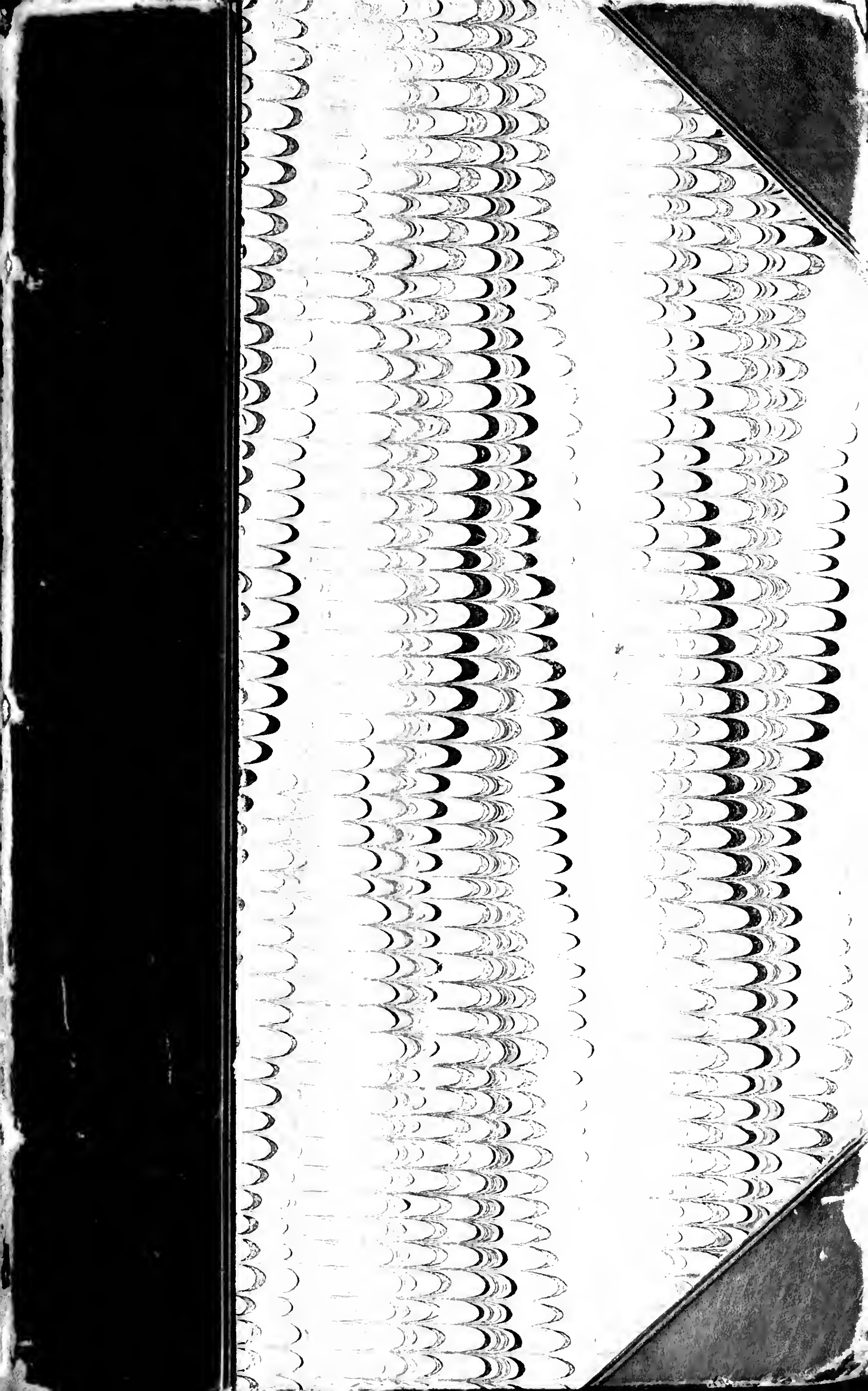
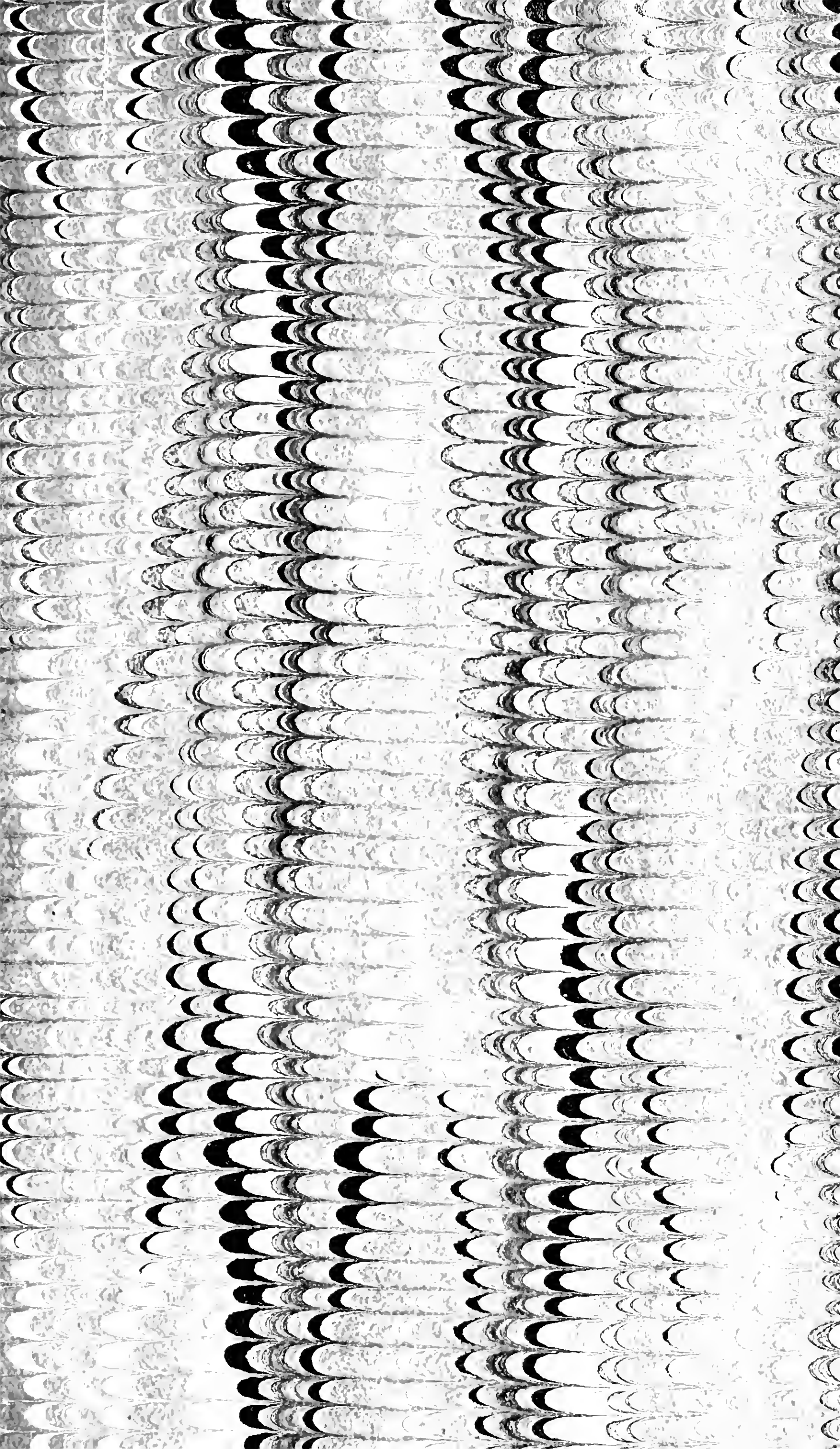




TRANSACTIONS

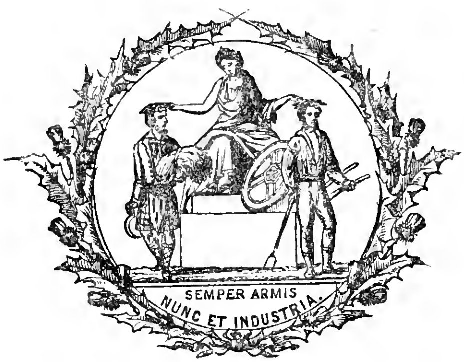
OF THE

HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND

WITH

AN ABSTRACT OF THE PROCEEDINGS, AND THE PREMIUMS OFFERED BY THE SOCIETY IN 1888.

PUBLISHED ANNUALLY.



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*** It is to be distinctly understood that the Society is not responsible for the views, statements, or opinions of any of the Writers whose Papers are published in the *Transactions*.

