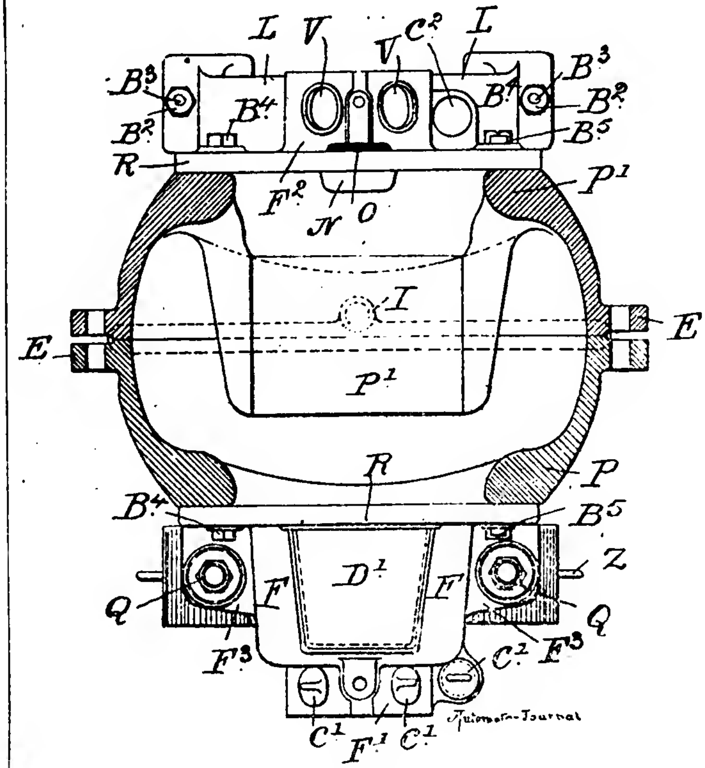

Fig. 6.

D. It has a bolt hole in its upper side to receive a bolt for securing the journal bearing, J; R[1] are oiling rings resting in slits in the journal bearing, J, and resting upon the upper surface of the shaft, C, and extending downward into an oil chamber constituted by the interior cylindrical portion of the part, F^1, and a detachable cup-shaped cap, F^2, secured to the outer end of the part, F^1, by lugs, *d*, and screws, t^1. The journal bearing, J, at the opposite, or pulley, end of the shaft, C, is formed and supported in a similar manner, being provided with oiling rings and with an oil chamber cast with the end plate, R; *j*, *j*, are pins extending through the upper flange of the journal bearings to retain the oiling rings, R^1, in place. c^2 are oiling ducts or channels for the introduction of oil to the oil chambers at the opposite ends of the armature shaft. V are peep holes for enabling the operation of the oiling rings, R^1, to be examined, and c^1 are caps for closing these ducts and peep holes. *c* are the commutator brushes, made preferably in the form of rectangular carbon blocks, and capable of sliding endwise to bear against the commutator under the influence of spiral springs secured in metallic brush guiding sleeves, W, attached to the body of the machine, but insulated therefrom by insulating material, I^1, I^2, and I^3. Z being a detachable cover and support for the springs to afford easy access to the brush and its attached parts.

B^5 are the binding posts, and *w* the conductors. O is a hard rubber thimble in the end-plate, R, through which the field-magnet windings are carried to a starting box (not shown in the drawings).

The oblong opening, O^1, through the part D, and the opening through the opposite end-plate, R, which supports the pulley end of the shaft, C, ensure sufficient ventilation for keeping the parts of the machine cool, by the passage of air indicated by the arrows in Fig. 2. By the arrangement of detachable end-plates, R, and legs or supports, L, these parts can be cast separately from the field-magnet cores and with the legs or supports, L, of any desired conformation.

TYRE MANUFACTURERS COMBINE.

A number of well-known tyre and manufacturing companies have, it is stated, formed themselves into an association for the protection of their interests, their object being to restrict competition and to resist payment of rebates and exhibition fees. The name of the new association is to be "The Pneumatic Tyre Manufacturers' Association," and the subscription has been fixed at ten guineas per annum. The following companies, among others, have joined the association:—The North British Rubber Company, the Palmer Tyre Company, the Amalgamated Tyre Companies, the Grappler Tyre Company, the Clipper Tyre Company, the New Ixion Tyre Company, the Preston Davies Tyre and Valve Company, the Non-Collapsible Tube Company, the Trench Tubeless Tyre Company, and the Tubeless Tire and Capon Heaton (Limited).

It is stated that it is intended to deal with the terms of guarantee under which members of the association usually sell their tyres, and it is possible that some arrangements as to prices for next season may be made. The association feel that the multiplication of local cycle shows is of very little real value to the trade, and as these have, it is asserted, been almost entirely run with their money, the benefits have certainly not been commensurate with the expenditure, and as a consequence the association has decided to limit its support of exhibitions to those held in London, Dublin, Edinburgh, and Liverpool. In plain English, this means that the tyre manufacturing companies find it absolutely necessary to cut down expenses.

The Limitations of the Trolley.—The limitations to the overhead trolley are now quite generally recognised. It has been found that it is difficult efficiently to transmit, by means of the ordinary form of trolley wheel, more than 150 ampères from the wire to the wheel without excessive sparking and loss. The speed at which a trolley wheel will stay on the wire, through section insulators, special work, and switches, is limited in good practice to not much over 10 miles an hour, says Mr. Pepper in the *Journal* of the Franklin Institute. When the trolley stand and wheel are both designed for high speed and the line carefully constructed, it is possible to run on straight-line work at a speed of about 30 miles an hour. Beyond this speed the tendency to throw the wheel from the wire, owing to slight obstructions on the trolley wire, is very great. If the wheel leaves the wire at this speed it is almost certain to either break the trolley pole or bring down a large portion of the overhead construction. It is for this reason that experiments have been and are being tried to substitute a fixed conductor near the ground with a large surface contact for the overhead trolley wire, for high speed and heavy currents.

NOTES OF THE MONTH.

The Manchester Ship Canal Company charge 2*s.* 6*d.* as toll for the transit of moto-vehicles over their bridges.

It is a very curious feature about not a few so-called "advanced" papers that they are among the most hostile as regards automobilism. Thus the *Review of Reviews* airs its views under the heading of "Moto-car Mania." Why mania? Of course this silly effusion is reproduced by *London*.

What is claimed to be the heaviest train on record drawn by a single locomotive was hauled on August 9th over the Pennsylvania Railroad from Altoma to Columba. The train consisted of 130 cars of coal, and had a length of 3,877 feet. The total weight behind the tender was 5,212 tons, of which 3,693 tons was paying load. The locomotive used weighed itself 104 tons.

According to the *Daily Chronicle* a new Flemish word has been coined to express the French word "automobile." It is "Snelpaardelooszonderspoorwegpetroolrijtuig." To be correct, if not already accepted, the word has at least been proposed at a session of the Flemish Academy at Antwerp. The great merits the new word possesses are its euphony and expressiveness.

Messrs. Carr and Co. (Limited), of Carlisle, are about to obtain delivery of a large automotor wagon, built by the Lancashire Steam Motor Company, Leyland. The wagon is intended for use in West Cumberland, and will probably do the work of four horses. It will be capable of carrying a load of 3 tons, at an average speed of five miles an hour. The wagon is fitted with a high-pressure boiler and is fired with liquid fluid.

An absurd canard has been going the rounds of the Press to the effect that the engineer-in-chief's department of the General Post Office is busily engaged considering tenders for the supply of motors to be used in connection with the postal service. The Post Office has been experimenting with motor mail vans, and several are actually running experimentally at the present time. Notwithstanding the success achieved so far the matter is still to an extent in the experimental stage.

The Kilmarnock magistrates have licensed Mr. W. A. Reid to run moto-vehicles as hackney carriages under the burgh regulations. Two motors have been placed on the route between Kilmarnock and Hurlford, one starting at each end every 20 minutes. The new vehicles are largely patronised. We understand that additional motors are shortly to be introduced on other local routes. The Dundee magistrates have granted permission to the Dundee and District Tramway Company to run three moto-vehicles between High Street and Magdalen Green, *viâ* the Esplanade, on Thursday, Friday, and Saturday.

For some time past the Devon Trading Company, of Axminster, had experienced considerable difficulty in hauling their goods from the Blue Seas Lime Works to Axminster, a distance of three miles. The road was soft and very narrow, and consequently the traction-engine used cut deep ruts, forcing the road up in the centre. Matters finally got so bad that the Company obtained one of the patent engines made by Messrs. P. J. Parmiter and Co., of Tisbury, which have a central roller wheel 4 feet wide, with the result that the condition of the surface has been rapidly improved. The engine is stated to have great tractive power.

As we go to press we understand that the municipal authorities of Westgate-on-Sea have reconsidered their foolish decision to sprinkle gravel on the roads with the object of rendering the passage of moto-vehicles difficult. These local bumbles have at length grasped the fact that a newly-gravelled road will be more severe on horse-drawn vehicles. At Margate the feeling against moto-vehicles is also very strong. At the latter place this feeling against moto-vehicles found expression in an assault committed by a local omnibus driver upon the driver of a moto-vehicle. This led to the former's appearance in the police court, and he was fined 10*s.* and costs.

A NEWLY announced substitute for rubber, named perchoid, the invention of Dr. Napier Ford, is described as an oil which has undergone a high degree of oxidation. The oil is heated with litharge, stirred long and continuously, and then allowed to cool. Specially prepared tow is then dipped into it and placed in wire baskets subjected to air. The oil admitted to the filaments of the tow thus becomes wholly oxidised. This is drawn through rollers and comes out a leathery material closely allied to, if not identical with, rubber. Its tenacity is increased by mixing sulphur with it. It is said that perchoid can be rolled as thin as a piece of tissue paper, and that it makes leather impervious to moisture, though not to air.

SAYS the Society correspondent of a contemporary :—Society is slowly dropping the bicycle in favour of the moto-car. In a year or so, if you have not your private motor you will no longer be "in the fashion." It is devoutly to be hoped that there will be moto-car schools, as well as bicycle schools, for the aristocratic amateur has already proved himself a source of grave danger to the pedestrian public in London. Lord Carnarvon, who was, I believe, one of the society pioneers in bicycling, has purchased two moto-cars, and has gone abroad with one of them for a tour. Lady Kitty Somerset and her husband have also succumbed to the fascinations of motoring, as well as Lady Alexandra Beauclerk, who contemplates a tour in company with Lady Kitty Somerset.

YOUGHAL now receives its mails by a moto-vehicle. The first moto-vehicle, imported by the Postal authorities for the delivery of the mails, lately made a successful experimental trip from Cork to Youghal. It left Cork at 8.34 a.m., having on board, besides the operator and the contractor's representative, Mr. G. A. Whitman, Assistant Surveyor, Post Office, and Mr. John Sheridan, Postmaster, Cork. It reached Carrigtwohill at 9.26, Middleton 9.53, Castlemartyr 10.29, Killeagh 10.53, and reached its destination, at the Youghal Post Office, at 11.51, thus taking 3 hours 17 minutes to do the journey, but from this must be deducted a five minutes' stay at each of the above-named places. The motor is a Daimler, and capable of doing 12 miles an hour. Everything worked well on the trial trip, those who travelled by it expressing themselves highly pleased. Its appearance on the roads, especially in the country districts, created great curiosity and wonderment, and large crowds collected opposite the Youghal Post Office to view it.

SIX of the new bogie single-wheel liquid-fuel burning express engines, designed by Mr. James Holden for the Great Eastern Railway, and built at the Stratford Works of that Company, are now out. They are numbered 10 to 15, taking the place of some very old locomotives which were scrapped. They have, says *Engineer*, 7-feet driving wheels, 18-inch cylinders, 160-lb. steam pressure, like the older single-wheelers, but the piston stroke is lengthened from 24 inches to 26 inches; the driving wheels have outside as well as inside bearings, the frames being double, and the weight is greatly increased, as much as 19½ tons being placed on the single drivers. The telescopic boiler is 11 feet long and 4 feet 4 inches in diameter. The fire-box is 7 feet long. The heating surface is :—Tubes, 1,178 square feet; fire-box, 114 square feet; total, 1,292 square feet; and the grate area is 21·37 square feet. The engines are fitted with Mr. Holden's liquid-fuel apparatus, steam sanders, water pick-up scoops, and exhaust steam injectors. They are employed on the heavy expresses between London, Ipswich, and Cromer.

A BELGIAN ministerial decree forbids the starting of gas and petroleum engines by pulling on to the spokes of the fly-wheel; and a specialist in such engines writes to the *Organe Industriel*, of Liége, drawing attention to the want of clearness in this decree, and also the grave consequences it may entail for the numerous industries in which such engines are employed. It is well known, he observes, that for starting an explosion motor at least two revolutions must be made before it receives a motive impulsion. For small motors it is quite safe and easy to give the engine a few revolutions by pulling the fly-wheel round by hand; but for larger sizes this work, if not dangerous, is fatiguing, and requires too many hands, so that makers generally provide their motors with self-starters, the principle of which is to introduce an explosive mixture behind the piston, to be exploded after the crank has slightly passed the dead point. This method does not dispense with acting on the spokes of the fly-wheel, since the crank has to be brought to the dead point. But it is not likely that the decree is intended to interdict that operation, any more than that of acting on the rim of the fly-wheel, when it forbids action being exerted on the spokes. The following method, intermediate between the other two, is also employed :—A cylinder full of explosive mixture is drawn in, while the fly-wheel is slowly turned for compressing this mixture, which is then ignited by turning the fly-wheel in the contrary direction, after which the engine will revolve in the normal direction. In this case action is exerted on the spokes or on the rim of the fly-wheel for two half-revolutions in contrary directions, and the fly-wheel is released directly the explosive mixture is felt to be ignited, so that there is no danger. Inasmuch as the decree aims at suppressing danger, the question is, says *The Engineer*, Wherein does the danger consist?

A FIRE EXTINGUISHING FLUID.—One of the best agents for extinguishing fires, according to the *National Druggist*, is aqua ammonia, without any addition whatever. "We have personally had experience with the almost marvellous power of this substance in this direction," says the editor of that journal. "In one instance, where fire had originated, probably from spontaneous combustion, in a pile containing several tons of cotton seed, and the interior of which was almost a solid body of live coal, a half-gallon of ammonia completely smothered the fire. In another, which occurred at Savenay, France, the vapours of a tank containing 50 gallons of gasoline caught fire in the linen-room of a laundry. The room was instantly a mass of living flames, but a gallon and a half of ammonia water thrown into it completely and almost immediately extinguished the fire. The ammonia was in a glass demijohn in an apothecary's shop next door to the laundry, and was thrown into the room by the druggist as an experiment. To use his own words in reporting the circumstance in the *Union Pharmaceutique*, M. Janneau, the pharmacist, says: 'The effect was instantaneous; torrents of black smoke rolled upward in place of flames, and in a moment every trace of fire was gone. So completely was the fire extinguished that workmen were enabled to enter the room almost immediately, where they found the iron tank of gasoline intact.'" Has the Fire Brigade of the London County Council tried this method?

NOTICES.

Contributions and articles likely to prove of interest to our readers will receive due attention, but in all cases the name and address of the writer must be given, not necessarily for publication.

All matter intended for publication should reach us not later than the 10th of each month, and be addressed to THE EDITOR OF "THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL," 62, *St. Martin's Lane, London, W.C. Stamped envelope must be sent if the manuscript is required to be returned. The Journal is published the middle of each month.*

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IMPORTANT ANNOUNCEMENT.

The current issue completes **Volume II. Price 9s.** (bound complete with Index).

The Index, which will be published free with the October number, will be very copious, and will include complete—

Alphabetical list of all New Companies Registered.
" " all Patent Specifications Published, carefully classified under subjects.
" " all Patentees' Names of Specifications Published.

For purposes of reference these particulars are likely to prove of immense value.

VOLUME I.

NOTICE.—A few copies of Volume I, bound complete, can still be supplied at One Guinea net, in consequence of our having purchased some of the numbers out of print, enabling us to make up some more complete sets.

Most of the back numbers can still be obtained at 6d. per copy, or 7d. per copy post free.

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The Automotor and Horseless Vehicle Journal.

A RECORD AND REVIEW OF APPLIED AUTOMATIC LOCOMOTION.

SEPTEMBER 15TH, 1898.

DIARY OF FORTHCOMING EVENTS.

Notices to be included under this heading should reach the Office not later than the 12th of each month.

1898.

Oct. 6 to 12 .. Poids Lourds, Paris, organised by the Automobile Club of France.

Nov. 18 to 26.. Stauley Show of Cycles, Motor-Carriages, &c. Royal Agricultural Hall, Islington.

1899 .. .. Race from Paris to St. Petersburg, under the auspices of the Automobile Club of France.

" .. .. Motor-Car Exhibition at Tunbridge Wells.

" .. .. Heavy Motor-Vehicle Competition at Liverpool.

1900 .. .. Paris International Exhibition — Great Display of Automotor-Vehicles and Allied Trades.

ANSWERS TO CORRESPONDENTS.

X. Y. Z. (Birchington).—We cannot recommend the Duryea moto-vehicle for the simple reason that we know nothing of the details of its construction. Why not try a Daimler, or Benz, or Riker? These we know.

CANTONESE.—Your great difficulty would be the supply of petrol at a reasonable cost. Millions of tons of burning oil are exported to China and Japan, but very little petroleum spirit. Consult Messrs. Samuel and Co., Houndsditch, London.

E. JONES (Coventry).—Friction discs wear rapidly and are very noisy. We cannot recommend the chain you mention because we fail to see that it has any mechanical advantage over the ordinary plate link chain. See Unwin's machine design.