TRANSACTIONS

OF

THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND.

EDUCATION IN DAIRY FARMING, AND DAIRYING IN EUROPE AND AMERICA.

By Professor JAMES LONG, of the Royal Agricultural College, Cirencester.

INTRODUCTION.

THE task of preparing an account of the means of education afforded in the various countries of Europe and in America has proved to be one of far greater magnitude than might be supposed to be the case, especially when, as we hope and believe, it is both authentic and comprehensive. In Europe alone, leaving Great Britain out of the question, we have been able to procure considerable information with regard to eleven countries, and with the dairy systems of seven of these we are well acquainted from actual study and investigation on the spot. It is a strange fact that even where dairy farming is a leading system of the country, as in Switzerland and Denmark, it is next to impossible to obtain full information from any central source, whether it be from the Government or the leading dairy societies. In almost every instance, where a nation is composed of separate states, provinces, or cantons, the authorities in the one state are almost ignorant of what transpires in another. This being the case, our task has been increased twentyfold, and the labour of preparing this report cannot be gauged by its length or even by the material of which it is composed. Hundreds of letters have been written to obtain the data upon which to base it, whereas these data, hidden in very many volumes, reports, prospectuses, tables, and other matter printed or written in seven languages, have only been extracted by lengthened study and with the assistance of those friends whose names are mentioned hereafter.

It will be found that the whole of the countries with which we deal are now specially alive to the great necessity of dairy instruction, that in many cases the State aid given is much less than has been supposed, whereas in others it is considerably more. In almost every instance, however, there is promise of further assistance, more especially where the butter-makers of the East are formulating fresh attacks upon the markets of this country. The report clearly indicates two leading facts, that Europe is being rapidly educated in the production of butter and cheese as well as in the improvement of dairy cattle, and in better systems of feeding and producing food, and that country after country is now ready, and will gradually grow more anxious, to supply us, and indeed will supply us, if we exhibit our incapacity to supply ourselves either as regards quantity or quality. We shall not, however, be able to compete in our own markets until our people have been taught how to make dairy produce equal, *en bloc*, to that from other countries, as well as to make that class of cheese peculiar to various parts of the Continent which we already consume in regularly increasing quantities. It will be noticed that the dairy schools of the Continent are to a very large extent adapted to the requirements of the lower classes of persons engaged in agriculture. This is as it should be, for where it is necessary for one person to pass through a curriculum of science and practice at a college or dairy station, it is necessary for twenty or more to master the details of practice only. In a word, at least twenty workers should be trained to one teacher, whether he is to be an employer of labour, a director, or a person actually engaged in instructing others. Again, it will be noticed that the majority of the schools have both cattle and land, without which little can be taught in the direction of practice. Experiment stations are justly esteemed in the leading dairy countries, and from what we know of their work, we are of opinion that their influence is greater than that of the actual schools, although they are so few in number. It is their work which has set others thinking, which has been productive of great economy, and which has been the leading feature in moving others to attempt to found practical schools throughout the whole of the countries referred to in this report. A dairy experiment station, where science and practice work hand in hand, is calculated to be of the greatest possible service to agriculture; its teaching reaches the whole of the educated classes, whose influence upon those less fortunate than themselves can scarcely be estimated. It is to be hoped that a station of this kind will be established in Great Britain. This work would create greater economy in the production of crops, in the preparation of foods, and, consequently, in the production of milk. It would assist in solving the thousand problems which exist in relation to butter and cheese, and in the prevention of fraud upon farmers as well as upon the consuming public. This, however, is not the place for a programme of the work which a station could undertake, the stupendous value of which can scarcely be grasped even by those who study what has already been done at the stations in other countries. We have now only to hope that we shall not be left behind Norway and Sweden, although we can scarcely hope to be placed upon a level with Germany and Italy as regards the extent of even dairy education; but it will not be the fault of such great friends of the movement as Sir Richard Paget, Mr Stewart, Captain Cotton, Mr W. B. M'Laren, Mr Gray, Mr Jasper More, and other members of Parliament, if something worthy of the greatest agricultural people in the world is not done.

The Royal Agricultural College.

Dairying has long formed a branch of the studies at the Royal Agricultural College, Cirencester, but it was only in 1885 that the important step was taken of instituting a Chair of Dairy Farming, and of building the admirable dairy which is now so great an element in the course of instruction. The dairy itself is intended to combine the various features of a perfect building, a first-class plant, and a perfect system. The block comprises three large apartments and three small ones. The first is the milk room, partly below the soil; the second, churning, separating, and butter-making room; and the third, the cheese room, where provision is made for the manufacture of British and foreign cheeses on the newest systems. The smaller apartments comprise an engine-room, a boiler-room, a cheese-room, and a store-room. The buildings are attached to the bailiff's lodge, the bailiff's wife being the dairy-woman. Demonstrations are given by the dairy-woman from week to week, and there is a special course of demonstrations in each term by the Professor of Dairy Farming. In the ordinary course of instruction the students pass through a curriculum of science and practice in agriculture under Professor M'Cracken. The instruction imparted is considerable. Commencing with cattle, and its numerous varieties, he continues by dealing with feeding and management in summer and winter, the land of the dairy farm, the selection of grasses, the drainage, manures, forage cropping, dairy buildings and utensils, the properties and manipulation of milk and cream, the manufacture and commerce of butter and cheese; finishing with the pig, its breeding and management, and the various breeds of poultry adapted to the farm. A special course of agriculture by Professor Little also includes reference to the cultivation of crops suitable to dairy cattle, as well as the cattle themselves; while the course of lectures of the Professor of Dairy Farming, in addition to these subjects, deals both in theory and practice with the milk and its constituents, its aeration and preservation, the various systems of raising cream and of testing milk for fat; of the preparation of curds and clotted cream; the effects of temperature; the use and value of the utensils and machines; the dairy and the factory; the churning of milk and cream in its separate forms; making, working, salting, potting, packing, and preserving butter upon the English and Continental systems; cheese-making, including the actual manufacture of the leading British varieties, of Gorgonzola, Gruyère, Camembert, Neuchâtel, and other milk, cream, and skimmed milk cheeses; the effect of temperature, rennet, the quality of milk, pressing, salting, and cooking in cheese-making; the fungus of cheese within and upon the crust, the parasites and ferments of cheese; creameries, cheese and butter factories, together with full details of dairy systems, as conducted in France, Germany, Switzerland, Italy, Holland, and Denmark. The students also have the advantage of learning to analyse milk, butter, cheese and cream, feeding stuffs and manures, in the laboratory under Professor Kinch; of examining seeds, as well as the fungi and ferments of milk under all conditions, in the biological laboratory under Professor Harker. These branches of study, as that of veterinary surgery under Professor Almond—an important subject in dairy farming—form part of the ordinary course of the college. The whole of the students, usually numbering 100, pass through the dairy course during their two years' residence, no extra charge being made. They have opportunities of becoming proficient in the practical as well as in the scientific branch of study, and compete for prizes at the college examinations in the practical work of the dairy. The dairy branch is extremely popular, and must effect considerable influence both upon the future of those who make it a portion of their after practical life, as well as upon those upon whom their knowledge is brought to bear.

Edinburgh.

The course of scientific and practical education in agriculture, which is conducted by Professor Wallace at the Edinburgh University, well provides for the wants of those who desire to master dairy farming in all its branches. We extract the following paragraph from the syllabus:—

"Dairying in all its branches, including the suitability or otherwise of surrounding conditions; the proper classes of dairy stock to keep, and their management; the treatment of milk, and its sale or manufacture into cheese, butter, &c."

In addition to the information conveyed in the lectures of the Professor, the students have the advantage, not only of visiting farms during the several terms of the year, but they have the opportunity of residing upon two farms, under the Professor and Messrs J. & S. Wallace; the one at Brunstane, which is near Edinburgh, during the winter session of five months, and for the remaining seven months, if they desire, upon the farm of Auchenbrack and Appin, near Thornhill, in Dumfriesshire.

Brunstane is a farm of 200 acres, rented at £5 per acre, farmed highly upon the four-course system, and maintaining a dairy of thirty cows. The other farm, of 4000 acres, chiefly maintains sheep and grazing cattle; but there is also a dairy of 60 cows, where cheeses are made upon the old Dunlop and the new Cheddar systems. The teaching in the extra-mural classes at Minto House, Edinburgh, also deals with the dairy under the head of agricultural chemistry. Edinburgh students have therefore every opportunity of learning both the theory and practice of dairying. Professor Wallace tells us that the students during the five months' session number from forty to fifty, and all have the advantage of seeing the working of the Brunstane dairy, as well as many others in the neighbourhood of the city. This is extremely satisfactory.

College of Agriculture, Downton.

We are indebted to Professor Wrightson for the following particulars:—

The dairy and dairy instruction form important parts of the course of teaching at this college. Professors Wrightson and J. P. Sheldon, with assistants, undertake the duties of instructors in dairy work. Excursions are made to the farms of Mr S. J. Taunton, a director of the college, who is also owner of a large milk business in London. The college dairy comprises 40 cows, although at present, owing to the peculiarities of the season, the number is about 30. The dairy cows graze in the rich dry water meadows, and the upper reaches of the farms are usually under ewe flocks, and this is the general arrangement at the College of Agriculture. The milk is for the most part sold, and goes daily to London. A portion is, however, reserved for churning, and cheese-making is prosecuted for several weeks every summer term. The instruction is imparted by means of courses of lectures on dairying by Professor Sheldon, and lectures on the races of cattle and agriculture by Professor Wrightson, on grasses by Professor Fream, and on the chemistry of the dairy by Dr Munro. Practical instruction in milking, parturition, calf-rearing, feeding and grazing, treatment in health and disease, is given by means of farm classes, and by encouraging the students to compete for prizes in milking, butter-making, cheese-making, and in the management of cows. There are also lectures on parturition, and the diseases of cows and calves. The dairy house is sufficiently commodious for ordinary purposes, and is furnished with a cream separator, apparatus for butter-making, for cheese-making, and for cooling milk for London. A milk register is kept of the yield of every cow twice daily. The results of the register are from time to time communicated to every student. There are at present between 50 and 60 students receiving instruction at the college.

Aspatria Agricultural College.

This college was established in 1874 for the education of students in special and practical instruction in the sciences connected with agriculture. The system includes courses of lectures, laboratory work, and daily lessons in the land, arrangements having been made with five farmers in the neighbourhood, whose farms are at all times free of access. Two of these farms are dairy farms, where butter and cheese making is taught. This plan, however, Dr Webb considers has not been quite satisfactory, but now that a dairy factory has been established he hopes to get a special school in connection with it. Scholarships, gold, silver, and bronze medals, and diplomas are awarded to successful students, and several scholarships of the Royal Agricultural and Highland Societies have already gone to the college. There are three terms of three months each, and the fees are from 15 to 17 guineas per term for students under twenty. The system at Aspatria is well worthy of attention, and appears to be specially well designed for the combined general, scientific, and agricultural instruction of young students.

Hollesley Bay College and Farm.

The principal, Mr Robert Johnson, informs us that dairy instruction is a leading feature in the curriculum of this college. The students receive practical teaching in the feeding and management of cows; they also milk, churn, and make the butter. The old dairy being inadequate for the requirements of the college, a new one is to be built, and is expected to be finished during the spring. This is to be capable of receiving the produce of 100 cows. The present dairy is furnished with a separator. Mr Johnson states that the students milk well, and that the dairy is a favourite branch of their instruction. He proposes, when the new dairy is complete, to illustrate the whole of the systems of cream separation—the ordinary shallow-pan system, the Cooley, the Jersey, the Swartz, and the Centrifugal. There is no extra charge for instruction in the dairying branch.

The Sudbury Dairy School.

It is some four years since we were invited to attend at the opening ceremony of the dairy school in connection with the Sudbury factory, belonging to Lord Vernon. The movement was started under the direct advice of the late Mr Jenkins, and a large number of the leading experts in dairy matters were present. It was believed that the considerable work which was performed at the factory would be of great value in showing persons desirous of obtaining instruction much that they desired to know, more especially in the management of separators, of the machinery of a large establishment, and of practical butter and cheese making. It need scarcely be said that in a case of this kind there is little *theoretical* instruction except in the form of lectures which have been occasionally given, and which for the current year are announced to be given at 3 P.M. on the second Tuesday of each month, as follows:—

1. Introduction to the course of lectures.
2. The dairy homestead.
3. The best dairy breeds.
4. The cultivated grasses, including the management of grass land and hay-making.
5. The system of feeding dairy cows.
6. The chemistry of the dairy.
7. Cream separation.
8. Butter-making.
9. Cheese-making.
10. The marketing of produce.
11. The pig—its relation to the dairy.
12. A retrospective view of the year's proceedings.

The pupils are allowed to remain for long or short terms: they are required to pay a fee of £3 for the first month, £2 for the second, and £1 for the third, but provide their own board and lodging, which is secured for them by the officials of the factory. It need hardly be stated that where so vast an amount of butter and cheese is made there is much to learn, and that pupils have the opportunity of becoming acquainted with the system of factory management at the largest establishment of the kind in this country. As the Sudbury school was the first establishment where pupils were taught in England, so it might be one of the first schools under the régime which we have great reason to hope for from the Government, with the advantages already referred to, combined with those appertaining to a large home farm, a fine herd of cattle, and the personal aid of Lord Vernon himself, who takes the deepest interest in everything connected with dairy education. Such a school should be a leading one in the country, and provided with the means of *theoretical* as well as *practical* instruction, also for research in the department of milk science.

Cheshire Dairy School.

The first English practical dairy school, unconnected with a factory or with any public body, was established by a Limited Liability Company composed of farmers and a few of the leading landowners of the county, at a farm-house, the property of Captain Cotton, M.P. (a good friend to dairy farming), at Worleston, near Nantwich. The primary object of the school was to illustrate and teach the best known methods of making Cheshire cheese, and to effect an improvement in the butter-making of the county, which, as is generally the case in cheese-making districts, has been very inferior in the past. In order to render the teaching easy of application, it is conducted upon similar lines to those pursued in the best farm-house dairies. The committee appointed Mr George Willis, a member of a well-known good cheese-making family, as manager and teacher of cheese-making; and Miss Mary Connell, a leading pupil of the Munster Dairy School, as teacher of butter-making. During the first year the 40 pupils who passed through the school remained various periods of from one to seven weeks. In some cases immediate and valuable results were obtained by these persons upon their return to their own dairies, and the whole of the pupils wrote in the most distinct terms of the satisfaction with which they had received their instruction. In the past year the school opened in April, and during the season 63 pupils passed through it. It should be mentioned that the teaching is chiefly in connection with actual practice, cheese or butter, or both, being made daily. The work is performed with the assistance of the pupils, who are shown how mistakes may be corrected and good results obtained; in the butter-making depôt practical observations are made, and the superiority of the best systems shown; such, for instance, as that of churning cream in the place of milk. The use of the separator is taught, and a good demand for the produce of the dairy has been created. The milk which passed through the school dairy in 1887 amounted to 38,000 gallons; in all, 12 tons 16 cwt. of cheese was made, which sold at a good price. The school also made and sold 2582 lbs. of butter, which averaged 1s. 3d. per lb., and 350 lbs. of whey butter; a large quantity of whey and milk was also sold. The pupils paid in fees £95, 5s. 6d., and they cost for board £30, 15s. 2d; on the other hand, the payment for manager and teaching, with secretarial travelling expenses, stationery, &c., amounted to £232. The total payments of the year amounted to about £1158, or £86, 16s. 10d. more than the receipts. Here, then, is an instance of valuable work being done at a small cost. Surely a case is made out for Government assistance, which, even though paid at so much per pupil, would amount to more than sufficient to maintain the school in a useful state. This success has been so great, for so it should be considered, that a second school is to be opened during the current year in another part of the county. It is the intention of the committee to push investigation into the mysteries of Cheshire cheese-making still further ahead, and to aim at the production of a still finer quality of dairy produce. The manager, Mr Willis, takes great personal interest in his work, and has done good service; while the help of Miss Connell has been sought as demonstrator at some of the large agricultural shows, where she has given every satisfaction. The chairman of the directors is Mr George Barbour of Bolesworth Castle, an untiring friend of the movement; and the secretary is Mr Thomas Rigby, whose name is now so closely identified with Cheshire dairy farming, and with the educational movement in particular, and to whom so many persons seeking instruction are indebted for help. The dairy school movement is also largely indebted to Mr Tisdall, Mr Roumieu, and Mr Thomas Nuttall.

Ireland.

The Albert National Agricultural Training Institution and Dairy School, Glasnevin, Dublin.

To Professor Carroll, the General Superintendent of the Agricultural Department of National Education of Ireland, we are not only indebted for considerable information in connection with the Glasnevin Institution, and the Munster School, with which he was formerly connected, but for personally showing us all that could be seen, both in the institution itself, in the farm buildings, and upon the three model farms.

This institution is designed to supply instruction—

(*a*) In the science and practice of agriculture to the sons of farmers, to national teachers, and others.

(*b*) In the most improved systems of dairying to young women.