JAS. KEELEY (London).—The Buffalo injector is not used, so far as we know, to any great extent on the railway in question. Gresham and Craven's is mostly used.

STEAM MOTOR.—The consumption of water in traction-engines is about 27 to 30 lbs. per B.H.P. hour, and the coal about 3 to 4 lbs. per B.H.P. hour. In moto-vehicles the consumption is about the same, small engines and boilers being usually very uneconomical.

FRICTION.—Morin's laws, although not exact, give very close approximations.

W. T. L. (Elgin Avenue).—The type of moto-car you refer to is now somewhat obsolete. It was, we believe, originally the design of a gentleman connected with the Elieson Lamina Accumulator Company.

J. A. L. (Mirfield).—Shall be very glad to purchase both No. 1 and No. 12, and will remit on receipt.

J. L. C. (Blackrock).—You will find the letter in No. 2, Vol. I. Copy has been sent you.

J. G. C.-G. (Hythe, Southampton).—The number of the patent is 10,081 (1897). The only suppliers of the improved Benz system manufactured by the Maison Parisiennes de Voitures Automobiles are the International Motor Car Company, of 15, High Road, Kilburn.

ROTARY MOTOR (Sheffield).—You must not blame us. Your claims do not particularly specify as being applicable to moto-vehicles. The great number of patents being taken out in connection with automobilism precludes our recording anything except where the claim applies particularly to moto-vehicles.

C. M. D. J. (Wistanstow).—(1) Not having made any personal tests of the vehicle in question we are unable to express any opinion. We are, however, promised a practical test by the proprietors. (2) We do not know. It has been promised for over a year now.

G. KESTER (South Wimbledon).—We do not know personally of any Daimler second-hand motors for sale, but would suggest your applying to any of the companies who are advertising in our Journal. They, no doubt, would be able to supply you with what you want.

F. HENDY AND Co. (Southampton).—We will add your name as desired on our next list as storing a large quantity of petrol and prepared to undertake repairs of motors. Specimen copy of the Journal sent.

THE HORSE-POWER OF PETROL MOTORS.

WE observe in some quarters that it is becoming a practice to employ the term "nominal horse-power" in connection with light oil—casually known as spirit or petrol motors. We wish to enter a protest against the introduction of such a misleading, erroneous, and unscientific term as nominal horse-power in connection with the petrol motor.

In the early days of the steam-engine the use of the term nominal horse-power had some justification, as it expressed, although in a crude and indefinite way, the power of the motor as a minimum. With the gradual increase in steam pressures, and the employment of accurate methods of measuring power, the nominal horse-power became a function of the indicated power; but with the introduction of "types" of engines the relation between nominal and indicated power became indefinite. Of late years the term nominal horse-power has nearly wholly dropped out of use even by commercial men who, as a rule (witness our weights and measures), cling tenaciously to inexact terms. Needless to say, in the scientific nomenclature of engineering nominal horse-power is meaningless and archaic. Its use by any engineer is a sure and unmistakable sign of a neglected or imperfect professional education. We are aware that the term still finds a place in the catalogues of not a few very eminent traction-engine builders; the reason is that the bulk of the customers of these firms are farmers who know perfectly well what they mean by a 10 nominal horse-power traction-engine, but who do not know, and who do not care a jot whether this engine indicates 30 or 40 horse-power, and who are sublimely indifferent to the relation between brake and indicated horse-power. With this exception, the term nominal horse-power is, as we say, obsolete. We now see its resurrection by manufacturers of petrol motors, in one of whose catalogues we see a motor spoken of as being "4 horse-power nominal and 5½ horse-power actual." Inquiry fails to elicit any definite statement of what the nominal horse-power of a petrol motor is and what is the actual, and also what is the relation between the two.

The statement that a motor is of 5½ horse-power actual is in itself vague. If it means that this is the indicated horse-power which is an "actual" power, then the effective or brake or again "actual" available horse-power will be perhaps 4½ or 4¾. If this 5½ actual horse-power be the brake-power, then the indicated power will be perhaps 6½. Brake and indicated horse-power are well understood and definite expressions, and both are "actual" entities. Why, then, introduce the confusing and misleading term nominal horse-power? If a motor is of 4 indicated horse-power and of 5½ brake horse-power, why not say so, rather than say it is of 4 horse-power nominal and 5½ horse-power actual? The former statement is plain and straightforward and strictly scientific. It also conveys to merchants and buyers a definite meaning. The latter statement is indefinite and unscientific, in that a wholly meaningless and obsolete term is employed. A person who purchases a 5 nominal horse-power oil motor could not recover if it failed to develop more than this, because the nominal horse-power is an indefinite and unscientific unit, neither could he if he purchased a 5 actual horse-power engine which only gave off 4½ available or effective horse-power. Indeed, for the sale of moto-vehicles we think the introduction of the term horse-power superfluous. Of course, in analytical writings such as appear in The Automotor, we have to employ the terms brake and indicated horse-power. We would personally much prefer to employ poncelets. So far as the relations between a seller and a purchaser are concerned we think it would be better, and certainly simpler, to conduct the transaction on the explicit statement that on a stated kind of road and grade the vehicle and its load would be moved at a stated minimum speed upon a minimum consumption of oil and water or other source of energy. Such a specification contains no reference to horse-power units of any kind. Another reason why it would be advisable to employ horse-power units as little as possible in, at any rate, commercial transactions, is the difficulty of measuring accurately the power of small rapidly-reciprocating petrol motors. The brake test, although simple and free from error, does not tell us how much is lost in friction and transmission. For our own part, we always regard statements concerning the power of these small motors with considerable doubt. Before the Liverpool trials we urged that the competing vehicles should be blocked up and the engines indicated and the power absorbed by the brake test determined. This, we regret to say, was not done. But such a test will be carried out some day, and many people will be surprised at the large amount of power absorbed between the cylinder and the driving wheels. With electro-motors the measurement of power is simple enough, the readings of the volt and ammeter give the watts, and therefore the power with little or no calculation, with the advantage that the accuracy can be as close as we please. With electrically-propelled vehicles we can specify horse-power without the slightest question being raised as to "nominal" or "actual" horse-power. With steam and petrol motors we have to consider whether the power is that indicated or is that actually available, but this knotty point is now further complicated by the introduction of the obsolete term nominal. Why?

THE ADVANTAGES OF MOTO-VEHICLES FOR MUNICIPAL SERVICES.

After the very emphatic opinion expressed by the Post Office authorities in the Postmaster-General's Report, which we publish elsewhere, viz., that "so far as the experiments went they showed that moto-cars were likely to prove in the near future a mode of conveyance for letter and parcels mails which would be attended with advantage both as regards speed and economy," we may well congratulate all concerned in this very satisfactory result. Automobilists need not now waste their time in convincing, or rather in trying to, the "many-headed." It will be sufficient to refer doubters to the Post Office Report for 1898. The era of experiment is now passed, and carriers, tradesmen, and others have the best possible assurance that moto-vehicles can be produced which may be employed with advantage "both as regards speed and economy." For municipal purposes moto-vehicles are eminently suitable, and their use will be attended with a most pronounced saving in the rates. When, however, it is proposed to employ moto-vehicles there will, of course, be the inevitable garrulous county or town councillor or vestryman—men almost invariably of small intellectual capacity and knowledge—who, with a natural desire to protect their own or their friends' vested interests, will give utterance to that venerable but very stale aphorism to the effect that "moto-cars are in their infancy." This absurd expression of opinion is too often regarded as indicative of profound and cautious wisdom. We would like to ask—How is it that the London County Council does not employ moto-vehicles? Perhaps some of our readers will explain.

SPECIFICATIONS OF TRAM RAILS.

In establishing a municipal system of traction, whether by horses, steam, or electro-motors, a large proportion of the cost is absorbed by the permanent way, and this cost is needlessly enhanced by the absence of anything like standard rail specifications, owing to which each municipal engineer does that which is right in his own eyes, and, of course, in specifying for rails a splendid opportunity presents itself of airing one's metallurgical knowledge—or, generally, want of knowledge. On the Continent light railways or tram lines are cheap because the rails are made in scores of mills all over the country to standard specifications, and hence are cheap. Moreover, the proprietors of the lines are saved the enormous inspecting and testing fees. An interesting instance of British methods is afforded by the municipalities of Glasgow and Halifax. Both municipalities want tram rail. Glasgow specifies for a steel of the following composition:—

Carbon, 0·55 to 0·65 per cent.
Manganese, 0·80 to 1·00 per cent.
Phosphorus, 0·06 per cent. (not to exceed).
Sulphur, 0·05 per cent. (not to exceed).
Silicon, 0·15 to 0·20 per cent.

The weight of these rails is to be 98 lbs. per yard.

Halifax specifies for a steel containing:—

Carbon, 0·28 to 0·40 per cent.
Silicon, 0·06 per cent. (not more than).
Phosphorus, 0·07 to 0·08 per cent. (not more than).
Sulphur, 0·06 per cent. (nor more than).

The chemical compositions of, and hence the physical qualities of, these rails differ widely. In both cases the rails have to perform the same work and under practically the same climatic conditions. A steel-maker tendering for the supply would have to quote at a high figure because he would have to make a series of chemical and physical tests in each case to arrive at the proper mixtures.

Now, both these specifications differing so widely cannot possibly be right. If 1 per cent. of manganese is necessary for the rails of Glasgow, and if its absence, or its presence in a lesser quantity, will cause a parcel of rails to be rejected, it is fair to assume that the ratepayers of Halifax will suffer damage because their rails will languish for the lack of the sustaining and necessary manganese. Similarly Halifax is not greedy in the matter of carbon; it likes a soft, well-wearing metal, and so is content with a modest quarter to one-half of 1 per cent. Glasgow, on the other hand, likes a hard rail, and so insists upon more than one-half of 1 per cent. of carbon, and, just to season the mixture, requires a dash of sulphur thrown in. As to the specifications themselves we express no opinion. Assuming, however, that the one represents scientific engineering practice, then the other does not, and *vice versâ*, and this means that one or the other Corporation will be paying a needlessly enhanced price for its rails. It would be interesting to know which specification is the most in conformity with the science of the thing, and which, therefore, is calculated to produce the most economical rail. Ratepayers should in their own interest try and find out the reason for this extraordinary divergence. After all, why not have standard rail specifications?

THE POSTMASTER-GENERAL'S REPORT.

The Annual Report of the Post Office has just been issued. The following is a *précis* of the more salient features:—

Tho letters delivered during the year numbered 2,012,300,000, the postcards 360,400,000, the book packets 727,300,000, and the parcels 67,823,000.

The growth of the letter post has been double that of last year.

Twice as many postcards were used as 10 years ago.

Newspapers formed the only department of Post Office literature which showed a falling off.

During two years the express delivery service has doubled.

There were 720,172 undelivered letters.

The number of letters posted without address was 38,860.

Four hundred and thirty new post offices and 1,231 new pillar and wall letter-boxes have been added.

The total number of offices open on March 31st last was 21,197, and the number of pillar and wall boxes 30,303.

The postal orders issued numbered 71,380,975, representing £26,014,583.

The number of deposits and withdrawals in 1897 was larger than in any previous year, but the total amount deposited fell somewhat short of the total for 1896.

During the year 83,029,999 telegrams were sent.

Tho staff of the Post Office has increased from 144,700 to 150,110 persons.

Referring to the experiments undertaken by the Department with moto-vehicles, the Report says:—

An oil moto-car, the property of the British Motor Syndicate, was engaged for a week in October for the conveyance of letter mails between the General Post Office and the South-Western District Office, and again a fortnight later for the conveyance of parcel mails for a week between the South-Western District Office and Kingston-on-Thames. Tho arrangement with the contractors for the London van and cart services admitted of the temporary transfer of this work, because the contracts, while fixing the rates for the several kinds of vehicles employed, leave the Postmaster-General free to diminish or increase the quantity of work at his pleasure.

For the oil moto-car a nominal charge was made of £1 6*s*. a week, said to be the out-of-pocket expenses of the Syndicate, whereas for the service which the moto-car displaced in the first week about £6 would, under the contracts, have been paid; and for the service to Kingston, which it displaced in the second week of trial, there would have been paid the sum of £5 7*s*. The moto-car performed the work in each case with great regularity and in somewhat less time than the horse conveyance ordinarily employed. The experiment was not pursued, as the car was not specially constructed for mail work, and the British Motor Syndicate preferred waiting before making further experiments, until they were in possession of a more suitable car.

The next experiment was with a steam moto-car, the property of Messrs. Julius Harvey. The number of parcels for despatch by the London and Brighton Parcel Coach had for some time been considerably in excess of the load which the coach could carry, and the steam moto-car was engaged between London and Redhill for six weeks, from December 16th, for the conveyance of the overflow. The price charged was £7 a week, as compared with an amount ranging from £11 8*s*. to £14, the estimated cost of a pair-horse van of like capacity. After the expiration of the six weeks the car was taken off and overhauled, and it again worked for a second term of three or more weeks on the same road and at the same rate of payment. An accident occurred on one occasion through a tube giving out, but, as a rule, the journey between London and Redhill of 24¼ miles out, 23¼ return, was performed in from 10 to 20 minutes within the time allowed for a horse conveyance.

An electric moto-car, the property of the Electrical Vehicle Syndicate, was also employed by four weeks on town work. One or two accidents occurred which led to delays, such as the slipping of a rubber tyre and the displacement of a screw, but in other respects the work was satisfactorily performed. The charge per week was £3 10*s*. as compared with £6 19*s*. 3*d*., which would have been paid under the London contracts.

So far as the experiments went, they showed that moto-cars were likely to prove in the near future a mode of conveyance for letter and parcels mails which would be attended with advantage both as regards speed and economy.

Arrangements have since been made for extended trials in London, on the Redhill route, in the neighbourhood of Reading, and also in Scotland and Ireland. It is confidently hoped that they will show that motors can be permanently used with advantage to the Mail Service.

LES POIDS LOURDS.—2nd CONCOURS.

The second competition organised by the French Automobile Club is fixed for October 6th to 12th next, and will be held at Versailles over the same routes as last year. The following are the entries at the time of writing:—

No. 1. Delivery van, by Panhard and Levassor (petrol).
„ 2. Omnibus, Roser (petrol).
„ 3. Delivery van, Middé (electric).
„ 4. „ „ Compagnie des Electromobiles (electric).
„ 5. Omnibus, 20 seats, De Dion et Bouton (steam).
„ 6. Char-à-banc, 24 seats, De Dion et Bouton (steam).
„ 7. Van, De Dion et Bouton (steam).
„ 8. Towing carriage, De Dion et Bouton (steam).
„ 9. Van, Valentin Pursey (petrol).
„ 10. „ De Dietrich (petrol.
„ 11. Delivery van, De Dietrich (petrol).

It is noteworthy that so far only one firm of steam moto-vehicles is competing—MM. De Dion et Bouton; neither MM. Scotte, Le Blant, nor Weidknecht are, we understand, likely to enter any vehicles. Indeed the general opinion seems to be that after the Paris trials of last year and the Liverpool trials in the early part of this, together with the recent Paris cab trials, sufficient information has been obtained to enable a pretty correct judgment to be formed as to the advantages and possibilities of the various systems of automobilism. Nevertheless, the forthcoming trials will add considerably to our knowledge of the recent developments in petrol motors. The trials will be conducted by M. Forestier, who will have with him a large staff of observers.

Automobilism and Sanitation.—The Sanitary Institute will hold their Annual Congress at Mason's University College, Birmingham, from September 27th to October 1st inclusive. During the session Mr. E. Shrapnell Smith will read a paper entitled "Somo Sanitary and Allied Advantages attending the Introduction and Use of Moto-Vehicles." From the practical knowledge which Mr. Shrapnell Smith has of this subject it should prove a valuable and interesting part of the Institute's programme, and we hope that the members will show their appreciation of the importance of the automotor industry by passing unanimously a resolution, which we understand will be moved by Mr. Shrapnell Smith, to the effect that the Sanitary Institute "is of opinion that the introduction and use of moto-vehicles should be encouraged by municipal, urban, and other authorities, in view of the fact that such departure will contribute to the general improvement of the sanitary conditions of our thoroughfares, and will effect economies under several heads of public expenditure."

Fig. 1.—Toward Tractor and Lorry.

Fig. 2.—Toward Tractor (Back View).

THE TOWARD STEAM MOTO-TRACTOR.

In the last issue of The Automotor we briefly described the steam tractor that Messrs. Toward and Philipson have designed and built for hauling omnibuses, lorries, &c., in Newcastle. We are now enabled to give an official description, together with illustrations, of this vehicle. Fig. 1 shows the tractor hauling an ordinary lorry. It will be observed that the fore-wheels of the latter are removed, the fore part of the body being carried on the rear end of the tractor, which is fitted with a turntable with an adjustable screwed spindle. In the view given this feature is not very apparent, owing to the view being obscured by a person standing in the foreground. By this means the major portion of the load on the lorry can be transferred to the rear part of the tractor, and this increases the load on the rear-wheels (the drivers) of the latter, and consequently the adhesion. It will be readily seen that almost any vehicle can thus be attached. This is an advantage peculiar to the tractor, and one which merits greater attention than has yet been given to it, as it affords a convenient means of getting the fullest benefit from the Locomotives on Highways Act. On a weight of 1 ton a very strong, simple two-wheeled lorry could be built that could safely carry 5 tons, and if all the weight allowed by the Act—viz., 3 tons—is put into the tractor, a much more substantial vehicle can be produced. Generally the practice is to construct the moto-vehicle to carry passengers or goods in addition to its own propelling power; this means that a large percentage of the available weight is utilised in providing carrying capacity, and hence the motor and boiler have to be of light scantlings. The tractor system, of course, means in effect an articulated six-wheeled vehicle, and, as the Liverpool trials showed, such a vehicle is difficult to manœuvre up a back street. This, however, is a matter of but small moment, and we understand that Messrs. Toward have not experienced any difficulty in regard to it.