The training institution is situated on the farm. The buildings comprise dormitories, dining hall, lecture and school-room, museum, library, and laboratory; an extensive range of farm offices, and dairies fitted up with improved machinery and implements. The farms and gardens, which contain about 180 statute acres, are situated about three miles north of Dublin, and one mile from the village of Glasnevin. An area of 6 acres 17 poles (statute) is cultivated as a small spade-labour farm, with the view of exhibiting a proper system of cultivating the vast number of small farms in Ireland. An area of 22 acres 3 roods 7 poles has been set apart with a view of illustrating a system of farm management adapted to the circumstances of farmers whose holdings are large enough to give employment to one or two horses. The remaining portion of the land forms the large farm. The arrangements afford to the students as complete an amount of information as possible upon every branch of the business of farming, including dairy husbandry, the fattening of cattle, the breeding and rearing of different kinds of live stock, &c.

The course of instruction imparted by the literary teacher embraces all the branches which constitute a sound English education, viz., English grammar and composition, arithmetic, book-keeping, and mathematics; natural philosophy, land surveying, levelling, and mapping. Each of the lecturers of the institution, viz., E. P. Wright, A.M., M.D., professor of botany: Sir C. A. Cameron, M.D., M.R.I.A., analyst; and C. Steel, F.R.C.V.S., veterinary surgeon, delivers a course of lectures every session. These lectures are illustrated by means of diagrams, collections of minerals, plants, &c., and chemical apparatus. There is one session for young men of eight months in the year—from 1st March to 31st October. Four classes are admitted to the institution—

1. Free intern or resident students, who are boarded, lodged, and educated at the public expense, and who are admitted by competitive examination.

2. Paying intern students, a limited number of whom are admitted upon certain conditions, and who are required to pay a fee of £15 for the session of eight months, which includes the cost of instruction, board, lodging, washing, and medical attendance.

3. Extern students, young men who board and lodge at their own expense in the neighbourhood, and who pay a fee of £4 for the session.

4. National teachers—teachers of national schools, especially of those with land attached, who are taken into residence for six weeks.

The female dairy pupils are admitted to the institution for instruction in dairy management, and are under the supervision of an experienced matron. The course includes—

1. Instruction in the principles of feeding cows, calves, pigs, and of the treatment of milk and its products; poultry, and their management.

2. The practice of dairy work. The making of butter and

cheese in large and small dairies, with improved machinery and implements, as well as by ordinary appliances.

Prizes for proficiency at the end of each course are awarded. The fee for the session of six weeks is £3. This fee covers the expense of board, lodging, washing, and medical attendance. As the pupils are required to take part in the work of the dairy, they must bring to the institution a serviceable dress, aprons, &c., which should be of plain washing material. Some respectable person must certify that the applicant is of good moral character. She must produce a medical certificate of health and freedom from any cutaneous disease. Each student who desires it receives a certificate, bearing testimony to general conduct and proficiency in studies. There will in future be two sessions of six weeks each in the year.

Professor Carroll says that there are generally from 40 to 50 pupils for the agricultural course of eight months; and from 20 to 30 female pupils for each of the six weeks' dairy sessions. The male and female pupils are at the institution during different periods. In 1885 the Commissioners established the system of dairy instruction for females, and the dairy course for young men commenced in 1886.

Special fees are given in Ireland for instruction in dairying in such schools as possess means of practical teaching. There are two such schools, for example, already established—the one, a convent school for girls, at Navan, co. Meath; the other, a convent school, at Ballaghaderreen, co. Mayo.

In all rural national schools for boys the teaching of agriculture is compulsory, although it is optional with girls. The Commissioners have sanctioned the payment of result fees for proficiency in dairy work to schools where dairy management is taught at national schools. The dairy instructor must, however, hold a certificate of competency; a dairy must also be in operation near the school, and be furnished with suitable appliances, and at least five cows must be kept. The pupils are examined periodically in the theory and practice of dairy management, as the approved extra branch, and fees are paid in accordance with the scale.

We thus see that Ireland is fairly well equipped with a system, although it applies chiefly to butter-making.

As Glasnevin Institution has now an important dairy school for both sexes, and as there are three dairies and three farms equipped and worked upon conditions corresponding with those of the three classes of farmers in Ireland, it will be useful to quote the actual cost of the entire establishment for the past few years, and the number of pupils of all classes who have availed themselves of the opportunities it affords—

Net Cost.

1881–82, ...	£1163 6 8
1882–83, ...	1498 6 3
1883–84, ...	1200 14 9
1884–85, ...	1815 8 6
1885–86, ...	2095 15 2
1886–87, ...	2150 0 10

Number of Pupils of all Classes.

Year.	Teachers in Training.	Agri-cultural Pupils.	National School Teachers, Special Session.	Female Dairy Pupils.	Male Dairy Pupils.	Total Number of Pupils.
1881	76	45	...	...	...	121
1882	74	36	52	...	...	162
1883	70	51	70	...	...	191
1884	78	39	40	33	...	190
1885	96	49	26	17	...	188
1886	115	31	59	50	...	255
1887	119	33	28	42	12	234

It will be remembered that when Professor Carroll was in charge of the Munster School his pupils took the leading prizes, and many of them, at the two great dairy shows at Birmingham and in London, in 1881 and 1882, although it was stated that good butter could not be made on such land. This result settled the question, and pupils commenced to enter the school in large numbers. The wisdom of the course followed at Glasnevin is apparent, as the instruction is thereby rendered available for the sons and daughter of the peasants, as well as for the sons and daughters of large farmers.

The Munster Dairy School.

It is probable that no institution has achieved greater results in connection with dairy instruction than the Munster Model Agricultural and Dairy National School, which is within three miles of Cork, and which exists for the instruction of young men in the science and practice of agriculture and of young women in dairy management. During the conference of the British Dairy Farmers' Association in May 1887, we had the advantage of visiting this institution, and of personally seeing the admirable manner in which it is managed by Mr Smyth, the director. The school consists of an admirably arranged building and farmstead, to which a farm of 126 acres is attached. The soil is described as a sandstone débris, with a chalky subsoil. About two-thirds are grass and the remainder arable, and upon the farm are kept 35 milch cows, which are selected for their milking qualities. The Conference party when at the school numbered nearly 130 persons, who were entertained at dinner by the ladies' committee; the *menu*, which consisted of thirty dishes, being entirely prepared by the thirty pupils, one girl taking each dish. From this it will be seen that cooking is also taught. We were also shown the capacity of each girl as a dairymaid, as exemplified by the butter she had made up, and which was waiting for inspection. This institution, which is within three miles of Cork, was established for the purpose of affording instruction in the science and practice of agriculture to the sons of farmers and others. A local committee co-operates with the Commissioners of National Education and their officers in watching over the interests of the school, in collecting local funds, and in applying these funds to objects which they think best calculated to promote agricultural education in Munster.

The two main departments of the institution are—

I. The instruction and training of the sons of farmers and others in the best modes of developing the resources of the land.

II. The instruction of the daughters of farmers and of others in improved modes of dairy management.

On the farm practical experiments are carried out in the use of manures, the cropping of land, the feeding of cows both in summer and winter, and in the rearing of calves, &c. It may be mentioned, in passing, that the young men have the advantage of practical demonstration in the most approved means and appliances used in the cultivation and management of the soil, and of dairying, as well as in accounts, surveying, and levelling. Lectures are given them upon agriculture, natural history as applied to the farm, chemistry, geology, and the physiology of farm stock. There is only one session yearly for these students, from August 20 to December 20, and they pay a fee of £7 if resident, or £2 if non-resident; prizes being awarded them after examination each term. The training of young women of the agricultural classes in dairy management includes—

1. Elementary instruction in the nature of food and the feeding of milch cows, and in the nature of milk and its products.

2. Practical demonstrations in the most approved systems of dairy management.

3. Such other subjects as the Commissioners and committee may determine.

The making of butter is carried on with ordinary appliances as well as with those most approved, and includes practical instruction in the factory system and the use of the separator.

There are three sessions, or terms of two months each, in the year, viz.:—

1st session,	commencing	1st	Wednesday	in	January.
2nd	„	„	3rd	„	March.
3rd	„	„	4th	„	May.

The fee for each term is £3, 3s., payable in advance. Non-resident, or extern students, are admitted at a fee of 15s. for the session. At the end of each term an examination is held under the direction of the Commissioners of National Education, and scholarships and prizes, presented by the Royal Dublin Society, are awarded to the most meritorious students. Three scholarships are offered for competition at the end of each session, and are awarded on total marks of over 75 per cent. gained for—1. Proficiency as tested by examination; 2. Butter-making; 3. General dairy business; 4. Best note-book. Other pupils who pass creditably in those subjects are awarded such prizes as the examiners may recommend. A scholarship consists of a free place, value £3, 3s., for one session, to be held within twelve months from date of examination. Any pupil remaining two sessions within twelve months, and passing the prescribed examination, is awarded a diploma. Instruction is also given in the rearing and feeding of poultry, and in bee-keeping. Under the superintendence of the ladies' committee, classes are held during the dairy pupils' term for instruction in cookery and the economical management of food. Members of the ladies' committee visit the school regularly during the dairy pupils' term. The fees named above cover board, lodging, washing, and medical attendance. In every case of contagious disease or severe illness a student is sent home, or to a hospital approved of by the medical attendant.

Time Table.

	H. M.		H. M.	
	A. M.		A. M.	
At	6 0			Pupils rise.
From	6 0	to	6 30	Dress, &c., devotional exercises.
„	6 30	„	7 0	Take part in milking cows, &c.
„	7 0	„	7 30	In dairy.
„	7 30	„	8 0	Make up beds and house business.
„	8 0	„	9 0	Breakfast and free time.
„	9 0	„	10 0	Lecture: Explanation and Examination.
			P. M.	
„	10 0	„	1 0	Practical demonstration in dairy, and general dairy business.
	P. M.			
„	1 0	„	2 0	Dinner and free time.
„	2 0	„	5 30	Part in dairy and part domestic business, alternately.
„	5 30	„	6 0	Take part in milking cows, &c.
„	6 0	„	6 30	Dairy.
„	6 30	„	7 30	Supper and free time.
„	7 30	„	8 30	Reading on subject of Lecture, or Needlework.
„	8 30	„	9 0	Devotional exercises, and retire to bed.

Mr Smyth gives us the following list of pupils which have passed through the school in each year, and he adds that the present class, which opened on 4th January, has the full complement of pupils which can be accommodated, viz., thirty, including four who attended a previous term, and the assistance of five other old pupils—

Number of Pupils.

1880,	32	1884,	65
1881,	39	1885,	76
1882,	36	1886,	89
1883,	54	1887,	82

We append copies of the Certificate and Diploma, and of the form of application for admission, which may be found useful in other cases:—

Munster Model Agricultural and Dairy National School, Cork.

Dairy Department.

Application for the Admission of a Dairy Pupil.

Name of pupil, ——————————— Age,
Address, ———————————
Name of nearest railway station, ———————————
Previous occupation of person for whom application is made, ———————————
To what religious denomination does she belong, ———————————
Name and address of parents, ———————————

Certificate as to Character.

I beg to state I consider ——————————— of ——————————— a person of good character, and in every way eligible for admission as a dairy pupil in above institution.

Name, ———————————
Address, ———————————

Certificate of Medical Doctor.

I certify that ——————————— of ——————————— is in good health, and free from any ailment that would disqualify her for admission to above institution.

Name, ———————————
Address, ———————————

Applicant.

I hereby make application for the admission of ——————————— of ——————————— to the above institution. I will pay the required Fee of Three Guineas as soon as this application is granted.

Name, ———————————
Address, ———————————

Certificate of Attendance at the Dairy School.

These are to certify that——————————————
of——————————————has attended during the terms of two months at this School ——————————————
She has conducted herself——————————————
In the work of the Dairy she is classed—

———for Milking Cows, ——————————
——— „ General Dairy Work,——————————
——— „ Making Butter,——————————
——— „ General Knowledge,——————————
——— „ Cooking,——————————
——— „ Tidiness,——————————
——— „ Notes,——————————

Dated——day of————18——

On behalf of
The Committee of Management,

——————————
Superintendent.

Certificate for Attendance at the Dairy School, and Diploma for Special Merit.

This is to certify that——————————————
of——————————————has attended the Dairy School during the two sessions————and————188——, and has passed the required Examination for this Diploma.

She has been awarded

For——————————————

Dated————day of————18——

On behalf of
The Committee of Management,

——————————
Superintendent.

Diploma Examinations.

In the year 1886 the writer brought a motion before the Council of the British Dairy Farmers' Association, proposing that a sum of £20 should be offered by the Association to provide a scholarship to be competed for by farmers or persons intending to follow the business of dairy farming or dairying. The motion was adopted, and it was provided that the successful competitor, after passing his *viva voce* and practical examination, should proceed to Normandy, and spend two months at least upon a butter farm, and keep a diary for publication. This was published in the Society's Journal.

At the same time we proposed that examinations should be held annually, and diplomas of the first and second class offered for competition by male and female candidates. The first class diplomas to be for proficiency in the science and practice of dairy farming and dairying, as shown by *viva voce* and practical examinations; while diplomas of the second class were for proficiency in the practice of butter-making or cheese-making. This proposition the Association also adopted and carried out.

The following details show the line which the examinations take:—

Class I.—The examination will be divided into two parts—(1) The *theory* of dairy-farming and dairying, and (2) the *practice* of dairy farming and dairying. The theoretical examination will be held at the offices of the Association, 191 Fleet Street, E.C., and include dairy cattle, their feeding, management, breeding, and rearing; foods, and their preparation; the buildings and machinery of the farm; management of the dairy farm; management of the piggery; elementary chemistry, as applied to dairy produce, to foods suitable for cattle and pigs, and to manures; elementary physiology and veterinary science, showing a knowledge of the treatment of stock (cattle, pigs, and horses) in case of accident, disease, or parturition; agricultural botany, so far as relates to a practical knowledge of grasses and forage plants; the dairy, *i.e.*, cheese, butter, and milk rooms—the theory of milk management and milk-setting, cream-raising, and butter-making—the theory of cheese-making; implements and machinery used in connection with milk, butter, and cheese manipulation.

The practical examination will take place at a farm or factory where there is convenience for cheese-making and butter-making, and where implements and machines of all kinds can be used as required; also where each competitor can be taken by the examiners among the stock, into the farm buildings, and over the farm. Each competitor to be tested *viva voce* in each department, to be required to test milk for specific gravity, and to make butter, and at least one kind of cheese.

Class II.—Examination at the offices of the Association in (*a*) the theory of cheese-making or *butter-making*, and milk management; and (*b*) the use of the implements and machinery adopted in cheese or *butter* dairies and factories. Practical examinations in (*a*) milk management, (*b*) cheese-making or *butter-making*, and (*c*) the implements and machinery of the cheese or *butter* dairy.

Although a number of candidates presented themselves for examination, few showed anything like advanced knowledge in either subject. As one of the judges, however, appointed for the first examination, we can testify to the value attached to the diploma, to the earnestness of the competitors, and still more to the great need of instruction, as exemplified by the results. We do not anticipate a repetition of so much ignorance on the part of the majority, and have every reason to believe that the next examinations (in May) will be attended not only by still more persons, but by candidates of much greater attainments.

Dairy Farm Records.

From year to year considerable instruction has been given to dairy farmers through the medium of the Farm Record Competition, which was instituted, upon the proposal of Mr Thomas Higgin of Liverpool to give a fifty pound challenge cup for the best kept record. It is well known that an accurately kept record of the milk-yield of cows, and of the work performed in a dairy, leads to improvements in the system adopted, and to an increase in the profits of a farm or a dairy. The Association's record competitions have therefore afforded a means of instruction to farmers themselves, and there are now hundreds who keep records, more or less elaborate, of a practical nature, where they were almost unknown before Mr Higgin offered his liberal prize.

Dairy Conference.

In all probability the most remarkable position which British dairying has now assumed has been gained more by the aid and impetus given by the annual conferences of dairy farmers than by any other special course of action. To Dr Bond of Gloucester belongs the credit of gathering together the first body of prominent British dairy farmers and others interested in the advance of dairy work. It was our privilege to co-operate with Dr Bond at the Gloucester Conference, and he and his friends, in their turn, gave their cordial support when, at the annual meeting of the British Dairy Farmers' Association, the following resolution was brought before the members—"That . . . . it be an instruction to the council to take into their early consideration the desirability of holding at least one annual conference on matters connected with dairying and dairy farming, at some place in the provinces to be selected from time to time." This was carried, and, the council entering into the scheme, the first conference was held in Cheshire, the second in Derbyshire, and the third, in 1887, in Ireland,—the leading men in each county, as well as in Ireland, taking every possible means to promote the success which was invariably attained. The last two conferences were attended by leading authorities from America, France, Holland, and Sweden; the fourth is to take place in Norfolk and Suffolk, under the presidency of the Marquis of Bristol, who, like his predecessors Lord Vernon and Lord Powerscourt, will undoubtedly render great service to the important interest he represents. It is hoped that another year the Conference may visit Scotland. Thus it will be seen how considerable has been the work of our Association in the education of those who have already passed from the region of school and college to that of practical life.

Private Teaching.