A general idea of Messrs. Toward's tractor will be gained from Fig. 1, while Figs. 2, 3, and 4 are views of the boiler and motors as seen from the foot-plate, &c.

The frame is of L steel made as wide behind as the driving wheels will permit and reduced in width at fore part to clear the steering wheels and support the boiler. This frame is suspended on four laminated springs; the rear ones, being attached to the axle boxes in the centre, are allowed to work free at the ends, being thickened to work on hardened wearing plates; the front ones are attached

FIG. 4.—TOWARD TRACTOR.

FIG. 3.—TOWARD TRACTOR.

in the usual way to the frame and axle; the latter is pivoted at each wheel, thus dispensing with fore-carriage and turntable. The floor-plate is extended over the sides of the frame and forms the front wheel cases; the front portion is cased all round excepting two openings, one on either side of the driver's seat. From the frame, which is well braced, depend the side frames, locomotive fashion, with horn-plates, for the boxes of the axle and adjustable bearings for the crank and intermediate shafts.

The employment of horn-plates has been persistently advocated in The Automotor for these moto-vehicles, as in no other way can the severe longitudinal stresses, set up when passing over a rough road, be satisfactorily provided for.

One of the features of this tractor is that the road wheels are built entirely of steel upon a cast-steel hub; with more than usual care, each spoke is fitted accurately into its recess, the other ends have T-heads and are riveted between two angle-rings by machine, the tyre is then shrunk on to the angle-rings and riveted to them; outer wearing pieces or tyres are then riveted on with double countersinks so that they cannot come loose. This method has so far been most satisfactory in practice.

The motor consists of a pair of vertical inverted compound engines, 4″ + 8″ × 6″; these are placed over the main shaft just in front of the boiler, as seen in Fig. 2, the steam pipe from the high-pressure exhaust to the low-pressure valve chest acting as a receiver. The low-pressure engine can, however, be worked at high pressure, if required, by means of a bye-pass. These engines can develop on occasion 25 I.H.P. at 400 revs. per minute. They are fitted with long connecting rods and ample wearing surfaces, and are designed to run for long periods with the least attention. The first motion shaft gears with an intermediate shaft which has two speed gears and the usual differential gear; on each end of it are two sprocket wheels which transmit the power to the road drivers by chain, the pitch of the links being 6 inches. The engines are geared to the driving wheels at six to one and three to one for the two speeds of four and eight miles an hour respectively. The tractor is fitted with two powerful independent brakes, one a pedal hand brake, and the other a screw brake acting on the driving wheels; with either the tractor can be brought to a stand with a full load on any hill. The controlling levers and drain cocks are all arranged very conveniently for the driver. Lamps are fitted at each side showing red lights behind; an alarm whistle is also fitted. The steering is done by worm and wheel gear.

Steam is supplied by a rectangular water-tube boiler, shown in Figs. 5, 6, and 7, the tubes being horizontal and connecting at each end with waterspans; the objectionable feature of flat surfaces under pressure is obviated by fitting heavy screwed stays, as shown in Figs. 6 and 7. As will be seen, the heating surface and grate area are very large in comparison with the total volume, and we understand, as we should surmise, that the boiler will give more steam than the engine can use. We have always in The Automotor urged the importance of providing large heating surface and ample steam-raising capacity, and no doubt much of Messrs. Toward's success is due to attention to these important points.

The space around the boiler is utilised as feed tanks and bunkers. Water sufficient for a run of 20 miles can be carried in the former, while the quantity of fuel (coke) that can be carried suffices for a run of 60 miles. The average speed attained when hauling a wagonette filled with passengers is about seven miles per hour. So far as their experience goes Messrs. Toward are fully satisfied with their system, and have several orders in hand for their tractors. Their system seems to be very suitable for a hilly country such as Northumberland.

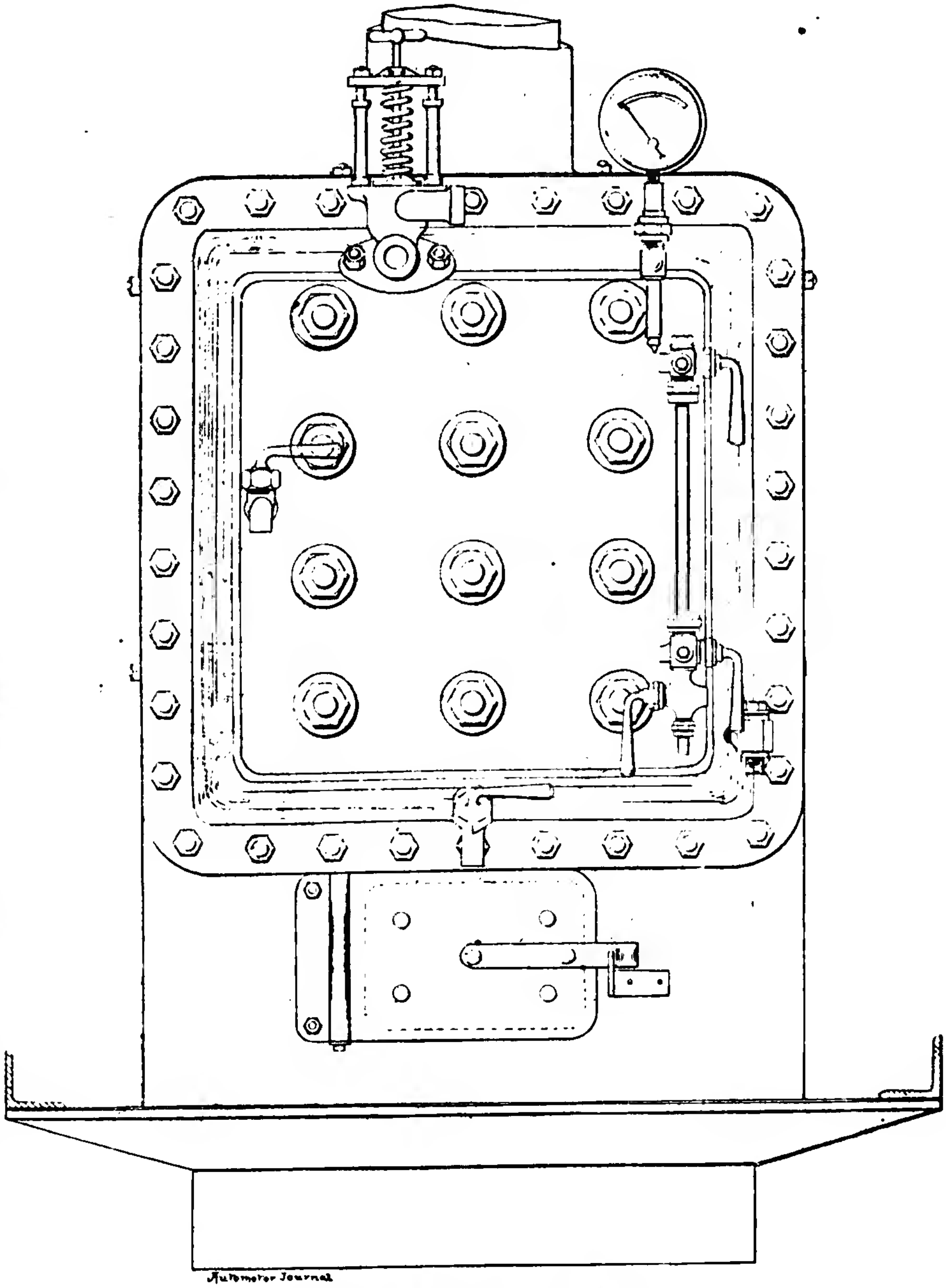


Fig. 5.—Toward Boiler (Elevation).

The most recent vehicle built by Messrs. Toward is one to the order of Messrs. Noble and Thompson, Morpeth. It is for use in

FIG. 7.—TOWARD BOILER (Longitudinal Elevation).

carrying coals and general cartage work in Morpeth and the neighbourhood. The vehicle was delivered on Saturday, the 3rd inst. The motor is a compound steam-engine, which carries coke and water sufficient for a journey of 15 miles. It has two speeds—one five miles per hour, and the other 2¾ miles. The cart or wagon is built of the usual hard wood, and has holding capacity for 3½ tons of coal. It is tipped up by a toothed rack and emptied by its door being made to swing. To the wagon there are fitted two powerful strap brakes on the driving wheels, and on the motor are friction brakes. It has also a steam whistle for alarm, and the regulation lamps. It left Pilgrim Street, Newcastle, with a 3-ton load of rubbish on the date mentioned, at two o'clock. It was driven by Mr. Meek, of Messrs. Toward, who had with him a stoker. In No. 1 motor wagonette there accompanied it Messrs. T. and W. Toward and Mr. William Philipson. Good time was kept and the distance done without a hitch. South of Stannington Mr. Noble met them, and he was so satisfied with the way the car went down the steep bank at Stannington Vale and up the opposite one, that he decided not to put it to the test of doing the Station and Stobhill Banks at Morpeth, as agreed upon. It was accordingly driven straight to the Quarry Bank east of Morpeth, which is the longest and steepest in the neighbourhood. Both the ascent and descent were accomplished in a most satisfactory manner. The load was emptied at the foot of the bank, and the car and cart driven into Morpeth, where they were stabled in Mr. Stafford's timber yard, Well Way. All concerned regarded the trial as eminently satisfactory.

REVIEWS OF BOOKS.

"La Voiture de Demain." Histoire de l'Automobilisme. Avec 250 figs. Par John Grand Carteret. (Paris: Libraire Charpentier et Pasquelle, 11, Rue de Grenelle, 1898). Prix, 5 francs.

In his preface the author points out that most of the works on automobilism are too dry, because too scientific, for general reading, or else the subject is handled in a vulgar manner interesting only to enthusiastic amateurs. Our cycling Press is a good instance of this. To the trained engineer the matter is, as a rule, so much uninstructed and ignorant babble. To the ordinary educated reader it is intensely dreary, but to the unscientific amateur it is of the most profoundly absorbing interest. One can find in a score of engineering textbooks the science of locomotion, whether on cycles or moto-vehicles, fully expounded, so can one find a score of journals on which the same subject is treated as a pastime or sport, but there is even yet plenty of room for a work in which cycling is treated in the same way as our author treats automobilism; that is, a work which shall be "historical, philosophical, anecdotal, and at times a little technical"—in a word, a work which interests the general reader. In the present volume this principle has been followed with considerable success, and there can be no question but that the matter is distinctly interesting. The history of automobilism, like that of most modern developments, can be pleasantly and profitably studied by a reference to the caricatures to which it gives occasion, and when automobiles first began to excite the Parisians it was only to be expected that such a promising subject of satire would be fully taken advantage of. Throughout the book we find abundance of caricatures, not only French but English, and not only relating to modern but to early automobilism. The more serious aspect of historical automobilism is well done, and the author has evidently been at great pains to obtain the earliest drawings relating to the art of locomotion. Many of these reproductions are of extreme historical value and very suggestive: thus we have a reproduction of a sculpture, dated 1760, showing an automobile gun and carriage. The gun is apparently loaded at the breech, and as the means of obtaining the motive power are not shown we are led to ask, Was Mr. Maxim anticipated? The earliest caricature is an English one, and is dated 1819: it is entitled "Going to the races," and shows an apparently military man and his lady being driven by five footmen mounted on hobby horses.

The work is divided into 10 chapters. The first is philosophical, and is intended to demonstrate the logical necessity of mechanical locomotion. The second chapter is historical. Here the author displays considerable learning, research, and, let us add, impartiality. He traces the germ of automobilism to the Egyptians, and do we know for certain that Hiero did not apply reactive steam-engines to the propulsion of vehicles and boats? Our author also sees the germ of the idea in the works of Salomon de Caus, Kercher, Dobozinski, Schoot, Worcester, and Papin. He gives an extract of a letter written by Roger Bacon in 1618, in which is clearly foreseen the possibility of locomotion without the aid of animals. We also learn that Jean Hautzch, of Nuremberg, in 1649 saw the possibility of "heat as a mode of motion," just 200 years before the great Tyndall published his classical work. Hautzch actually had a machine running in the streets of his native city. In this period mechanically-propelled vehicles were regarded as either miraculous vehicles or else as inventions of the devil. Newton's steam carriage is described. The engine of this vehicle, by the way, is clearly what a modern patent lawyer would term a colourable imitation of Hiero's motor of 2,030 years ago. Coming down to the eighteenth century, we have short but interesting accounts of the works of Robison, Darwin, Boulton, and others, not omitting the justly celebrated Cugnot (1770), whose vehicle is still in existence, and one of whose descendants is a well-known French journalist and automobilist. Watt, Read, Symington, and Trevethick are also mentioned, and their troubles. At the end of this (the eighteenth) century automobilism was occupying the attention of many persons both in England and France, as our author truly remarks. It was a period fertile in inventions and projects; there were two really practicable steam vehicles—that of Cugnot in France, and that of Trevethick in England. Both these distinguished inventors were, in the modern jargon, "born before their time," and both died broken-hearted.

Automobilism as a popular means of locomotion may be said to date from the early part of the present century, and as most of the practical efforts and experiments were chiefly made in England, our author devotes a chapter to describing them. Much of the information given is new and of considerable historical value. It has been dug out of all kinds of literary storehouses. The author would appear to have spent much time in ransacking the public libraries both in France and England. Many of the illustrations of these early vehicles are of extreme interest. In this chapter the efforts, successes, and the trials of Church, Gurney, Hancock, Squire, and Sir Charles Dance are well told. We need not dwell upon this part of the work as it is not flattering to our vanity, either as a practical or civilised people. We are, thanks to the School Boards, gradually breaking down the walls of prejudice, and a modern automobilist can through the Press be sure of at least a fair consideration of his cause. Chapter IV is an account of the progress of automobilism in France up to 1870. Chapter V describes the progress of automobilism in both countries up to 1870, as depicted in the comic journals. We have here a series entitled the "March of Intellect," containing many allusions to automobilism. Thus the "Grand Vacuum Tube Company" takes passengers from Greenwich to Bengal. A cartoon, by Alken, is reproduced, showing Regent's Park in 1831. All the vehicles are self-propelled. Another by the same artist gives a view of the Whitechapel Road, showing the steam coach, "The Infernal Defiance," racing with "The Dreadful Vengeance." The French caricatures are equally indicative of public opinion. Chapter VI deals with the period of 1870–1898, and in it all, or nearly all, the modern types of moto-vehicle are illustrated and described from the historical point of view. Most of the illustrations have, however, appeared in the pages of The Automotor. Chapter VII is an attempt to forecast the form that moto-vehicles of the future will take. Here our author allows his imagination to run away with him, and we hardly think that vehicles will ever assume the grotesque forms he gives them. Some of the designs are very artistic and appropriate; such, for instance, is the design for a moto-vehicle for the "Cordonnerie du Chat Nois," on p. 239. Another elegant but *genre* design is that of M. Gaslon-Charles, on p. 247, while an automobile for a newspaper has a duck in front—hardly the most complimentary, but decidedly a very allegorical allusion. Chapter VIII deals with contemporary caricature, and a very amusing one it is.

Considerations of space forbid us to mention the many good things it contains, and the same reason prevents us from dealing with the remaining chapters. In conclusion we can say honestly we know no better work on automobilism. It is exceedingly well written and entirely impartial. No attempt has been made to exalt any one nation or individual. The merits of all are fully acknowledged, and at the same time proper judgment has been observed. We have read the work with great pleasure, and can cordially recommend it to all who would know the history and social influence of automobilism.

"The Mechanical Engineer's Handy Office Companion." By Robert Edwards, C.E. (London: Crosby Lockwood and Son, 1898.) Price 3*s.* 6*d.*

This is doubtless the germ of what will develop into a much larger volume. Mechanical engineering is such a large subject that it is quite impossible to condense matter relating to it within the space afforded by some 60 pages. At the same time, for the workshop and office elaborate sets of tables to the seventh place of decimals are not so much required as plain formulæ and rules that will give results sufficiently accurate for all practical purposes. Mr. Edwards has probably had this idea in view, as the "Office Companion" clearly indicates that it is the work of one who has felt the need of having the means at hand of making calculations rapidly and accurately without the loss of time occasioned by turning over many pages. Thus in the general tables is one of numbers 1 to 100, each number advancing by quarters. Each number represents inches (of course, it may represent other units). Its decimal equivalent in feet and millimetres is given; as the diameter of a circle, the area in feet and in inches of the latter is given, and also the circumference. The weights and measures are all arranged with metrical columns; long measure, for example, has kilometres, metres, and millimetres. A useful electrical table of equivalent kilo-volts, horse-power, volt-ampères, foot-pound minutes and seconds is also given. The rules and tables given for the strength or proportions of machinery are all arranged with suitable factors of safety, &c., from the actual practice of the present day. Formulæ are not stated in algebraical language, but in plain English; this is an advantage which will doubtless be appreciated. A useful rule for the power required to propel moto-vehicles is given; this rule is a modification of the one usually employed, but expressed in terms of brake horse-power per ton. There is much useful information in the book, plainly and clearly expressed. It is just the kind of work for a mechanic to refer to, but the price seems high, especially as compared with similar publications.