As advocates endeavouring to show the necessity for State assistance in dairy education, we ought not to lose sight of the fact that much can be, and doubtless is, done by practical farmers. We have shown that pupils are received upon farms in other countries, and not only taught the operations of the farm and dairy, but required to devote at least half a working-day to practical work, which partly pays for their teaching and subsistence. The practice of taking pupils in Great Britain is quite common, but as a rule the fees are high and the pupils are not required to work at all. The knowledge which can be gained by a pupil of sufficiently ripe years to think for himself is often very considerable, if he is willing to go through the whole of that laborious routine which he may at some time be called upon to direct. This is still more patent when a dairy of any pretensions is worked in conjunction with a farm. A few words of personal experience may provide matter for reflection upon this subject. Some four years ago, when we had commenced experiments in the manufacture of foreign cheese and forage cropping, the late Mr Jenkins asked us to take as private pupils a young Frenchman who had gained an exhibition from the French Government after passing through a farm school and one of the leading colleges, and a young Dane of considerable attainments. Two other pupils were accepted contemporary with these. During their period of residence these young men assisted in the practical work of the dairy, and upon the land—especially in the conduct of cropping and feeding experiments—and numerous experiments with milk and cream, cheese, and butter. In all cases the produce of the land was utilised in feeding the cattle, and that of the cows in making butter and cheese of various kinds. So far any extensive system of cheese manufacture was not conducted, the whole dairying operations being carried out from an educational standpoint. The idea, however, of Englishmen producing foreign cheese was not acceptable to some persons, who attempted to ridicule it, and from that moment manufacture for market commenced, and now that it has been shown that the dairy can send out French and Italian cheese—such as the Camembert, the Neufchatel, the Brie, and the Gorgonzola—absolutely equal to the produce received from abroad, and so largely sold in the British markets, there are numerous persons who, believing that they will afford the means of more profitable dairying, are desirous of receiving instruction in their manufacture. The committee of the House of Commons, before whom we were examined upon the "Dairy School" question, laid considerable stress upon this branch of dairying. The Italians at their chief dairy school teach the manufacture of four varieties, including Gruyère and Parmesan. At Kiel French cheese is made in addition to the cheeses of the country. In Denmark Madame Hanna Nielsen obtained great notoriety on account of her skill in making a variety of the cheeses of other countries, which she sold in her shop, and upon our visit to her in 1883 we found her surrounded by ten female pupils, and engaged in the manufacture of one of these varieties. In a word, we are convinced that the British student should be taught to make any class of dairy produce which finds a ready sale in his country, and that his knowledge should not be gained by mere theory and experiment, but by theory and daily practice where manufacture is conducted from a business standpoint, and where the reasons for the many complicated questions which arise in connection with the temperature or fermentation, rennet or fungi, can be explicitly given. This branch of dairy education is quietly and steadily proceeding; but, inasmuch as the students, whether they are private pupils, or pupils at the Royal Agricultural College, are persons of education and some position in life, it is certain to have considerable influence in the near future, when they will be in a position to bring their knowledge to bear to its full, and to commence to supply, or assist others to supply, our markets with their wares. We do not feel any hesitation in stating our belief that the new scheme of dairy education in Great Britain will make itself felt earliest and keenest by the foreign dairy farmers, who supply our markets with some of the most popular of the Continental cheeses, because, although the quantity consumed in this country is comparatively small, it is really great.

Working Dairies at Agricultural Shows.

So far as we are able to learn, the instruction of the public through the medium of public demonstration, commenced with the dairy shows at the Agricultural Hall and the Royal Agricultural Show at Kilburn, where the arrangements were carried out by Mr G. Mander Allender, one of the pioneers of British dairying. Since that date the Royal, like the British Dairy Farmers' Association, have regularly made an important feature of their working dairies, which are not only the media of ordinary demonstration, but afford means of conducting competitions in butter-making, an innovation which has been the means of attracting the public and adding many skilled persons to the ranks of practical dairy workers. It is probable that no man gave so much assistance in promoting the extension of the working dairies and butter-making competitions as the late Mr H. M. Jenkins, whose early death was a great blow to dairying. The next important agricultural society to follow suit was the Royal Dublin Society, which enjoyed the invaluable aid of Canon Bagot, who has laboured harder than any man to spread a knowledge of good butter-making; of Professor Carroll, to whom the great early successes of the Munster School were due, and who is chiefly responsible for the admirable system now conducted at the Glasnevin College and Farm, of which he is director; of Mr James Robertson, an indefatigable, earnest, and well-beloved worker in the cause; Mr Richard Barter, honorary secretary of the Munster School, and others. Next came the Bath and West of England Society, which, under the management of another great friend of dairying, Mr George Gibbons, has conducted some of the best demonstrations—cream-raising trials and butter-making competitions. At each exhibition since the introduction of the dairy, the writer has given a variety of demonstrations at this great annual meeting, together with lectures on general dairying. Important series of lectures have also been given by Canon Bagot and Professor Carroll. Lincolnshire made the next departure, and, as in the case of the Essex show, conducted working dairies, with lectures, in connection with the British Dairy Farmers' Association. The Cheshire Dairy Show has, with the practical help of Mr Rigby, Mr Willis, and many others, always been a success in this direction; and Mr Rigby has carried his zeal into the great Manchester and Liverpool Society, of which he is secretary, where a first-rate working dairy was organised last year, and where lectures were daily given by Professor Carroll and ourselves. The Royal Counties, the Somerset, and the Suffolk Societies also started in the same direction last year, although on a smaller scale; while the Gloucestershire Society has already advanced far, under the incentive long given by Lieut.-Colonel Curtis Hayward and Dr Bond. Working dairies and lectures have now become somewhat general, and are gradually extending throughout the country, as we have reason to know, from the many requests made to us to render assistance. We have now, however, no fear in stating that several of those who have so long carried their advocacy of improved dairying into more practical platforms have, except in few instances, done so at their own expense. There is, however, a limit to such work, more especially in the cases of men to whom both time and expense is of considerable moment.

If we venture to point out how working dairies may be improved and their influence increased, we should suggest that they should be constructed so that, whatever shape the building may be, the enclosure itself should be circular. The present system entirely prevents those at the corners either hearing or seeing when the dairy is large. With regard to the work conducted, the programme should be drawn up by an expert, and carried out under his charge. The floor should not be covered with implements which are not actually used, nor should the friends of officials be admitted during demonstrations and lectures, both alike disturbing those engaged and obstructing the view or hearing of the public. Having assisted in all parts of the country, we are too well acquainted with the necessity of carrying out clear rules in a rigorous manner. Again, the prizes are too often awarded to butter which is too new to judge instead of to the work of the operator. A skilled judge would prefer to see a person work if he purposed engaging him himself; but butter, which is perfectly sweet when quite new, is often made up by working with the naked hand or with a cloth, which is equally disagreeable, or indeed the operator may display entire ignorance of the rules of good butter-making which a judge at once detects if he sees the operation. Instead of making awards by points for texture, colour, flavour, and *weight* of butter, the features to be considered should be (1) knowledge of butter-making as evinced by the work of the competitor, (2) expedition, expertness, and cleanliness, (3) the quality of the butter itself. To award prizes to weight is to encourage the most objectionable of all practices—bad washing in the churn and bad working; in the one case curd is left in the butter, and in the other water, both contributing to add weight; thus, instead of 7 per cent. of water and a trace of curd, we have perhaps 18 or 20 per cent. of the one and 4 per cent. of the other. Again, we consider that public demonstrations or comparative experiments in raising cream by the leading systems should form a feature in every working dairy. There is no branch of the work which so readily and so fully shows the practical farmer how much money he is losing by his primitive practice; but the work should be well done and thoroughly explained. Lastly, we can see no reason why the British public should not receive instruction by demonstration in cheese-making, including those leading foreign varieties which find an important sale in this country, such as the Dutch (Edam and Gouda), the Gorgonzola, and the Gruyère.

Dairy Institute and Experiment Station.

At the annual meeting of the British Dairy Farmers' Association in March 1886, we proposed that an institute should be founded with the threefold object of teaching, experiment, and research. The idea was well received, and the council at once proceeded to carry it out. A committee was formed, a scheme drawn up, and visits made to suitable localities. Aylesbury was finally selected, and meetings held, which were addressed by delegates from the Association. The Bucks farmers formed a local committee, with the view of obtaining support—the council of the Association having determined not to commit itself until £500 had been subscribed, when it promised to add £100, and to make an annual grant if necessary. Up to the time we write, the scheme has received the support of the Duke of Buckingham, Lord Rothschild, Mr Leopold Rothschild, Sir Harry Verney, and many of the landed gentry of the county; and, in addition, a large number of farmers have consented to subscribe for three years. As the money will be easily obtained, and as a suitable building can be secured, it is probable that the institute will be the first of its kind in this country, and that it will, moreover, earn the right to receive a liberal grant from the Government.

A movement has been inaugurated in Scotland by Mr A. W. Cruikshank, who desires to found a dairy school for Forfar and Kincardine shires; and there is some probability of a second school being started in Cheshire, and of a new one in Leicestershire, important meetings having recently been held with that object, which we were invited to address, the initiative being due to Mr Thomas Nuttall.

France.

We are indebted to numerous friends in France for particulars of the dairy instruction which is being communicated in that country, but especially to Professor Lezé, the editor of *L'Industrie Laitière*, and to M. Wery, secretary of the Institut National Agronomique, who kindly gave us introductions to the directors of the principal dairy schools.

There are already existing, or about to open in France, six dairy schools, viz. :—

Coigny (Manche), ... } Budget, £800.
Saulxsurres (Vosges), ... }
Saint Remy (Haute Saône).
Coëtlogan, near Rennes (Ille-et-Vilaine).

Schools are also in process of erection at Aumale (Seine Infèrieure), Maroilles (Nord)—all of which receive assistance from the Government. The first two schools are in connection with the farm schools forming one of the branches of French agricultural education, which is divided into four systems. The principal system is centred in the Institut National Agronomique at Paris; the second system in the three colleges of Grignon Grand Jouan, and Montpellier; the third system includes seventeen schools of agriculture and irrigation, and three schools of horticulture and viticulture; while the fourth system includes nineteen farm schools distributed in different departments of France. Some of these we have had the advantage of inspecting in addition to the College of Grignon, where dairying forms a branch of the studies, both practical and theoretical. The dairy is well arranged, although by no means large, and it is fitted with the Danish separator and other important new machines and utensils. At Grand Jouan a dairy branch is to be shortly added.

The practical schools of agriculture were constituted by the law 30th July 1875. The Government pays the expenses of experimental and personal instruction; it takes care that the farm is well conducted; it affords good examples of culture; but the department or the proprietor of the farm in connection with the school is responsible alone for the profit or loss. If a school is found desirable in a particular district, those who have facilities and who care to undertake the responsibility, make application to the Minister of Agriculture, who forthwith creates a school, if the building, the farm, and the whole *tout ensemble* are found satisfactory, and in this case the Government grants are made. From personal examination of the system conducted upon these farms, and we may take La Pilletière in Sarthe as an example, the system affords a capital model for a similar class of schools in this country, more especially for schools of dairying. The proprietor at Pilletière, M. de Villepin, is appointed director, and he is assisted in some cases by the sub-director, and always by a *personnel*, comprising teachers of agriculture, zootechny, rural economy, and masters who instruct in mathematical science and natural history; also by a veterinary surgeon, a farm bailiff, a head gardener, a book-keeper, and a military instructor. These schools receive the sons of small proprietors, farmers, and artisans, all of whom are lodged and boarded. The cost of education varies between £16 and £24 per annum; but in some cases a certain number of purses are provided by the Department or State, carrying gratuitous instruction, also of prizes which are awarded to pupils when they leave, varying from £8 to £20. One half of the day is devoted to the practical work of the farm, the other to study. The age of the pupils varies on admission from 14 to 16. We find in a note prepared by the Minister of Agriculture on the organisation of these schools, that in pasture districts only one pupil is permitted to each 12 to 15 acres, and that the pupils are required to remain from two to three years. The director is allowed a sum of £10, 6s. per annum for each pupil, whose work, valuable in the case of the older ones, is at his disposal. The payment of the *personnel* is as follows:—

The director receives for his personal service,	£96.		
The "surveillant," who is accountant to the director,	40	to	£60.
The head gardener,	40	to	60.
The farm bailiff,	40	to	48.
The veterinary surgeon,	20	to	22,

—there being three classes of salaries for each teacher. The whole of the staff is responsible to the director, who nominates and dismisses them.

There appears to us to be no reason why practical schools of dairying should not be formed upon a basis similar to this, where a responsible farmer or owner who farms his own land could be found to undertake to combine a school of instruction with his farm. He might with very great benefit to the State be taken under its wing, and created director of the school, provision being made for the payment of himself and staff, together with so much per head for the pupils. It would necessarily be required that his system of instruction, both as regards theory and practice, should be conducted in a manner satisfactory to the Agricultural Department or the Minister of Agriculture, who before such schools are created in England will undoubtedly come into existence. There is a great distinction between agricultural education of a high class and of a class suitable to a working population; it is the latter which is the most admired, and that education can only be conducted satisfactorily when the practice is so regular and complete that the pupils will be daily engaged in work as they would be if labouring for a wage, or upon the farms of their parents, thus gaining experience from every-day practice of the best possible kind.

According to the German author Martiny, the following schools also exist in France, although we have been unable to obtain details respecting them from the French authorities with whom we are acquainted:—The cheese school of Maillat, in the department of Ain. This school was founded by the Cheesemakers' Society of Maillat, under the authority of the Agricultural Department of France, in 1882. The course of instruction lasts one year.—The cheese school of Ruffien, also in the department of Ain, which was opened in 1883. The course lasts one year.—The cheese-making school of Gruyère, connected with the farm school of La Roche, in the department of Doubs. This school is for the instruction in Gruyère cheese-making.

In many of the southern dairy districts, especially of the Alps, the Jura, and the Vosges, there are *fruitières-ecoles,* which, together with a certain number of fruitières (co-operative dairies) and cheese factories, receive subventions from the State, the whole sum granted amounting to from "80,000 to 100,000 francs" (£3200 to £4000).

France is well supplied with teachers, not only in its numerous schools, but in the person of the professor attached to each department; and as there are some 300 trained experts employed under the Government régime, the farm school will always afford a medium for the entrance of a number of young men into agricultural life. Government aid, however, does not stop here, for travelling scholarships are awarded annually, and these are worth £100 a year for two years. There are also large sums granted for prizes and medals, awarded to leading farmers for good cultivation, and to manufacturers of dairy produce and implements. According to the budget of the Minister of Agriculture for 1888, in which reductions are made under each department as compared with the sums granted for 1887, it appears that the total, which reaches $1\frac{1}{2}$ millions sterling, includes £18,500 for the "personnel," and £24,000 for the "matériel," in connection with instruction and stock-breeding establishments, and £29,200 for subventions to the various agricultural institutions, chiefly schools and experimental stations. It is also proposed to establish a national "cowhouse," chiefly for the production of good dairy cattle, in Normandy.

Saulxsurres Dairy School (*Vosges*).

We have received numerous details with regard to this important school of dairy farming. The director, M. Brunel, says the principal aim of the school is to improve the dairy industry of the Vosges, where a large quantity of cheese, known by the name of Gerardmer or Géromé, is made. This cheese constitutes the principal source of revenue of the mountain farmers, and is sold in most of the chief towns of France and Algeria for consumption by the working classes. As a rule, the Géromé cheese is not esteemed by the better classes on account of its size and its smell, which in consequence of bad manufacture is often most pronounced. The work of the school is to modify and improve this cheese, which has been made upon a method adopted "from all eternity." So far, the results obtained have been most satisfactory, and the cheese of the school has invariably obtained the first prize in competition. The instruction imparted has principal reference to this important industry, but it does not prevent the pupils being instructed in the manufacture of butter and of other kinds of cheese, although the work in connection with them is only in the form of demonstration. The students also receive instruction in agriculture appropriate to the requirements of the district generally. The course lasts two years, and the students divide their labours, working in the morning and studying in the afternoon; indeed, they perform the whole work of the farm, both interior and exterior. The instruction given is gratuitous, but £20 per annum is charged for board; in some cases, however, the pupils have received purses either from the State or the Department. For one reason the director believes that the number of pupils will never be considerable, and this is that the farmers chiefly interested have not even the small means at their command which would enable them to pay the very moderate charges of the school, nor do they yet sufficiently understand the great necessity of agricultural instruction. It is for these reasons that the Department provide so many scholarships or purses. Every pupil upon leaving receives a diploma if he passes his examinations. Some of the pupils become farm bailiffs, others chief dairymen or cheese instructors, and others again pass to superior schools, and become teachers in their turn. The *personnel* includes a director, a professor of dairy farming, a professor of agricultural science, a veterinary surgeon, two instructors who teach mathematics and French, a farm bailiff, and a gardener. The dairy school is now only in its third year, the establishment having originally been a farm school only. The director accepts day pupils and externes, as well as boarders; these two classes pay £10 and £2 each respectively. The system of instruction in detail and of control is identical with that which has been referred to in the schools above mentioned. The school is provided with admirable class rooms, a chemical and other laboratories, collections of instruments and objects of interest to dairy farming, and a library. Among other introductions the director has instituted the use of metal cheese-moulds instead of moulds of wood, which appear to have had much influence upon the odour of the cheese of the district. He has also immensely assisted farmers by teaching the use of the rennet of commerce, instead of that prepared by them on twenty different plans. Already the dairy industry of the Vosges has been totally changed, and in view of this fact the French will undoubtedly multiply the dairy schools which they have commenced to organise. The land attached to the school comprises 40 acres of irrigated meadow and 12½ acres of ploughed land.