La Revue de Méchanique.—The August number contains several articles of great use to the advanced engineering student. That by Professor Dwelshauvers-Dery upon the "Compression of Steam in the Clearance Spaces of an Engine" is, it is needless to say as coming from this distinguished authority, a critical study of the highest order and importance. It is divided into six chapters and contains an exhaustive analysis and discussion of the effect of steam compression under various conditions. M. Rateau continues his investigation of the "Theory and Application of Turbines," and in the present number he discusses, among others, the Pelton wheel, of which he gives the complete theory. M. C. Roche continues his description of various types of French warship machinery, the machinery now described being that of the "Amiral Trehouart," "Jemapes," and "Valmy." There is also an excellent description of various systems of "Grain Elevators," by M. G. Richard, and much other interesting matter. The number is, as usual, well illustrated.

Cassier's Magazine.—The September number is mainly devoted to mining and naval matters. As regards the former there is a copious article on "Diamond Mining in South Africa," by Mr. T. H. Leggett, and one on "The Cyanide Process," by Dr. Joseph Richards. Captain Zalinski describes the use of "Torpedo Guns Afloat and Ashore," with special reference to the part the "Vesuvius" took in the bombardment of Santiago. We doubt whether the author's views on the value of this weapon will find general acceptance. "Speed as an Element of Warship Design," by Mr. M. McFarland, U.S.N., is a not very logical demonstration of an accepted principle. "The Protection of British Commerce in War Time," by Lord Charles Beresford, is an inconclusive thing in the nature of a pot-boiler in that officer's well-known style. As a contribution to naval science it is utterly valueless. It is followed by an excellent and instructive article on "Projectiles for Modern Naval Ordnance," by Professor P. Alger, U.S.N. Needless to say a projectile making its way through a nickel steel armour plate is a most unquestioned automotor, whose speed even the most conscientious policeman would have some difficulty in measuring. An interesting and amusing account of the latest big American swindle is given. This it seems took the form of a scheme for extracting gold from sea water. It appears that the "inventor" and manager built a small shed at the end of a wharf projecting into the sea. Through a hole in the floor there was lowered, by means of a windlass, a large box containing a pan of mercury. An electric battery, supplied by the "inventor," was applied during a whole night in the presence of some capitalists from Middletown, Conn., who had brought with them the mercury. The next morning the mercury was lifted from the water and given to a chemist, who assayed it, and found in it 4.50 dollars of gold, and thereupon the capitalists, much pleased, paid the first instalment on their investment. The deception in the experiment, according to the detective, consisted in a diver's proceeding under water during the night to the box, pouring out the mercury, and substituting for it another lot of mercury containing gold. Upon this basis was floated the 10,000,000 dollar company. Its success in obtaining gold at North Lubec was attested by its sending frequently to the New York Assay Office "gold bricks" containing each about 2,000 dollars of gold, and the exhibition of similar bricks at the Company's office in Boston. Now comes the news that the whole thing has collapsed, and that the "inventor" of the process and manager of the Company—the Electrolytic Marine Salts Company, of North Lubec, Me.—has absconded after having received the snug sum of 338,000 dollars, or about £67,600, of the "profits," which were derived not from sea water, but from the stockholders. According to a recent news paragraph he sailed for Europe under an assumed name after having converted about 100,000 dollars cash into Government bonds in New York City. The "gold from sea water" scheme thus appears to have been one of the most gigantic swindles of recent years. It was similar in many respects to the Electric Sugar Refining swindle in New York City in 1884, by which many prominent business men, including even sugar refiners, were victimised.

The Engineering Magazine for September is more than usually good. Vice-Admiral Colomb contributes an able article on "The Essential Elements of Modern Sea Power." The late Spanish-American War continues to be the subject of investigation at the hands of various writers. This time it is Mr. Hiram S. Maxim, the well-known automobilist, who thinks that the lesson taught by the war is that mechanical supremacy is the vital factor in naval success—a conclusion that we share with him. It is the man who can use the machine that wins. The Spanish, as Mr. Maxim shows, had the tools and machines, but, like the Chinese, they allowed them to get out of repair, and besides were without the mechanical instinct. The consequences in both cases were obvious. A very interesting article is that by Mr. Greslar Lindenthal, on "European and American Bridge Construction." "The Comparative Cost of Steam and Water Power" is discussed by Mr. W. Webber. The article which we think will be most widely appreciated is that on the "Underground Railways of London." Few people have any accurate idea of the cost of the Metropolitan and District Railway. Some of the more recently-built portions, such as the Mansion House and Aldgate section has cost £372,000 per mile. We are told that the capacity of the lines is about 15,000 persons per hour; a complete circuit of the line is made in 70 minutes, and the average speed is 14 miles per hour. The account of the tubular railways is no less interesting. Mr. J. Sinclair Fairfax discourses learnedly on some comparative points of international patent law. Nowadays nearly everyone has occasion to have some connection with the "inventor," usually a plausible, generally clever, but invariably a more or less impecunious individual, and once one touches "patents" it is difficult to say what the result will be; it may be fortunate, but the possibility is that it will not, and when one attempts to patent an invention abroad the process is tedious and expensive, and the would-be patentee has little guarantee that his patent is after all valid. Mr. Fairfax gives inventors some very useful information, and his advice should be the means of saving them a good many pounds. Just now petroleum is one of the subjects occupying the attention of the public, and every information as to its production is of value. Mr. D. A. Louis describes the Baku petroleum district of Russia in a most graphic manner. His article abounds in information and is well worth reading. Electric traction by means of alternating currents is the second contribution to this important matter by Messrs. Chas. Davis and H. C. Forbes. Tramway and railway engineers will peruse it with advantage.

The Automotor and Horseless Vehicle Pocket-Book, &c., for 1898, contains over 200 pages of information. Price 1*s.*; post free, 1*s.* 2*d.*; leather, 1*s.* 8*d.*, of F. King & Co., 62, St. Martin's Lane, London, W.C. See it for reprint of the "Locomotives on Highways Act, 1896."

THE DUPLEX MOTOR.

This is a spirit or light-oil motor working on the Beau de Rochas cycle, but the peculiarity in the design is that it is double-acting, there being an impulse on the piston in each revolution. For the impetus given by the first, will sensibly lessen the rhythm of the vibration caused by explosions taking place at intervals of one-tenth of a second, and acting always in like manner in the ordinary motors such as Daimler's or others, even with two cylinders.

In establishing a symmetrical type of this motor, it remains only to place the other parts and a cylinder, so that they bolt together sideways to obtain a motor with two cylinders, and by making the

Fig. 1.

Fig. 2.

following description we are indebted to our contemporary, *La France Automobile*:—

This motor, although it has only one cylinder, affords greater means for lessening unpleasant vibrations than other motors, by reason of the two explosions taking place in one revolution and in a contrary direction, so that the second explosion coming (at 600 turns per minute) at one-twentieth of a second reacting against the shaft with cranks set at 180°, an explosion will be produced at each stroke of the pistons with the parts perfectly balanced, and consequently there will be no vibration.

Description (*see* Figs. 1 and 2).—The motor is composed of a cylinder, 1, in which the piston, 2, works; the piston rod, 3, is attached to the crosshead, 4, which through the connecting rod, 5, communicates the movement to the cranked shaft, 6. Upon this shaft, 6, is keyed a helical gear, 9, engaging with another, 10; this last, having twice as many teeth as the former, causes the main shaft to turn, 11, one revolution to two against the crank shaft. The admission of the explosive charge is effected by the pipe, 20, and the automatic valve, 21.

The carburated air passes through pipe, 24, to valve, 25, open for this purpose, and fills the space, M, at the back of the piston during its forward motion. The valve, 25, remains open until the piston has completed half of its backward motion, also the valve, 26, so that half of the explosive mixture returning again through pipe, 24, passes from the M side of the cylinder to the other side, N. At this half of the stroke the two valves close; the half volume in M is compressed there, then fixed by the electric spark of the igniter, M, and the resulting explosion starts the piston; this during its forward motion compresses the other half volume in N, where it is then fixed by the spark of the igniter, N, and makes the second explosion, sending back the piston; the valve, 27, allows the first burnt particles to escape, then the same operation is done the other side by the valve, 28. In 19 and 29 are the commutators distributing alternately the currents to the igniters (M and N).

As will be seen, all the motion rods, crank, &c., are closed in, but are easily accessible for examination, &c.

The above motor is 145 mm. × 120 mm. stroke = (5·708″ × 4·724″). It has a fly-wheel weighing 110 lbs., and runs at 600 revs. per minute; it gives off 6 H.P., and weighs 400 lbs.

THE CROCKER-WHEELER SLOW-SPEED MOTOR.

THE 2 H.P. slow-speed motor runs at 100 revs., and has eight poles and eight brushes. The brush-spindles are connected to two rings, the positive brushes to one and the negative to the other. These rings are rigidly connected, but insulated from one another. The rings are placed next to the armature, leaving the commutator clear and easy of access. There is a characteristic of slow-speed motors which in certain cases gives them an important advantage over others. Their moment of inertia is low and permits starting from rest in a minimum of time with a minimum of current. In the case of the above 2 H.P. 100 revs. armature, the product of the moment of inertia by half the square of the angular velocity is 280 foot-pounds, while in the case of the 2 H.P. 1,000 revs. motor it is 900 foot-pounds. Where the duty the motors have to perform requires quick and frequent starting and stopping this difference is very noticeable, and plays an important part in the economy of the plant. The regulation, however, is much less perfect with slow-speed motors. A 5 H.P. motor at 950 revs. will slow down 4 per cent. when full load is put on, but a 4 H.P. motor at 200 revs. will slow down 15 per cent. under the same conditions. In shunt motors the field is controlled by a rheostat or is wound in multiple sections, whose circuits are opened successively. Series motors have their speed controlled by short-circuiting various portions of the field. Compound motors have a constantly excited shunt and a series field in two sections, or they have an unvaried series-coil with a shunt-coil whose strength is changed by a field regulator. All these motors are designed to be capable of an increase of 50 per cent. above normal, and a decrease of 10 per cent. below normal speed. Two kinds of controllers are used; the cylinder reverses giving as many speeds backwards as forwards, operating through a resistance, regulating the speed by cutting down the voltage supplied by the line, and a commuter, specially designed for use with a compound motor. The commuter varies the speed by changing the connections of the various field-coils.—*Electrical Engineer*, New York.

DÜRR'S PETROLEUM BURNER.

IN this method of burning petroleum, invented by Herr Dürr, the well-known engineer of Bremen, there are two burners and one vaporising chamber—one burner being used to heat the latter and so vaporise the oil, while the other acts as the burner proper, *i.e.*, it performs the function for which the apparatus is intended. These burners are placed the latter above the former with the vaporising chamber between them. The construction is shown in the following drawings in which Fig. 1 is a longitudinal section and Fig. 2 a cross section:—

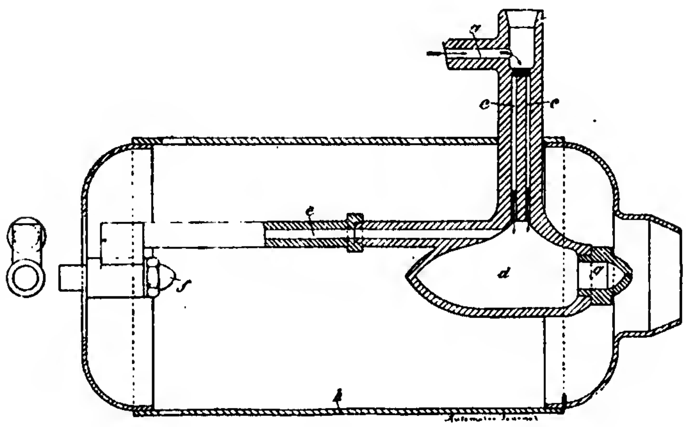


FIG. 1.

The vaporiser body, in which the petroleum gas or vapour is produced, consists of a hollow body, *d*, which is made in one piece of suitable cast iron; the vaporiser, *d*, is provided with a tubular piece, by means of which it is connected with the pipe, *a*, for

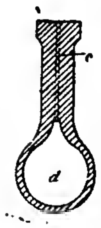


FIG. 2.

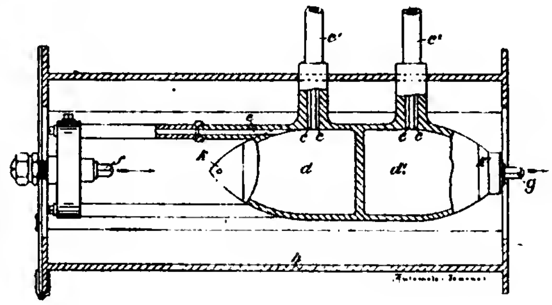


FIG. 3.

supplying the petroleum which enters the vaporiser from the supply pipe, *a*, through fine perforations, *c*, in the tubular piece; for regulating the supply of oil there is inserted into the upper part of the tubular piece a valve, *b*. This valve is accessible from above; for cleaning it is easily removed and a cleaning device is then forced through the perforations, *c*. In the upper point of the vaporiser the

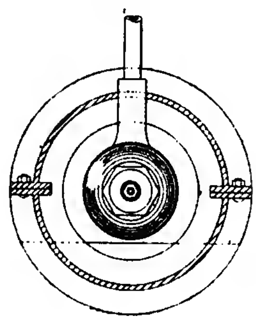


FIG. 4.

illuminating or heating burner, *g*, is inserted; from the lower side of the vaporiser a tubular piece, *e*, leads to the heating burner, *f*, which is mounted at the bottom or inner end of the casing, *h*, where it is capable of being easily examined.

The petroleum enters, in a regulated but sufficient quantity, slowly into the vaporising space. For putting the apparatus into action the vaporiser is first heated by a burning wad of cotton-waste or the like placed around the same. Petroleum vapour passes through the pipe, *e*, to the heating burner, and ignites in front thereof, and the heating flame thus produced spreads over the vaporising body, heating the latter, so that the petroleum is transformed into superheated gas or vapour. This complete gasification or vaporisation has also the result that deposits are not formed in the vaporising space.

The vaporiser, *d*, may be of any suitable shape, but in order to utilise the heating flame as much as possible it is, however, advisable to give it such a shape that the heating will spread over it on all sides; for this reason the ellipsoidal form shown is preferred. The form of the front burner, *g*, depends on whether it is to be used for heating or for illuminating. After this burner has been screwed out the vaporising space can be easily examined.

Figs. 3 and 4 show a second construction of the vapour burner in longitudinal section and in front elevation respectively. In order to prevent the vaporiser from cooling quickly, should the working be interrupted, it is divided, so that the two burners, *f* and *g*, have separate vaporising chambers, *d* and d^1 respectively, each of which is provided with a separate petroleum supply-pipe, c^1 or c^2. The feeding and arrangement of these supply-pipes correspond to those of the construction shown in Fig. 1.

When the petroleum supply of the pipe, c^2, for the illuminating or heating burner, *g*, is shut off, the lower half of the vaporiser and its appurtenances continue to work, so that the heating burner is fed with gas or vapour as before, and it heats the vaporiser so perfectly that, when the petroleum supply to the vaporising chamber, d^1, is reopened, the illuminating burner, *g*, enters at once in action. In this construction the vaporiser is provided at each end with a removable closure-head, *k* or k^1.

Dorey's Carburettor.—A successful form of carburettor is that known as Dorey's, for which many practical advantages are claimed. This carburettor was shown in action at the recent Automobile Exhibition in Paris, where it attracted considerable attention. As will be seen by the accompanying illustration, it consists essentially of a reservoir, B, into which the oil flows through the inlet, A, as the float, C, descends. This float, C, has a small point at the top, which regulates the flow of the oil in proportion as the oil is drawn towards the motor by suction; the feed of the oil is thus regulated automatically by the speed of the motor. When the motor is in work it draws the oil through the channel, E, up to F, and here meets with a strong current of air drawn in through the orifice, G, likewise by the suction of the motor. The oil is broken up by the rush of air, and is in this state sent through the fans, H, which run at a high speed. These turbines complete the admixture of air and oil, and a perfect gas is sent to the motor. The working is very simple, and the advantages of this carburettor are that the motor can be set to work at once, and there is marked economy in the quantity of oil used, and no smell, as every drop of the oil is turned into gas.

Gear Chains.—We have always urged that the various chains for cycles and moto-vehicles introduced during the last few years possessed no mechanical advantages over the plain plate link while being much more expensive. A chain much boomed when it came out was the Simpson Lever Chain. Cyclists swore by it, as they do by every novelty which is based upon the inversion of some mechanical principle. We were consulted about the application of this chain to certain moto-vehicles, and after due examination we reported that there was no mechanical advantage in fitting it. The Company has lately been wound up; the proprietors having found that the chain was useless as an invention, and so ceased to make it.

OBITUARY.

DR. JOHN HOPKINSON, F.R.S.

THE tragically sudden and simultaneous deaths of this distinguished engineer and three members of his family (two daughters and a son) have produced a profound shock in engineering and scientific circles. Dr. Hopkinson and his family were taking their holiday in Switzerland. Being expert mountaineers, he, together with his son and two daughters, attempted on the 27th ult. to climb a peak in the Alps known as the Petite Dent de Vesivi. All the party were tied together by a rope, as is customary. Unfortunately, they slipped and fell over a steep cliff, at the foot of which their dead bodies were discovered the next morning.

Dr. John Hopkinson was a man of very rare talent and ability. He came of a well-known and successful—both commercially and intellectually—Manchester family, and was thus enabled to pursue the natural bent of his mind under the most fortunate auspices, and with none of those hindrances to success that most people experience. He was born in 1849, and at 22 years of age was a Senior Wrangler and Smith Prizeman. He was also an M.A., Whitworth Scholar, and D.Sc. In 1872 he became consulting engineer to the well-known firm of Messrs. Chance Brothers, of Birmingham, and was chiefly engaged in lighthouse work. In this branch of engineering he effected many improvements, and invented the now widely-used system of "group flashing." Many of the most powerful lights on our own and foreign coasts were designed by him. His great work, however, was the giving to the world the complete theory of dynamo design. Of course, dynamos were used long before this, but their construction was entirely a matter of rule of thumb and empiricism. Dr. Hopkinson showed how for any stated output every part in a dynamo is a matter of calculation. The result of his researches was that the practice of dynamo and electromotor design was entirely revolutionised, and the perfection and high efficiency of these machines as now made are due entirely to him. The credit for the introduction of electricity for lighting and traction purposes, especially by municipal bodies, must also be accorded to him, and his success in this direction, as in other fields of engineering, was the conscientious application of the principle that physical research and calculation should always precede practical application. This is the rock upon which not a few engineers split. So-called "practical experience" is too often relied upon rather than scientific research, with disastrous results.

Dr. Hopkinson's career was a striking instance of the supreme importance and great value of a sound mathematical training to an engineer. Had he commenced his career by going as a pupil to an engineer in practice, or had he gone through the "shops" in the orthodox way, he would have remained a comparatively unknown man. As it was, he became a Senior Wrangler before he became a pupil, and hence as a young man could tackle the most abstruse engineering problems with a facility and certainty that older engineers would have shrunk from or would have solved by a trial and error process. Dr. Hopkinson was in every way an example to be copied. By his death we lose not only one of the few really distinguished engineers of the day, but also a perfect gentleman, using that word in its truest sense.

THE EARL OF WINCHILSEA.

THE Earl of Winchilsea died on the 7th inst. at Haverholme Priory, near Sleaford, in the presence of his family, after a long illness.

His lordship, who is succeeded by the Hon. Henry Stormont Finch-Hatton, was born in 1851. Lord Winchilsea in 1892 established the National Agricultural Union, with the object of uniting agriculturists and to induce them to co-operate in all matters of mutual interest. In season and out of season his lordship preached co-operation as applied to agriculturists, and in his newspaper, the *Cable*, he wrote article after article driving home the same truth. In politics he was a Conservative, and represented South Lincolnshire from 1884 to 1887. His estates included about 12,900 acres.

In recent days the Earl of Winchilsea came more prominently before the public eye by reason of his association with Mr. Harry J. Lawson and Mr. Hooley.

DOINGS OF PUBLIC COMPANIES.

Mr. H. F. Pollock, M.P., has been appointed chairman of the European Petroleum Company, from the Board of which Lord Clanmorris and Lord Granby lately resigned.

London General Omnibus Company.

The ordinary general meeting of the London General Omnibus Company (Limited) was held on the 18th ult. at the offices, 6, Finsbury Square, Mr. John Pound presiding. The Chairman, in moving the adoption of the report, said the receipts during the past half year were £553,223 and the expenses £512,195, the profit on working being £41,028, as against £59,717 in the corresponding six months of the Jubilee year. They had run 90 more omnibuses and 1,000,000 additional miles, and carried 6,250,000 more passengers, but the receipts showed an increase of only £13,785, or a decrease of 2*s.* 9¾*d.* per omnibus per day, making a difference in the half year of nearly £20,000, and more than accounting for the variation in profits. With regard to the expenses, although they had been increased by £32,474, they were proportionately rather less than those of last year. The price of provender had been rather adverse, but this excess had been neutralised by economies in other directions. The horse stock had been well maintained, and the average life had exceeded that of the corresponding period of the previous year. As to steam omnibuses (even supposing a company were in the position to put them on the road), the directors considered that they could not compete successfully with omnibuses drawn by horses. The Board proposed to carry £10,000 to the reserve, making it £175,000, and to declare a dividend at the rate of 8 per cent. per annum and a bonus of £1 5*s.* per cent. (equal to 10¼ per cent.). The motion having been seconded, the resolution was agreed to. Mr. Horton moved a resolution authorising the directors in future to abstain from putting in the report the price paid by them for provender. He considered that it militated against them, and was not in the best interests of the Company. Mr. Costello seconded the proposition. A shareholder opposed the motion, and objected to the directors being invested with this further power. After a little disorderly discussion, and the Chairman having expressed the opinion that the suggestion was in the interests of the shareholders, the resolution was put and carried by a small majority.

New Companies Registered.

[Under this heading we give a full list of new Companies registered which take power to make, deal, or become interested in any manner in automotor vehicles.]

Compound Hydro-carbon Motor Syndicate (Limited).—Registered by Budd and Co., 24, Austinfriars, E.C. Capital £12,000, in £1 shares. Object, to enter into an agreement with John Holroyd, Edmund Wiseman, and C. T. Wordsworth, for the acquisition of the business carried on by them at Luton, Bedfordshire, and to manufacture, sell, and deal in oil, gas, steam, and electric motors, moto-cars, and cycles of all kinds. The first directors are J. Holroyd, E. Wiseman, and J. Tearle.

Farley Cartman Company (Limited).—Capital £20,000, in £1 shares. Objects, to enter into an agreement with Cecil O. Webb, and to manufacture, repair, and deal in machinery, engines, boilers, electric plant, electric light, electricity for traction, motive, and other purposes, automotor cars, carriages, vans, vehicles, &c. Registered by B. Webb, 16, St. Helen's Place, E.C.

Jackson and Harrison (Limited).—Capital £3,000, in £5 shares. Objects, to acquire the business carried on by George H. Jackson and William C. Harrison, at 132, Woodhouse Lane, 120, North Street, and "Bon Marche," New Briggate, all in the city of Leeds, and to carry on the business of cabinet makers, decorators, cycle and moto-car manufacturers, electrical and general engineers, &c. The first directors are Henry R. Webster (Chairman), Benjamin Mountain, Richard R. France, George H. Jackson, and William C. Harrison.

Liverpool and District Cycle Trades Association (Limited).—Registered by T. T. Hall, 22, Chancery Lane. Capital £1,000, in £1 shares. Object, to promote and protect the interests of cycle, motor, and carriage manufacturers; to hold and subsidise in Liverpool or elsewhere shows for the exhibition of cycles, &c.

Liverpool Cycle and Motor Show (Limited).—Registered by Halse, Trustram, and Co., 61, Cheapside, E.C. Capital £1,000, in £1 shares. Object, to carry on business in the manner suggested by the title. The first directors are J. C. Robinson, R. MacLennan, C. Coops, C. Hughes, N. Maclumpha, and H. Robinson.

Martini Ozone Company (Limited).—Capital £10,000, in £1 shares. Objects, to acquire the patent rights in any inventions for improving vacuum dielectrics, electrodes, and apparatus for the production of and utilisation of ozone, to enter into an agreement with Dan Martini, and to carry on the business of electrical and mechanical engineers, cycle and moto-car manufacturers, &c. The first directors are Dan Martini and John Dunham-Massey. Registered office, 8, Princes Street, E.C.

Motor and Cycle Trades Club (Limited).—Registered by Jordan and Sons (Limited), 120, Chancery Lane, W.C. Capital £1,000, in £5 shares. Object sufficiently indicated by the title. President, Charles Showell, Esq. The property and control of the Club is vested in a general committee. Registered office, 26, Corporation Street, Birmingham.

Motor Touring Company (Limited).—Registered by A. H. Atkins (Limited), Bouverie Street, E.C. Capital £5,000, in £1 shares. Object, to adopt a certain agreement, and to carry on business as motor car, coach, and cab proprietors, carriers of passengers and goods, motor car and coach builders, &c.

Recreation Motor Cars (Limited).—Registered by T. Scott, Devonshire Chambers, Bishopsgate Street Without. Capital £10,000, in £1 shares. Objects, to enter into an agreement with Henry Johnson, and to manufacture, sell, let out on hire, export, import, and deal in moto-cars of every description. The first directors are: Wm. M. Gow, Arthur Eliot, and Henry Johnson.

Société Internationale de Construction d'Automobiles (Limited).—Registered by G. St. G. D. Massey, 8, Princes Street, London. Capital £50,000, in 5,000 £1 shares and 11,250 £4 shares. Object, to acquire either solely or jointly with other persons or companies, in France and elsewhere, patents, licenses, and other rights and privileges concerning the manufacture, the sale, the exportation, and the importation of motors, motor-carriages, tricycles, and all other accessories relating to the industry of mechanical and electrical engineers, metal founders, wheelwrights, blacksmiths, carriage builders, wood turners, upholsterers, and lamp manufacturers; with a view to the above object, to adopt and carry out, with or without modifications, an agreement dated July 11th, and expressed to be made between Messrs. Tauzon et Cie. of the one part and M. P. E. Moyse, as trustee for and on behalf of this Company, of the other part; and, further, to act as mechanical and electrical engineers, motor manufacturers, carriage builders, painters, &c.; as manufacturers of motors, motor-carriages, bicycles, carriage builders, &c.

White's Carriage Company (Limited).—Registered by Thomas T. Hall, 22, Chancery Lane. Capital £50,000, in £1 shares. Object, to acquire upon the terms of an agreement made between W. White, jun., as vendor, of the one part and this Company of the other part the business of dealers in and importers and exporters of cabs, carriages, cars, and other vehicles, and of horses and other animals, and of motor-cars, motors, and other machinery. The first directors are R. B. Crowe and W. White, jun.

ACCIDENTS AVOIDABLE BY USING MOTO-CARS.

A two-horse brake on the 11th inst. was proceeding down a steep hill at Hawkwell, near Southend, when the horses bolted and the vehicle overturned. Nine of the 11 occupants were injured.

Mrs. Harroby, of West Kensington, on the 12th inst. was being driven to Victoria in a cab, when the horse shied at a bicycle, causing the vehicle to swerve and overturn. Mrs. Harroby was seriously injured and the cabman sustained a fractured arm.

JOY'S VALVE GEAR FOR STEAM MOTO-VEHICLES.

It is well known that the steam-engines used in launches and moto-vehicles are exceedingly extravagant in their steam consumption. In such motors the consumption will be anything from 25 to 30 lbs. of steam per horse-power hour; this not only means that a larger supply of feed-water has to be carried, but also that the fuel consumption in the boiler is unduly great. In these small motors it is usual to have a late cut-off so as to get a high mean pressure, and therefore high engine power, as compared with the size of the cylinder. In these small motors the steam distribution is most usually effected by means of Stephenson's well known eccentric and link-motion gear. This was originally introduced by the celebrated engineer of that name, and was by him applied to locomotives, for which purpose it was at that time eminently well suited. Those were the days when it mattered little how much coal and water were consumed. This gear is still largely used on railways, especially on those roads known as being not too progressive, the reason for its retention being mainly that its fitting and adjustment is well understood by the ordinary journeyman engineer. For this reason it is, as is the old-fashioned Scotch return tube-boiler, almost exclusively employed on vessels of the mercantile marine.

In this gear the motion of the valve is synchronous throughout its stroke, that is, the valve passes over equal spaces in equal times; this means that the ports on the cylinder face are gradually opened and as gradually closed, thus producing wire-drawing on the admission side accompanied by a loss of pressure and undue cushioning on the exhaust side. In both cases power is lost which by the adoption of suitable valve gear might be saved.

Considering how necessary it is to keep down weights in steam moto-vehicles it is somewhat surprising that so far the British constructors of these machines still cling tenaciously to an obsolete and most extravagant form of valve gear, necessitating as it does the carriage of larger fuel and feed tanks (thereby lessening the useful dead weight carrying capacity of the vehicle).

French and German constructors have for the most part abandoned the Stephenson valve gear. Thus Weidknecht uses the Solms (a modified Hackworth gear), and Le Blant the Walschaert gear.

In moto-vehicles in which steam is the propelling agent the importance of a proper steam distribution can hardly be overestimated, as, owing to the inferior evaporative powers of the boiler and the transmission gearing, the absolute efficiency of the machine is extremely low.

In an ordinary steam cylinder, in order to effect a proper steam distribution, the valve motion should be such that directly the crank has passed its dead centre the admission port in the valve opens to steam, and remains *full* open during the period of admission. The port should then close suddenly and remain closed during expansion; it should then suddenly open, and remain full open during the period of exhaust, closing again and suddenly opening during admission. To effect this it is necessary that the valve should in its travel be alternately accelerated and retarded. This constitutes the great defect of the Stevenson gear. Since his time many engineers have endeavoured to accomplish the movement indicated. Corliss practically succeeded in so doing, but his gear is altogether inapplicable to the class of motor we are considering. Hackworth and Marshall in England, Bremme and Walschaert on the Continent, have introduced gears which meet the condition laid down more or less completely. The gear, however, which gives the best steam distribution, and at the same time is simple and inexpensive, is that known as the Joy valve gear.

This gear has been before the engineering public for the last 20 years, and it has been applied with the greatest success to all classes of steam-motors—especially to locomotives warship and launch engines. It is thus by no means a novel or untried invention. We introduce it to the readers of The Automotor, as from our knowledge of its working we think it will solve in a very satisfactory manner one of the most important problems in moto-vehicle design. The principle of the gear is shown in Fig. 1, which represents the connecting and valve rods of a horizontal engine, the former being at the end of its stroke, and the latter, *G*, being practically at rest, but just about to make a sudden movement to the left which constitutes the admission period of the ordinary steam cycle. To the connecting rod at a point, *A*, about one-third or so from the piston-

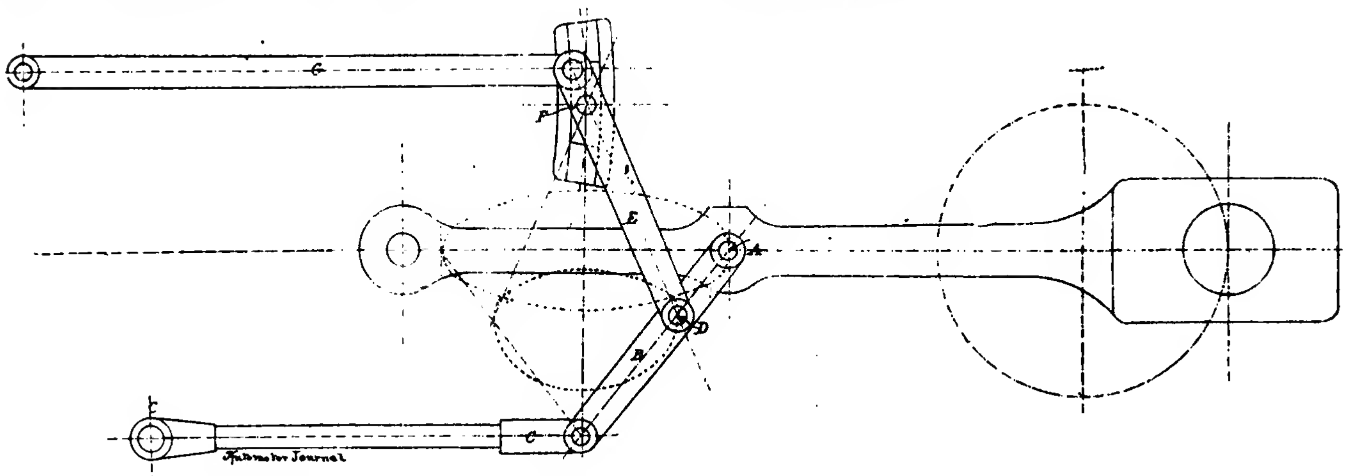


Fig. 1.—Position of Links at End of Stroke.

rod end, is attached one end of the link, *B*; the other end being attached to the end of a simple vibrating link, *C*, the end of which, *C'*, swings on a fixed pin. As every engineering student is aware, the point path described by *A* is an ellipse, hence the path described by a point in the link, *B*, will be the resultant of the elliptical path due to *A*, and the circular arc described by *C*; the result is that the point, *D*, describes a peculiar flattened oval as shown (in dotted line). At *D* is attached the swinging lever link, *E*, which is fulcrumed to a pin, *F*, this pin is held in a slipper which moves in the curved slotted path, *J*, of radius equal to the slide valve connecting rod, *G*, the end of this rod being joined to the link, *E*. The point, *D*, of the link, *E*, during a complete revolution of the crank describes as stated, the flattened oval as shown the other end of *E*, viz., that connected to *G* describes as the fulcrum slides up and down the curved slot, *J*, a vertical ellipse; the proportions of the links are so chosen that the lesser diameter of this ellipse is equal to twice (lap + lead). As shown, the curved slot is in a position at right angles to the axis of the cylinder, this gives the mid-gear position. If now the curved slot, which is also fulcrumed at *F*, be inclined the ellipse described, the end of rod, *G*, where it joins link *E* will be inclined; hence by inclining this slot in either direction, direct and reverse motion is obtained. With this gear the "lap" and "lead" are constant, but the admission is regulated by the position of the curved slot. A little reflection will render it evident that if the lever, *E*, were pinned direct to the connecting rod at the point, *A*, it would vibrate its fulcrum, *F*, unequally on either side of the centre of the curved slide, *J*, by the amount of the versed sine of the arc of the lever, *E*, from *FD*; it is to correct this error that the lever, *E*, is pinned at the point, *D*, to a parallel motion formed by the parts *B* and *C*. The point, *D*, performing a figure as seen equal to an ellipse, with the error to be eliminated added, so neutralising its effect on the motion of the fulcrum, *F*.

The point, *F*, represents the centre of oscillation for the links and the centre or fulcrum of the lever. And these must coincide, when the piston is at each end of the stroke, the lead being fixed, the links can be pulled over from forward to backward, or any point of expansion, without altering the lead. This may be taken as a test of the gear being set out correctly.

Thus the "lap" and "lead" are opened by the action of the valve-lever acting as a lever, and the port opening or admission is given by the incline of the curved slot in which the centre of that lever slides, and, as before said, the amount of this opening depends upon the inclination of the curved slot. It follows that when these two motions synchronise the travel of the valve is very rapid, and this occurs at admission. Then follows the period in which these two motions are out of phase, or opposed to each other; when this occurs the valve travel is checked and the steam port is then fully open. The next acceleration produces the sharp cut-off, which is such a desirable feature in any steam-engine.

Fig. 2.—End Elevation of Vertical Engines.

Fig. 3.—Side Elevation of Same.

The "compression" resulting with this gear is also reduced to a minimum, owing to the peculiar movement given to the valves (*i.e.*, the series of accelerations and retardations referred to), as while the "lead" is obtained later and quicker, the port is also shut for "compression" later and quicker, doing away with the necessity for a special expansion valve, with its complicated and expensive machinery, and allowing the main valve to be used for expansion, as the "compression" is not of an injurious amount, even with a "cut-off" reduced to 15 per cent., or about one-sixth of the stroke.

So much for the question of steam distribution. As regards the practical fitting of this gear, this is shown in Figs. 2 and 3, which represent a set of vertical three-stage marine engines. The same method of fitting would be followed in engines, whether simple or compound, intended for moto-vehicles. It will be observed that in this gear no eccentrics are employed, and the fitting is altogether much more simple. Both space and weight are saved to a very considerable extent; the latter is, it is needless to say, a point of no mean importance in moto-vehicles, where we are so sadly limited as to weight. G. H. L.

JOURNALISTS ON AUTOMOBILISM.

In the pre Board School days the Press was all powerful. Cabinet Ministers consulted editors, and a "leader" in an influential morning paper was regarded by the common people as a kind of Delphia oracle. In most cases the men who wrote these leaders were but of little better education than those who read them, and such writers would now be deemed but very indifferently educated people. With the general spread of education the power of the Press has declined, because on the ordinary or common newspapers the writers are rarely better educated or better informed than their readers. Hence the growing number of "specialist" newspapers and journals. If anything is calculated to depreciate a newspaper as a property it is the utterance of opinions on matters which the writers have absolutely no knowledge of whatever. The following is an amusing instance of that good all round knowledge of nothing in particular that is characteristic of so many scribes. A person lately wrote to the *Weekly Sun* asking for advice on moto-vehicles. Our contemporary sagely replied:—

"It would be wiser, on the whole, to defer your purchase of a moto-car for the present. We do not know the company you have been in communication with, and have nothing to say against their vehicles, but, unless you are prepared to face the cost of what at best is a doubtful experiment, you had bettor stick to the local job-master yet awhile. If the matter is pressing, get the car on six months' trial, by which time you will be in a position to judge of its suitability to your requirements. If the makers will not grant such reasonable terms, it ought to be sufficient evidence that their confidence in the machine is not particularly strong. It is quite certain the business is not so flourishing that the company can afford to be too independent, if they wish to give you complete satisfaction as well as to get your money."

"Get the car on six months' trial" is distinctly good; "by which time," &c., is, however, better. As a specimen either of drivelling journalism or of unconscious humour, the above "advice" would be hard to beat.

We then have a garrulous scribe writing in the *Referee* an interesting but wearisome account of his holidays. This person has been to Westgate-on-Sea, where there are, it appears, certain moto-vehicles. Says he: "And so ended my holidays, except so far as a visit to Westgate-on-Sea, where the repose of the invalid settlement is murdered by moto-cars, run for and on account of alien speculators. The moto-car, as it is developed for hire, is a cause of danger to most other wayfarers."

It is hopeless to repeat for the benefit of such writers that in Paris, where there are so many moto-vehicles, the silence with which these vehicles proceed is one of the chief causes of complaint against them. Of course, a spirit-motor and its gear when worn are unquestionably noisy, but much less so than a cab. The London police on night duty in residential districts will detect the approach of a hansom half a mile away by the sledge-hammer blows given by the horse on the asphalt. This noise, from a police point of view, is advantageous; but a moto-vehicle is practically noiseless, and it is this quality which tends to make policemen suspicious of moto-vehicles. A little knowledge is, we all know, a dangerous thing, but such knowledge of moto-vehicles as the scribes referred to above possess is worse than dangerous—it is stupid.

HORSE AND MOTO-VEHICLE ACCIDENTS.

Another "Frightful" Accident to a Moto-Vehicle.—"About three o'clock yesterday afternoon," says the *Morning* of the 20th ult., "an exciting scene was witnessed in the neighbourhood of Fleet Street. An electric moto-cab on turning into Whitefriars Street out of Fleet Street could not be stopped, probably on account of the incline. The cab swayed from right to left, and eventually dashed into a coal van standing outside one of the printing establishments. Two newspaper sellers standing near the van had a narrow escape. Fortunately no one was injured, but the cab was damaged."

[The "dashing" may be judged from the fact that beyond a few bruises on the paint the moto-cab showed no sign of damage.—Ed.]

A Singular Accident.—Accidents accompanied by personal injuries or even loss of life or damage to property, occasioned by horses taking fright, are so common that they hardly get recorded in the ordinary Press. The following singular accident was surely worth a line in the local Press, which usually has to fill up its columns with stale sermons and flabby poems, but hardly any papers noticed it. At Morpeth a Mr. Geo. Bainbridge was driving with two friends in a dog-cart to the station, when another dog-cart came dashing down the hill from an opposite direction. The vehicles collided, the shaft of the runaway cart piercing the breast of Mr. Bainbridge's horse. All the occupants of the vehicles were thrown out, and the colliding vehicle was capsized; in turning over it fell upon a passing cyclist. The damage was very great, and the injuries sustained very serious. It appeared that the horse in the colliding vehicle had been frightened by passing two other horses, which in their turn had bolted with their vehicles. And yet there are many people who, with stupid bigotry, would do all they can to prevent the use of vehicles which would be quite free from this kind of accident.

SELF-PROPELLED TRAFFIC ASSOCIATION

(INCORPORATED).

LIVERPOOL AND DISTRICT CENTRE.

Liverpool Heavy Trials.

In reply to many inquiries we have pleasure in stating that we are informed officially that the Judges' Report for these trials will be presented at the opening meeting of the Third Session of the Self-Propelled Traffic Association (Liverpool Centre), to be held in November next.

THE AUTOMOBILE CLUB OF GREAT BRITAIN AND IRELAND

(With which is incorporated the Self-Propelled Traffic Association).

At a recent meeting of the Club Committee it was decided to form a "Foreign Relations Committee," chiefly for the purpose of arranging reciprocal relations with the Continental Automobile Clubs. Amongst the members invited to sit on this Committee (which has power to add to its numbers) are:—Mr. Roger Wallace, Q.C., Mr. Frederick R. Simms, Mr. Andrew Barr, Mr. Worby Beaumont, Mr. Frank Butler, Capt. the Hon. Cecil Duncombe, Mr. Boverton Redwood, Sir David Salomons, Bart., Mr. Alexander Siemens, Mr. Paris Singer, Rt. Hon. Lord Suffield, K.C.B., Rt. Hon. Viscount Templetown, and the Secretary (*ex-officio*).

The Secretary of the Automobile Club asks us to state that the account of the Club run to Mr. Butler's house-boat on July 23rd should have stated that Mr. Alfred Ledger, with Mrs. and Miss Ledger, were present, having driven in Mr. Ledger's car from Blackheath to Shiplake, a distance of 55 miles.

LAW REPORTS.

Bankruptcy Court.

Mr. Frederick Henry Pollexfen, 13, King William Street, E.C., has been appointed liquidator of the Salocin Patent Carriage Wheel Company (Limited), 64, Finsbury Circus Buildings, E.C.

Cycle and Motor Accessories (Limited).—Under a winding-up order recently made against this Company the statutory meetings of creditors and contributories were held, on the 3rd inst., at the offices of the Board of Trade, Lincoln's Inn Fields. Mr. A. S. Cully, Assistant Official Receiver, presided. The Chairman reported that, according to the articles of association, which were of a very wide nature, the Company was formed to acquire inventions generally, and especially to take over and develop a patent electric cycle lamp. With the exception of Mr. Richards, all the directors paid cash for the shares they acquired, but it appeared that Mr. Richards received 600 shares as nominee of the vendor "in consideration of services to be rendered to the Company." It was understood that he was to introduce or "influence" a certain amount of capital, but this had not been done, and it would be a question for the liquidator to ascertain what liability was upon Mr. Richards in respect of those 600 vendor's shares. It appeared that the Company was promoted by Mr. J. E. Preston and Mr. C. Simkin, each of whom had a half interest in the invention. The purchase price to be paid by the Company was £7,000 in cash and fully-paid shares of the Company. He (the Chairman) did not know upon what basis the patent was valued, but it had not been developed, and it had been admitted that the price was fixed to allow a bonus of shares to be given to intending subscribers. The Chairman added that the Company had only a small amount of debts, and its only tangible asset was the uncalled capital. There was the patent of the cycle lamp, but he understood that a patent agent had a lien on it for his fees, and there was also the question of Mr. Richards's liability upon the 600 shares. No prospectus had been issued to the public, and the money which had been subscribed by the directors had been absorbed in general expenses, payment of the managing director's salary, and the fees of the other directors. The proceedings resulted in resolutions being passed at hoth meetings appointing Mr. Hollis, chartered accountant, liquidator of the Company, with the aid of a committee of inspection.

Leather-Shod Wheel Company.—The case of Howard *v.* the Leather-Shod Wheel Company (Limited) and others came before Mr. Jnstice Phillimore in the Vacation Court on the 7th inst., on a motion for the appointment of a receiver and manager. Mr. Chitty said this was a debenture-holder's action, the plaintiff holding 60 out of 200 debentures of £100 each. He understood that the Company did not appear. Mr. Jnstice Phillimore: This is a case where there has heen a petition presented for winding up the Company. Mr. Chitty: Yes. The debentures are due. There is a trust deed covering the debentures, and I understand I can appear for the trustees. The Company has practically oeased to carry on its business, and the danger is that the Company will deal with its property in such a manner as will materially injure the rights of the debenture-holders. Mr. Justice Phillimore appointed Mr. Arthur E. Howard, accountant, receiver and manager.

Police Court Proceedings.

An Injudioious Jehu.—On August 23rd at the City of London Summons Court, Francis Leadon, in the employment of Arthur Sanderson, of 52, Berners Street, Oxford Street, W., was summoned under the Light Locomotives on Highways Act for causing an obstruction with a moto-van. P.C. Sharplin, 613, said at 5.50 p.m. on the 16th ult. the defendant came to him by the Mansion House and said be had a motor down Walbrook, and he could not get out as a van was in the way. The witness went into Walbrook, a narrow thoroughfare, with room for one line of traffic only, and found the defendant had entered from the south and prevented four vans that had entered from the north end from going through. He told the defendant it was the rule to only enter Walbrook from the north end, so he must back out. After some talk he started working a pipe, remarking, "We have to do this for three minutes before we can start." (Laughter.) A crowd had oollected and the remark caused much laughter. The defendant then took hold of a screw and began moving that, stating, "We have to do this for two minutes." (Laughter.) The crowd was blocking up tbo way by that time, and the defendant next took hold of a handle and began working that, saying, "We have to do this for one minute." (Renewed laughter.) He tben backed slowly out to the Cannon Street end, and refused to go away. He took him to the station. Alderman Strong: Three, two, and one, that would be six minutes. Mr. Richards (the clerk): But did he stop all that time? Sharplin: It was ten minutes before he moved. The defendant said another constable directed him to go through Walbrook. He had no idea of only being supposed to enter by the north end. As to the delay there was no unnecessary stopping. It was a Daimler motor, and he had to pump the pressure into the tubes before he could back, which he did slowly, so as to avoid danger to the publio. A witness corroborated. Alderman Strong said it was quite clear that however the defendant came into Walbrook (and he might be reasonably excused for not knowing of any regulation about which end he should eutor), it was his duty to move out when requested to by the policeman as quickly as possible. He did not believe he did so, and imposed a fine of 10*s.* and costs, reminding him that the full penalty was £10.

Furious Driving.—At the Gainsborough Petty Sessions on the 16th ult., Johu Heinle, pork butcher, Gainsborougb, was summoned for three offences against "the General Order of tbe Local Government Board prescribing regulations as to light locomotives." Tbe offences were against Articles IV, Sections 1, 7, and 8 respectively. The charges, briefly stated, were that he drove a moto-vehicle at a speed greater than was reasonable and proper, so as to endanger the life and limb of one James Hawkins; tbat he did not, at the roquest of Hawkins, a person having charge of a restive horse, cause the said light locomotive to stop and to remain stationary; and that he did not, hy sounding a bell or other instrument, give audible and sufficient warning of the approach of the said locomotive. According to the evidence, Hawkins was a coachman in the employ of Mr. Edward Pearson, J.P., C.C., Morton House, and on June 3rd he was taking a pony trap along Morton Terrace to fetch Mr. Pearson from the office. Near the Elm Cottage there is a dangerous double corner, a sort of Z-shaped hend. On nearing the Elm Cottage, the pony showed signs of terror, when, withont any notice, the defendant's moto-vehicle appeared round the corner, coming at a high speed, stated to be about 10 miles an hour, towards the pony trap. The pony shied on to the footpath, threw itself down, and the driver, Hawkins, was pitched out of the trap. Evidence was given at considerable length on both sides. The Bench deoided that there must be a conviction, hoth for driving the vehicle too quickly, and also for failing to give audible notice of its approach. The chairman explained the magistrates' views at great length, and said the fact of an accident having occurred showed to his mind that proper precautions had not been taken. This being the first case under the Local Government Board Order, the fine imposed would be very small. For fast driving the fine was 10*s.*, 16*s.* 9*d.* costs, and £1 10*s.* solicitor's fee; for not audibly sounding the bell the fine was also 10*s.*, the costs being 12*s.* 3*d.* The total amount was £3 10*s.*

Furious Driving.—At the West London Police Court, on 29th ult., George Deadman was summoned for driving a moto-vehicle furiously, on August 16tb, in Lillie Road, Fulbam. Police constable 485 T said he put up his hand for the defendant to stop, but he went on round the corner and collided with the kerb on the wrong side. The constable described the speed at the rate of 10 miles an hour. The defendant told the magistrate he was only on the tbird speed, which was at the rate of eight miles an hour. He also said the fourth speed was 12 miles, which was the highest it could go. The constable: He said he could go round any corner at eight miles an hour. It was a dangerous corner. The defendant: I cleared the kerb and everything. Mr. Lane, Q.C., inflicted a penalty of 8*s.*, with 2*s.* costs.

The Determination of Speed.—At the Newbury Petty Sessions, on the 9th inst., the Earl of Carnarvon appeared in answer to two adjourned summonses, one of which alleged tbat on August 29th his lordship drove his moto-vehicle on tbe highway at a greater speed than 12 miles per hour, and the other that he did not stop the machine on the signal of Mr. William Walton, who was in charge of a restive horse. Mr. Walton, who is a barrister, residing at Donnington Holt, on the outskirts of the town, and was the complainant, conducted the case in support of the summonses. Mr. George Wallace, barrister, appeared for Lord Carnarvon. The hearing occupied nearly four hours, and the court was crowded, the attendance including several ladies. In support of the two charges, evidence was given by Mr. Walton, Colonel Cunliffe, and others. Mr. Walton stated that on the day in question he was riding on horseback in the Wash Road, when he saw a moto-car coming down the hill, making a great noise. He put up his haud to stop it, but no notice was takon of the signal, and the car travelled down the hill at an increased rate. He timed it by his watch after it had passed him, and subsequently found that it oovered 480 yards in 45 seconds, which was at the rate of 22 miles an hour. He was nearly unseated from his horse, which was much frightened by the noise of the motor. On inquiry, he found that the occupants of the car were Lord Carnarvon and a French engineer in his lordship's service. Colonel Cunliffe estimated that the car was proceeding at the rate of 12 or 15 miles an hour. Another witness estimated that the rate was 20 miles an hour. For the defence Mr. Wallace called Lord Carnarvon's engineer, who gave his evidence in French, which was interpreted by Mr. Crundon, a local resident. The witness said he saw nothing of Mr. Walton or his horse. The moto-car had three brakes, and it could be brought to a standstill in four or five yards. Mr. Anthony G. New, engineer, of Westminster and Woking, gave technical evidence describing the construction of the moto-car, which was of French make. It was worked by petroleum vapour, which was really gas. It was a four-gear machine, and if kept at 600 revs. a minute would be capable of running 12 or 14 miles an bour. It had a governor which prevented its goiug more tban 600 revs. a minute, but if the governor was taken off it would go much faster. The witness said it was extremely difficult to know at what rato a moto-car was going, because people were apt to confuso noise with pace. The faster such a machine travelled the less noise it made. Mr. Wallace, on Lord Carnarvon's behalf, denied that his lordship or his engineer saw any signal given by Mr. Walton. Had Lord Carnarvon seen the signal he would not have been so unneighbourly and ungentlemanly as to decline stopping the machine. The Justices retired to consider the case, and after a short deliberation the Chairman said that the magistrates considered that it had uot been satisfactorily proved that Mr. Walton's signal was seen either by Lord Carnarvon or his engineer, and therefore that summons would be dismissed. As regards the other summons, which alleged that Lord Carnarvon had driven his moto-car at a rate exceeding 12 miles an hour, they had decided to convict, and Lord Carnarvon must pay a penalty of £5 and costs.

Excessive Speed.—At the County Police Court, Birmingham, on the 3rd inst., Alfred Rollason, gentleman, of Winnick Warren, Nottingham, was summoned for driving a moto-vehicle furiously on the Barford Road, on the 12th ult. Police-sergeant Dawson said the car was driven at the rate of 20 or 25 miles an hour. William Canning, farmer, of Debden, said his pony, which was usually quiet when moto-cars were driven past it, was so frightened on this occasion that it backed the trap into a hedge and threw him out. Another witness named Thomas Page gave corroborative evidence. Defendant admitted that he had travelled nearly 30 miles in about an hour and a half. The Bench fined defendant £5 and £1 0s. 6d. costs.

Excessive Speed.—At Northampton, on the 7th inst., Joseph Grose, stated to be a well-known cycle and moto-car manufacturer of London and Northampton, was summoned for driving a moto-car through the streets of the town at a greater speed than was reasonable. The Chief Constable complained of the high speed at which moto cars were driven about the town. A constable named Goodfellow said he timed the car by his watch. It covered 400 yards in 55 seconds, and ran over a dog, which was nearly killed. The magistrates imposed a fine of 20s., including costs.

Excessive Speed.—At Loughborough Petty Sessions, on August 31st, the Rev. E. Foord-Kelcey, the Vicar of Quorn, was summoned for driving a light locomotive, otherwise a moto-car, at a greater speed than 12 miles an hour, the speed prescribed by the regulations of the Local Government Board, on August 20th. Mr. Kenneth McAlpin (Leicester) appeared for the defendant, and, pleading guilty, expressed regret. The machine had lately been purchased, and defendant was tempted to experiment with it, and he admitted that he was driving faster than the regulation speed. He promised that it should not occur again. A policeman said that on the afternoon in question he saw the defendant going into Mountsorrel down the Cemetery Hill on a moto-tricycle. He was going at 18 or 20 miles an hour, and there were a lot of people and traffic about, defendant dodging in and out like a swallow flying along. The Chairman said it seemed a serious affair, for it might easily have led to very serious consequences. One of the magistrates was nearly run into by this same machine. Mr. Kelcey ought to be more careful and more sensible. This was the first case of the kind, and they would only inflict the comparatively small fine of £2 and costs.

The Hampstead Roads.—Mr. Charles H. Lowe, M. Inst. C.E., F.S.I., surveyor to the Hampstead Vestry, says, in his annual report to that body :—"The condition of the roads in Hampstead is good. The standard of excellence, however, which the cyclist has set up has not been attained, and, with the wear and tear caused by the incessant heavy traffic over the main roads, it is hardly possible for it to be, and to make special provision for bicyclists is impracticable. What it might have been had the machine been known to our forefathers can only be surmised. Probably a carriage-way, two footways, and a cycle track would have formed the ordinary highway, repairable by the inhabitants at large. The nearest approach to the ideal, from the cyclist's point of view, is the wood paved carriageway, and, now that the experimental stage in the use of Jarrah and other similar hard woods has been passed, the only thing standing in the way of their more general adoption for paving purposes is the initial cost. The supply of the material is practically unlimited, and, with the cost reduced—and it is reasonable to expect that this will be effected by the competition in the trade—there is no reason why Jarrah should not be used in paving the more important streets, such as are now coated with the best quality broken granite." Referring to moto-vehicles, Mr. Lowe says:—"If ever the day does come which shall see the highways taken possession of by the horseless carriage, that same day will witness the difficulty of maintaining a smooth surface surmounted, for every wheel will have a rubber tyre, and the decrease in the number of horses pounding the roads with their hoofs will be so marked that the destroying agents in the roadway will be reduced to a minimum."

FOREIGN NOTES.

The first electro moto-cab commenced to ply for hire on the streets of Pau on the 9th inst. It is, we understand, a Krieger with Fulmen cells.

M. Scotte has been exhibiting his traction system in the provinces with great success, and much to the satisfaction of local mayors, farmers, and others.

The Mayor of Saint Ouen l'Aumone has issued a bye-law to the effect that moto-vehicles must not exceed a speed of five miles per hour while in his jurisdiction.

A Company has been formed by MM. Fauchère, Ochin, and Dangleterre, with a capital of £6,000, for the purpose of manufacturing the Express moto-vehicle.

The Annual National Exhibition of Work will be held in Paris on October 16th next, at the Palace of Sports, Rue de Berri. A large section will be devoted to moto-vehicles.

There have been a few rather serious accidents with petrol moto-vehicles lately. The vehicle belonging to M. Lucenski was completely burnt near Lisieux through the ignition of the petrol.

Moto-vehicle races promoted by newspaper proprietors are the "correct thing" in France. The latest is one promoted by *Les Sports*, and will take place between Paris and Saint Sebastian.

M. Etienne Giraud, a well-known *chauffeur*, had the misfortune at Mans to run down a child who unhappily was killed. Proceedings were instituted and the Court found extenuating circumstances, but condemned M. Giraud to pay 500 francs and costs.

An experimental electric haulage line is being laid down between Eberswalde and Ragos on the Finow Canal by Messrs. Siemens and Halske, of Berlin. The boats will be hauled by an electric locomotive running on a narrow gauge track on the canal bank.

It looks as though the Paris-St. Petersburg Race will, after all, be abandoned. According to a letter published in *La France Automobile* from a correspondent, it would seem that there are hardly any good roads in Russia. The letter is exceedingly candid on this and other matters. We should think that recent events, too, have rather cooled the enthusiasm of our French friends for "the brave Russians."

A 4 H.P. electro moto-vehicle—the first of its kind—has been introduced into Toronto, Canada, by the Robert Simpson Company. It inaugurates, according to the *Toronto Globe*, the twentieth century movement in that country. We do not know exactly what the twentieth century movement may be, but nevertheless we are glad to learn that, in the words of our contemporary, "it has struck Toronto."

The moto-vehicle, as we have had occasion to remark elsewhere, is not liked by the police, as it is a most effective agent in the hands of the fashionable thief or society fraud. At some of the French seaside resorts the practice is growing up of utilising the moto-vehicle as a means of obtaining access to the better hotels, and, after ransacking the rooms, to depart without paying the landlord for the accommodation. The *modus operandi* is for a couple of well-dressed men to drive up to an hotel in a swaggering style and order lunch or dinner; they propose to stay the night, and retire to wash, &c. After "going through" the rooms and picking up unconsidered trifles of loose cash and jewellery, they have their dinner and go for a drive. They do not return.

The Daimler Manufacturing Company, of America, has acquired all the real estate, personal property, plants, machinery, patent rights, and outstanding accounts of the Daimler Motor Company, Steinway, Long Island, and will continue the business with increased facilities. The officers of the Company are:—Frederick Kuebler, president; Horace Bacon, vice-president; Otto G. Nestle, treasurer and secretary; Adolph O. Krieger, assistant secretary and treasurer.

There is a lull in automobile activity just now in France. Races seem to pall, and with the check that has very properly been given to fast driving, many people have ceased to take much interest in the doings of automobilists. Even the automobile papers seem to find it difficult to say anything fresh. The petrol motor in its unending variants of the single type has been described, re-described, and examined from every possible point of view. It has been put into every conceivable kind of vehicle, from a bath chair to an omnibus, and now we know all about it and for our part do not think much of it. Our contemporaries seem gravelled for lack of matter. With us in The Automotor, we find it a matter of extreme difficulty to keep our numbers within those limits fixed by an unphilosophical and unsympathetic Post Office. We are, in fact, simply bursting with information that we are anxious to impart to our readers.

There is to be an exhibition of moto-vehicles and appliances at Boston, U.S.A., from October 10th next to December 3rd. It will be held, according to the *Horseless Age*, under the auspices of the Massachusetts Charitable Mechanics' Association, at their magnificent building on Huntington Avenue. The forthcoming exhibition will be the twentieth, and will no doubt be even more successful than previous enterprises of the Association's undertaking. More than 2,000 square feet of space have been set apart in the basement for the moto-carriages, and no charge has been made for space. Vehicles will be divided into three classes—steam, hydrocarbon, and electric. Free current will be given electric exhibitors to the extent of a 10 mile run each day, while steam and gasolene motor exhibitors will find fuel and supplies ready to hand. Huntington Avenue, a fine asphalted boulevard, will be easy of access at any time for trial or exhibition runs.

Prospects for the moto-vehicle are, says our contemporary, very bright in Boston and vicinity. The roads in that section are as fine as any in the world, the suburbs of the New England metropolis are unsurpassed for beauty and gentility, while its citizens are progressive and sufficiently blessed with this world's goods to indulge all their reasonable tastes for the novel and the strange. With all these signs in its favour it is not surprising that we should find many new companies preparing to enter the field and a very lively interest among nearly all classes in the coming means of locomotion.

We do not suppose that British manufacturers will exhibit, as the time is too short for one thing, and it is not worth their while to do so for another. In this, as in so many other branches of manufacture, they are excluded from participation by the operation of a peculiarly hostile tariff which effectually shuts out our goods.

According to the Paris correspondent of the *Daily Telegraph* the final examination for the newly-created appointment of Inspector of Moto-Car Traffic in Paris took place on the 6th inst. There were some half-dozen competitors eager to be nominated to this responsible post. The successful candidate now bears, therefore, the official title of Inspector of the Traffic of Vehicles propelled by Mechanical Motors. This newly-appointed servant of the Prefecture of Police—whose post, considering the extraordinary popularity of the moto-car in Paris, is not at all likely to prove a sinecure—will be in receipt of an annual salary of £120, with an allowance of £20 yearly for travelling expenses. The inspector will keep an eye on obstreperous and law-breaking moto-drivers in this city. He will also be called upon to assist the engineers of the Government Corps of the Mines in submitting to a stiff examination candidates who are desirous of obtaining the certificate of *chauffeur* which confers the legal right to drive a moto-car in Paris. The new official's duties will likewise include inspecting all vehicles propelled by mechanical means, and certifying that the said vehicles may safely be put into use on the public highways. We may add that the successful candidate was M. Hommen, who is a professional engineer of considerable standing and reputation.

CORRESPONDENCE.

*** *We do not hold ourselves responsible for opinions expressed by our Correspondents.*

*** *The name and address of the writer (not necessarily for publication)* MUST *in all cases accompany letters intended for insertion, or containing queries.*

*** *Correspondents are particularly requested to write on one side of the paper* ONLY, *to place the subject of their letters as a headline at the top of the sheet, and their names and addresses at the foot. Attention to these matters saves much time and ensures the insertion of the letter.*

CELLULOID FOR CYCLE GEAR CASES.

To the Editor of The Automotor.

Sir,—I am advised to have a celluloid gear case for my cycle. On mentioning the matter to a friend he said celluloid was a most dangerous substance to have near one's person. What is celluloid; and is it dangerous? An answer will greatly oblige.—Yours truly,

Wimbledon, S.W. Jos. Finney.

[Celluloid is a compound of nitrocellulose, camphor, and water. It is a hornlike transparent substance, slightly yellow, its sp. gr. being 1·25 to 1·45. It is readily inflammable, being, in fact, somewhat akin to cordite. Such substances are distinctly dangerous. —Ed.]

THE CONSUMPTION OF PETROL.

To the Editor of The Automotor.

Sir,—In the paper dated July 15th, at p. 406, I find that a Daimler motor ran 52 miles on 2 gallons and 6 pints of petrol at a cost of about 1*s.* 9*d.* Is this correct? If so, where can the petrol be purchased at that price? Our machines, of which we have eight, consume quite double that amount of oil for a like distance. With apologies for troubling you.—Yours,

Falkirk District Motor Co. (Ltd.).

[The consumption is certainly low; we have not verified it by any independent test, and so it must be taken for what it is worth.—Ed.]

MILITARY MOTO-VEHICLES.

To the Editor of The Automotor.

Sir,—It may interest you to hear that I have completed a contract with Messrs. Vickers, Sons, and Maxim (Limited), for a sole licence for my motor war vehicles, and that I am now building for this firm two motor war carriages, one of which is a very light (3 cwt.) military railway inspection car, designed for operation in Egypt on the lines of the railway system. It is armour-plated, of 5 mm. Vickers's steel (small bullet proof), and accommodates two officers and one man. It is propelled by two of my small new petrol motors coupled together. The car has two definite speeds, viz., four and 16 miles per hour, the intermediate speeds being obtained by way of my new electric ignition timing gear. The car is equipped with a Maxim quick-firing gun, so mounted in its position that the direction of firing can be changed to any required position. It is entirely self-contained and automatic in its action.

The other vehicle is an armoured motor war-car, designed to run on ordinary roads, and even on rough surfaces, without rails. It is propelled by a 14 H.P. Daimler motor, and has four different speeds, the maximum being about 16 miles per hour, and this car can be run in either direction at the same speed. Two 8 mm. calibre Maxim guns are mounted in revolving turrets, in such a way that any angle of fire can be obtained. The armour is carried to a height of 6 feet above the axles and completely encircles the vehicle like a kind of crinoline or petticoat round the whole of the vehicle, and suspended from the main framing by independent springs, thus avoiding any tendency to jar, and is connected with the under frame by means of lateral stays designed to adjust themselves to the swing of the armour. The front and rear points of the frame are strengthened so as to form rams, and can be utilised in cutting a way through crowds. On the top of the armour half embedded rollers of steel are placed, which revolve freely on their spindles, so as to make it difficult for an opponent to board the car. The bottom of the steel armour plates are provided with a belt projecting about an inch, sharpened in case of war, so that the mere passage of the car would inflict heavy wounds on the assailants. This belt may also be insulated and connected to the electric current supplied off the main engine, and thus transmit shocks to those endeavouring to mount the car.

These war-cars will be introduced under the name of "Simms's Motor War-Car." The car will carry, in addition, a military searchlight (Suez Canal Type). The extreme dimensions are—length, 26 feet; beam, 8 feet; total weight, 3 tons.

Large space for ammunition, stores, &c., is provided, and accommodation for three to six men. The car is also arranged to serve as a tractor, if necessary, for hauling ammunition, war stores, or guns, or for the laying of field wires, or for ambulance services.

These carriages are now in the course of construction, and I shall be pleased to invite you to the trial trips in about three or four months' time.—I am, Sir, yours faithfully,

Amberley House, FREDERICK R. SIMMS.
12, Norfolk Street, Strand, W.C.

PARSONS'S STEAM TURBINE.

To the Editor of THE AUTOMOTOR.

SIR,—I am anxious to know whether the new steam apparatus used by Mr. Parsons for the "Turbinia" is likely to be used for moto-cars? A description is given in *Pearson's Magazine* for August, the vessel being propelled at the rate of 40 miles per hour.—Yours, &c., W. L.

[If you will read literature of the kind referred to you must not expect accurate technical information. Had you perused THE AUTOMOTOR regularly your knowledge of motors would be, or rather should be, sound, and you would have learnt that the Parsons's steam motor is in its present form a uni-direction motor. This, however, would not prevent its use for moto-vehicles. The objection to its use for this purpose is its excessively high speed of revolution.—ED.]

STEAM-POWER *v.* HORSE-POWER.

To the Editor of THE AUTOMOTOR.

SIR,—I notice that at the recent meeting of the London General Omnibus Company the chairman is reported to have said that steam-power could not be made to compete successfully with horse-power. Is this correct, because, if so, the repeated statements in THE AUTOMOTOR must be wholly incorrect? You, Sir, have always maintained that steam is more economical than horse-power. Either you or the chairman of the L.G.O.C. are wrong. I shall be curious to see your reply.—Yours truly,

A SHAREHOLDER IN THE LONDON GENERAL OMNIBUS COMPANY.

[We have no hesitation in saying, and we are prepared to substantiate our statement, that the assertion said to be made by the chairman of the L.G.O.C. is wholly incorrect. It is a matter of mathematical demonstration, corroborated by the practical experience that has been gained in France, that under similar conditions steam omnibuses can be worked cheaper than can horse-drawn ones. We trust that the shareholders in the London omnibus companies will apply to us for figures and facts, and we shall be glad to see the question fought out.—ED.]

FOUR OR SIX WHEELS?

To the Editor of THE AUTOMOTOR.

SIR,—In reply to Mr. Geo. Coombs's remarks on a previous communication of my own, I should like, with your permission, to say a word as to "trailing steerers." Surely the connection requisite to enable them to turn with the front steerers through an equal angle, but in an opposite direction, would not tax the ingenuity of even a practical engineer for very long; a jointed rod or two would soon settle the matter.

As regards locomotive practice, a central driving axle with supporting axles at either end is a not unknown type, and even the substitution of a bogie truck for a rigid axle does not affect the principle involved.

Again, a modern long bogie carriage (why should it not have a central supporting axle or two?) hints at fore-and-aft steering as a possible and perhaps not unreasonable design for common roads.

In conclusion, to limit a heavy moto-vehicle to four wheels seems to me rather like designing a two-wheeled omnibus because a hansom cab is found a convenient vehicle for two.—I am, yours faithfully,

ALFRED J. ALLEN.

London Institution, E.C., *September 1st.*

NEW INVENTIONS.

Claiming particularly to apply directly or indirectly to Motor Vehicles, &c.

Compiled for "THE AUTOMOTOR AND HORSELESS VEHICLE JOURNAL" by HERBERT HADDAN and Co., Registered Patent Agents, of 18, Buckingham Street, Strand, W.C., London.

Patents Applied For.

Abbreviations: Impts., Improvements in; Relg., Relating to.

1898.

Aug. 3. 16,809. C. P. BARY and P. J. BASNIER. Impts. moto-carriages.
,, 3. 16,810. H. W. RAVENSHAW. Impts. automotor cars.
,, 5. 16,926. A. GRUNER and M. COOBY. Brake lock.
,, 9. 17,128. D. W. CROSLAND. Propelling launches and cars by gas.
,, 10. 17,226. T. C. FIELD. Variable speed gear.
,, 10. 17,246. W. SCHEN. Impts. relg. moto-cars.
,, 10. 17,300. F. H. BIASSE. Apparatus for compression and utilisation of air for motive purposes.
,, 11. 17,354. C. JEANTAUD. Electrically propelled vehicles.
,, 12. 17,439. R. C. AYTON. Impts. steering apparatus.
,, 12. 17,440. R. C. AYTON. Variable speed driving gear.
,, 15. 17,535. H. SHOOSMITH. Steering gear.
,, 15. 17,536. R. LUCAS. Impts. in motors.
,, 17. 17,750. H. H. LAKE (La Société Continentale d'Automobiles). Impts. motor road vehicles.
,, 18. 17,813. H. F. JOEL. Propelling and regulating apparatus.
,, 19. 17,913. T., H. J., and T. COULTHARD and W. NORRIS. Impts. moto-vehicles and fittings.
,, 20. 17,930. C. HARVEY. Joints for tubular parts.
,, 24. 18,213. BRITANNIA MOTOR CARRIAGE COMPANY (LTD.) and J. SMITH. Impts. electric motors.
,, 25. 18,243. W. KIMBELL and A. COOPER. Detachable mudguard.
,, 26. 18,344. E. POTIER. Improved moto-car.
,, 27. 18,395. W. H. WALKER and G. SMART. Impts. drive chain adjusters.
,, 27. 18,448. L. M. GAUTIER. Impts. motor road vehicles.
,, 29. 18,472. S. STRAKER. Impts. construction moto-vehicles.
,, 30. 18,548. G. E. RUTTER. Impts. drawing gear.

Specifications Published.

THE following is a List of Specifications recently published, and obtainable at the Patent Office, 25, Southampton Buildings, London, W.C., at the uniform charge of 8*d.* per copy. Owing to the enormous pressure upon our columns it has been found impossible to deal in any other form with the accumulation of patents now being taken out in connection with automobilism. As far as possible, a selection for special mention is made by the Editor from the more prominent inventions:—

Applied for during 1897.

16,380. C. RICCI, 47, Campana Road, Fulham, S.W. Ignition apparatus.
16,705. C. E. CALLOCH, 31, Boul. Henri IV, Paris. Moto-car.
16,715. E. H. HODGKINSON, 8, Lancaster Gate, London. Velocipedes and automotor carriages.
16,724. H. M. BIGWOOD, 131, Penn Road, Wolverhampton. Driving chains and chain wheels.
16,729. A. G. NEW, 8 and 10, Bridge Street, Westminster, S.W. Heavy oil engines.
17,084. R. C. SAYER, 11, Clyde Road, Redland, Bristol. Speed regulator.
18,865. The Hon. R. T. D. BROUGHAM and W. C. BERSEY, Juxon Street, Lambeth. Safety device for use in connection with carriages propelled by electricity.
19,069. C. JOST, 13, Hornby Row, Bombay, India. Fluid pressure motors.
20,801. J. EDMONDSON and J. W. DAWSON, Albert Electrical Works, Hey Street, Bradford. Starting apparatus.
20,845. A. MULLER, 31A, Luisenstrasse, Berlin. Accumulators.
14,649. X. DE LA CROIX, 117, Rue Froissard, Brussels. Motocycles.
20,455. P. JENSEN (C. and A. White, Baltimore, U.S.A.). Electric igniter.
21,823. C. TENNETT, and A. J. RILEY, 180A, Leeds Road, Bradford. Compound steam motors.
21,329. E. K. DUTTON, Arden, Cornwall Road, Harrogate, Yorks. Oil, gas, and analogous motors.
22,972. H. H. LEIGH (B. J. X. Gosseliu, 22, Boul. Poissonniere, Paris, France). Fluid pressure motors.
17,379. T. HEWETT, 6, Jeffrey's Square, St. Mary Axe, London. Chain gearing.
22,339. O. C. IMMISCH, 102, Tollington Park, London, N. Electric switch.

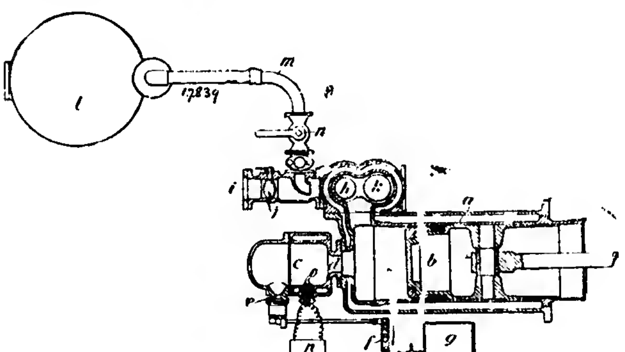
23,332. E. A. PARIS, 33, Chestnut Road, West Norwood, London. Secondary battery plates or electrodes.
30,365. G. DORE and H. I. BORUSSON, 15, Grand Rue, St. Maurice, France. Driving mechanism.
18,953. R. H. RIDOUT, Parkstone, Sunbury. Fluid pressure motors.
21,434. G. WEBB, Ganarew, near Monmouth, Hereford. Ball bearings.
21,651. W. H. BARKER, 37, Haverstock Hill, London. Driving mechanism.
22,386. J. KENNEDY, 25, Elmbank Street, Glasgow. Variable speed gearing.
23,528. Major H. C. L. HOLDEN, Royal Arsenal, Woolwich. Controlling gear.
18,531. H. J. LAWSON, 40, Holborn Viaduct, London. Motor road vehicles.
18,796. W. M. MCDOUGALL, 43, Sussex Avenue, East Orange, N.J., U.S.A. Storage batteries.
21,257. T. H. NEWCOMB, Addlestone Ironworks, Addlestone, Surrey. Brakes.
22,200. F. BILLING and others, Livery Street, Birmingham. Tool for forming grooves in the junctions of moto-car frames.
23,067. F. WOODCOCK, 5, Marshfield Place, West Bowling, Bradford. Pitch chains.
28,262. H. H. LAKE (Old's Motor Vehicle Company, 210, River Street, Lasing, Michigan, U.S.A.). Moto-vehicles.

1898.

10,237. E. E. F. FAGERSTROM, 22, Pipersgutan, Stockholm. Regulating device.
10,613. G. WESTINGHOUSE and E. RUUD, Pittsburg, Allegheny, Penn., U.S.A. Internal combustion engines.
10,911. A. J. BOULT, 111, Hatton Garden. Burners.
6,232. G. STRUCK, 18, Buckingham Street, Strand. Starting devices.

17,839. Explosion Engines. W. Hornsby and R. Edwards, Spittlegate Iron Works, Grantham, Lincoln. July 29th, 1897.

Relates to improvements in explosion engines of the kind forming the subject of letters patent Nos. 7,146 of 1890, 15,994 of 1890, 3,909 of 1892, and 6,933 of 1896, wherein to start the engine the vaporiser has to be heated.



a is the working cylinder, *b* the piston working therein, *c* the vaporiser in open communication with the cylinder, *a*, through the contracted neck, *d*, *e* the inlet for the liquid hydrocarbon in the vaporiser, *c*, *f* the pump for introducing the said liquid hydrocarbon from the tank, *g*, *h* the air inlet valve for admitting air through the passage, *i*, which passage is provided with a valve, *j*, for regulating the supply of air, and *k* the exhaust valve, all of which parts are arranged substantially in the manner described in the specifications before referred to and therefore require no further description herein.

l is a carburetter of any ordinary or suitable construction which has an air inlet opening and is also connected by a pipe, *m*, with the usual air passage, *i*, of the engine in such a manner that when the valve, *j*, in the said air passage is wholly or partially closed, air will be drawn through the carburetter and the pipe, *m*, into the cylinder, *a*, past the valve, *h*, on the outstroke of the piston, *b*, and will on the return stroke of the piston, *b*, when the valve, *h*, is closed be forced through the contracted neck, *d*, into the usual vaporiser, *c*.

n is a cock placed in the pipe, *m*, for controlling the passage of the carburetted air through the pipe, *m*.

o, *o* are the electric terminals of an igniter which are placed in connection with a source of electricity, for instance, with a battery, *p*, the said terminals being arranged in the usual manner so that the current will spark between them. The circuit of the battery, *p*, contains a contact maker which is controlled by the movements of the engine in such a manner that the circuit will be closed at the proper time when the piston is at the end of its instroke to ignite the charge which has been forced into the vaporiser or combustion chamber, *c*.

q is a cock which is arranged between the oil reservoir, *g*, and the pump, *f*, for shutting off the supply of oil to the said pump.

In starting an engine the cock, *q*, is closed and the cock, *n*, is opened so that on the outstroke of the piston which is produced in any suitable manner, for instance, by manual power, a charge of carburetted air will be drawn into the cylinder, *a*, which charge on the backward stroke will be forced into the combustion chamber, *c*. When this has been effected the said charge will be ignited by the electric spark between the terminals, *o*, *o*, whereupon the piston, *b*, will be forced outwards by the explosion and thereafter continue to work by the explosion of the successive charges drawn through the pipe, *m*. When the vaporiser, *c*, has become sufficiently hot to vaporise and ignite the usual oil with which the engine is intended to work, the cock, *n*, is closed and the cock, *q*, is opened so that the usual oil will be injected into the vaporiser by the pump, *f*, and air will enter the cylinder through the passage, *i*, the valve, *j*, having been previously opened to the desired extent.

10,579. Brake Gear for Railway Wagons, &c. Edward Brown, Goosehill, near Normanton, Yorkshire. April 28th, 1897.

The gear consists of a shaft placed across the wagon or similar vehicle, capable of being rotated by a handle or hand-wheel from either side of the vehicle; on this shaft is fixed near one end—or both ends in case of the brakes being required to act on four wheels—a bevel or mitre wheel, gearing into a suitable wheel or wheels fixed on a longitudinal shaft or shafts, the said shaft or shafts being carried by castings firmly fixed to the sole bar of the vehicle, and provided with bearings or journals at right angles to each other, the said longitudinal shafts having a thread cut at the opposite end, engaging a nut, circular in section, held loosely in a lever, which is solid with and forms part of a rocking lever, to which push rods are attached from it to the brake blocks, the said rocking lever being supported by, and free to rock on, a short shaft firmly fixed and carried by hangers from the sole bar of the wagon or similar vehicle.

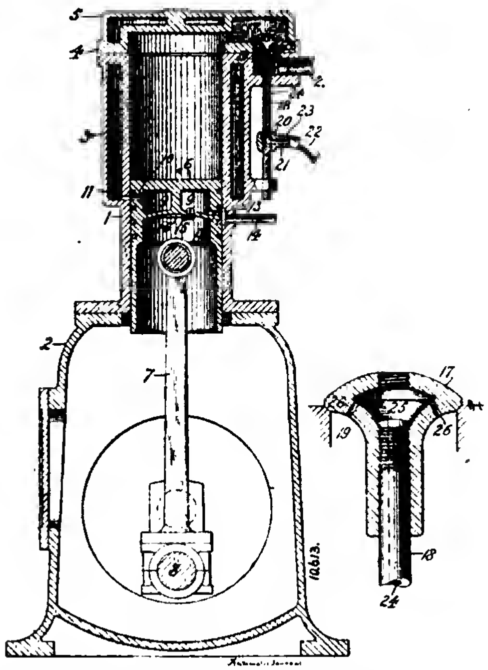
10,613. Internal Combustion Engines. G. Westinghouse and E. Ruud, Pittsburg, Pennsylvania, U.S.A. May 9th, 1898.

The object is to provide an improvement in internal combustion engines; and to this end it consists in means for cooling certain movable parts of the engine, and in certain combinations and features of construction.

The cylinder, 1, of the engine is mounted on a crank case, 2, and is surrounded on a part of its length by a jacket, 3, within which a cooling medium is circulated for the purpose of preventing injurious over-heating of the cylinder. The cylinder head, 4, is provided with a jacket, 5, and the space through which the cooling medium is passed around the cylinder is, preferably, in communication with the space enclosed by the jacket or cylinder head.

The main piston, 6, is connected by a connecting rod, 7, with the crank, 8, on the main shaft, and in the upper portion of the piston is formed a chamber, 9, which is provided with a port or passage, 10, so located that it is adapted to register with a passage, 11, in the wall of the cylinder, when the piston is at or near the lower end of its stroke. The passage, 11, communicates with the interior of the jacket, 3, and when the piston is at or near the lower end of its stroke, the chamber, 9, is in communication with the interior of the jacket, 3. A passage, 12, through the wall of the piston is adapted to connect the chamber, 9, with a port, or cavity, 13, when the piston is at or near the lower extremity of its stroke, and a pipe, or passage, 14, leads from the cavity, 13.

When a cooling fluid is supplied to the jacket around the cylinder, and the piston, 6, moves into position to connect the ports, or passages, 10 and 11, a portion of the cooling fluid will pass through those passages into the chamber, 9, in the piston, 6, and at the same time, and during the time that the passage, 12, is in communication with the cavity, 13, fluid will flow from the chamber, 9, through the passage, 12, and cavity, 13, and be discharged through the pipe, or passage, 14.



When the piston moves from the position which it occupies, and during its upward and downward stroke, the flow through passage, 11, from the jacket, and the flow through the passage, 12, from the chamber, 9, will be cut off, and chamber, 9, will be kept charged with fluid during the upward and downward stroke of the piston.

When the piston approaches the end of its downward stroke, the passage, 12, will register with the cavity, 13, before the passage, 10, registers with the passage, 11, and there will be little or no resistance to the passage of the cooling fluid into the chamber, 9, through the passages, 11 and 10.

If water or other liquid be employed as the cooling fluid, it may flow to and through the pipe, 14, by the action of gravity only, or it may, if preferred, be forced through and out of the piston under pressure, no matter what the fluid may be.

In order to avoid explosion by pressure generated from the fluid within the piston, we may provide a safety or relief valve, 15, for controlling a passage leading from the chamber, 9, into the open ended trunk of the piston, and through which the pressure may be relieved, and fluid discharged into the crank case. The valve, 15, is normally hold to its seat by spring, 16.

In order that the pipe, 14, and cavity, 13, may be quickly and surely cleared by water before the return of the piston, it is preferred that the lower end of the piston should pass above the cavity, 13, or at least partly uncover it, when the piston moves to the upper end of its stroke, so as to permit water to drain therefrom into the crank case.

The exhaust valve, 17, is provided with a downwardly extending stem, 18, which may be operated by any preferred means so as to open and close the exhaust passage, 19, at the proper times, and the valve and stem are made hollow and provided with means for circulating water or other cooling fluid therethrough.

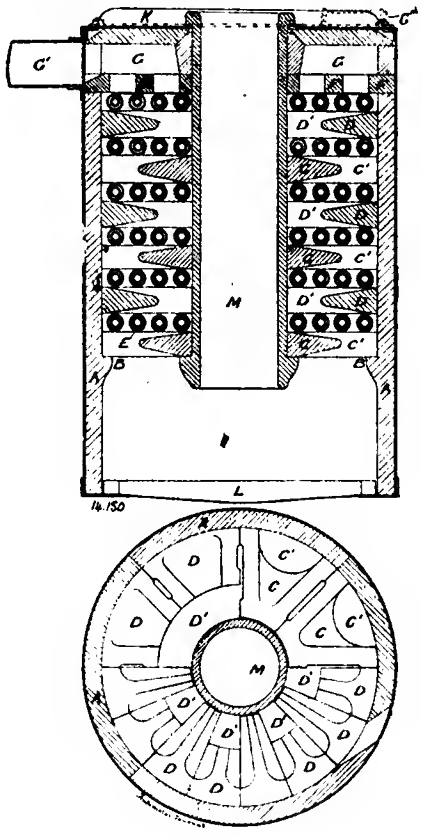
A collar, 20, is clamped or otherwise rigidly secured on the stem, 18, and a nipple, 21, formed on the collar, is provided with a passage, 23, which connects at one end with the passage, 24, formed on the stem, 18, and which at its other end opens into the flexible pipe or hose, 22, which is secured to the nipple, 21. The flexible pipe or hose, 22, may be connected with any pipe, passage, or vessel from which the cooling fluid is to be supplied, and it should be of such ength and flexibility as to permit the necessary reciprocating movement of the stem, 18, by which the valve is opened and closed. The cooling fluid passes through the pipe, 22, passages, 23 and 24, and fills the chamber, 25, in the valve, 17, from which it flows through the passages, 26, into the exhaust passage, 19, and is discharged with the burnt gases through the exhaust pipe, 27. Modifications are described and shown.

14,150. Steam Generators. W. W. Beaumont, Outer Temple, 222, Strand, London; and H. P. Holt, 22, Chancery Lane, London. June 10th 1897.

Relates to steam generators chiefly of the type described in the Specification of the Patent No. 5,505 of 1897, and consists in the arrangement of the tubular or other heating surfaces, or water and steam enclosing envelopes and their connections and attachments, and also in the methods of supporting these tubes or envelopes by, and the formation of, the generator casing lining and heat storing blocks forming flues or passages for the products of combustion.

The generator casing is lined with the vertical segmental pieces, A, on the lower inside of which is formed a projection for supporting the discs, C and D, and the generator tubes, E, and leaving the spaces, C^1 and D^1, for the passage of the gases which finally find their way through perforated segmental discs, F, into the space, G, surrounded by blocks of refractory material, and from which the gases pass out to a chimney, as at G^1, or as indicated by dotted lines at G^{11}. The blocks, D, are shown in three forms; the one form as shown in the lower part of the drawing consists of alternate long and short blocks, leaving alternate flue spaces, D^1. In the upper part of the same drawing the blocks, D, are formed so as to leave a continuous or unbroken annular flue space, D^1; in the right hand upper part of the same drawing are shown the segmental disc-forming blocks, C, which leave the flue spaces, C^1, near the casing instead of towards the centre of the generator.

In another form of generator the blocks, C and D, are similar to those already described, but are in some cases carried into the centre, where they take the place of the central tube.



Grate bars for solid fuel are shown, and the fuel may be fed in by the tube, M, which would be fitted with a cover not shown; a fire door in the lower part of the casing would be provided in the ordinary way for access to the fire or for clinkering.

Other modifications and details are also described.