Coigny Dairy School.

The dairy school of the Department of La Manche was opened in August 1886, by order of the Minister of Agriculture. It is intended to prepare teachers to give advanced instruction to farmers in general, and to young people destined for an agricultural career, with special reference to the dairy industry. The establishment occupies the spacious buildings of the farm of Vieuxchâteau; there are capital class-rooms, dining-rooms, dormitories, and other requirements, especially as regards health and light. Upon the farm attached to the school the pupils are able to see and follow all the operations of culture. The pupils received are either boarders, day-boarders, or externes; the first named pay £16, the second £10, and the externes £2 per annum, in three terms in advance. They are also required to pay per annum a sum of 20 francs (16s.) as a guarantee of payment of articles broken, spoiled, or lost by any fault of their own. The Government annually provides £96, and the Department £160 for scholarships, which are arranged by the Minister of Agriculture and the Prefect of the Department, upon the proposition of the committee of surveillance. These scholarships, or purses as they are termed, go to successful pupils whose parents' means are shown to be insufficient for the education of their children. Pupils are received after examination, which takes place on the third Monday in September. and the course which commences immediately afterwards terminates on the last Saturday in August. Pupils must be between fourteen and twenty years of age, and they are required to furnish the usual registers of birth, vaccination, and good conduct. The examination for entrance is, in the French language, the metric system, and the history and geography of France; but a knowledge of other subjects assists them in competition for vacancies. The course of instruction lasts two years, and comprises both theory and practice—one half of the day being devoted to practical work in the field, the laboratory, or the dairy, or with the stock; visits are also made to the neighbouring farms. The theoretical instruction includes geometry, levelling, plane and lineal drawing; physics with special regard to their application to the dairy, chemistry as applied to dairy farming; natural science, including botany, geology, zoology, diseases of plants; general agriculture; rural engineering, dealing with the implements and machines of the dairy farm; rural economy, zootechny, especially with regard to the health of farm stock; agricultural accounts, and of course, as in almost every French school, military exercise. Lessons last one and a half hours, the first half hour being devoted to questions upon the preceding lesson. Scholars who fail to pass their examinations may double their period of instruction, but if they have received a scholarship they lose the advantage of such State assistance. Certificates of instruction when awarded convey certain rights, such as the benefit of a year in the *Volontariat*, and the right to compete for scholarships offered by the National School of Agriculture. The *personnel* includes a director, who is in charge of the institution and the farm; and a sub-director, who takes charge of the instruction and the discipline of the scholars. Especial subjects are physics, chemistry, and dairying. There are two professors;—one who teaches agriculture, rural economy, and engineering; and the other the natural sciences, zoology, and zootechny. A master gives instruction in primary education; there is also a veterinary surgeon who deals with his own department; a dairy director, a gardener, and a military instructor. The committee of surveillance is composed of the Inspector-General of Agricultural Instruction of the District, who is president; three members of the council-general of the Department; a professor of science attached to an establishment of public instruction, and two leading agriculturists of a department named by the Minister; a medical man is also attached to the establishment. Each pupil is required to provide himself with a specified list of clothing, including a uniform, two pairs of "sabots" (probably of wood), sheets, and pillows, &c.; he must also provide his own books and other necessaries of instruction, and pay annually 32s. for his washing expenses. The school is on the line between Paris and Cherbourg, the nearest stations being those of Carentan and Chef-du-Pont.

Coëtlogan.

The practical dairy school of Coëtlogan is established in the chateau of the same name, which is upon the domain connected with the farm school of Trois-Crox. It was created by the Government at the request of the Chamber of Commerce of Rennes, and is maintained by subventions from the Ministry of Agriculture. In the town of Rennes and the department of Ille-et-Vilaine every effort has has been made by these authorities to provide the farming community of the district with thoroughly practical instruction for young women, such in fact as is afforded to young men at the farm school. The directress of this dairy school is Madame Eugène Bodin, who is assisted by her daughter, the actual work of cheese-making and butter-making being in the hands of a dairyman and his wife, with the full assistance of the pupils. Madame Bodin tells us that if there were more pupils the manufacture of both butter and cheese, which is an important industry in the district, would be largely augmented. Pigs are bred, in order to show how skimmed milk and whey may be utilised, while dairy work is the essence of the teaching. Madame Bodin adds that the pupils are kept informed with regard to the whole work of a farm, in order that they may take their part in its management in their future career. According to the programme of the school, the term for studies last six months, although upon request those pupils who are sufficiently deserving may be authorised to remain an entire year. The cost, including board and lodging, is £5 per quarter. Four purses or exhibitions have already been placed at the disposition of scholars by the Government, and several others by the Conseil Général of the Department, these conveying the right to gratuitous instruction during the entire term. All scholars, whether they have gained exhibitions or not, are required to procure their own books and other necessaries of instruction, together with the following trousseau:—two pairs sheets, two blankets, one pillow, four pillow-cases, four large aprons, six serviettes, and four pairs of false sleeves; the ordinary clothing being left to the discretion of the parents. The pupils are under complete surveillance at all times, and are unable to leave the school without the authority of their parents and the permission of the directress. The first course of instruction commences in January, and terminates at the end of June, the second course commencing in July and ending in December; no pupils are received under fourteen years of age. Each pupil is required to furnish the following documents to the directress upon application for admission, at least fifteen days before the examination:—(1) the request of her parents, upon stamped paper; (2) a copy of their registry of birth; (3) a certificate of vaccination; (4) a certificate of good conduct from the mayor of the commune or the directress of the school where the pupils terminated their studies; (5) diplomas and certificate of studies must be attached. Where application is made for a purse for gratuitous instruction, the pupil or parents must attach some data prepared by the conseil municipal, showing the position and resources of the family. All applicants for admission must pass an examination in the French language, in arithmetic (the metric system), and the history and geography of France. Applicants who are furnished with certificates of studies are allowed to compete for vacancies in the school. Admission is finally granted by the directress, subject to the approbation of the Minister of Agriculture. The instruction in the school is both practical and theoretical. The theoretical department includes (1) a study of the dairy cow, her character, management, feeding, and breeding, and the fattening of calves; (2) hygiène of the farm; (3) milk and its management, the utilisation of the produce of the dairy, the implements and machinery used in the manufacture of butter and cheese; (4) the piggery and the poultry yard, and the breeding and feeding of pigs and poultry; (5) the management of the farm, especially with regard to the dairy work and accounts. The practical instruction comprises the manufacture of butter and cheese, the feeding and management of poultry, some knowledge of gardening, together with sewing, cooking, and laundry work. The time of the pupils is divided into two parts, in order that they may receive lessons during the one portion of the day, and practical instruction during the other. Thus concludes the programme—"There will be neither fatigue for the spirit nor lassitude for the body." Pupils who accomplish their term of studies with regularity, and satisfy the examiners, are awarded a certificate by the Ministry of Agriculture upon the proposition of examiners. During the examination at the close of the first term of 1887, the committee present were M. Gréset, conseiler général; M. Mengère; MM. Champion and Galery, farmers; and M. Le Chertier, director of the Station Agronomique of Rennes. The pupils were questioned *viva voce*, and required to perform certain dairy operations, and six were awarded diplomas. Some difficulty is experienced in getting the pupils for the commencement of the second term, in consequence of the parents requiring the assistance of their daughters during the busy months of July and August. Professor Le Chertier considers that the future of the school is assured, and that its success is owing to its excellent installation, to the good instruction given, and the intelligent management of Madame Bodin, whose name inspires confidence in the minds of the farming community.

Germany.

It is an undoubted fact that we owe a great debt to Germany for the valuable discoveries she has made, and the facts she has elicited through the medium of multitudes of experiments in the science and practice of the dairy. We must not, however, omit to notice that this good work has almost wholly been done through the action of the Imperial and Provincial Governments in affording pecuniary aid, first for the instruction and preparation of teachers, and next for the conduct of experimental work. This aid has not been great; but, remembering the laborious, patient, and careful nature of the German scientist, it has been sufficient to enable him to solve problems to which we in Great Britain have not had the time or the means to turn our attention. The prizes connected with agricultural science and the pay for agricultural scientific work are not so great that the few qualified men we have can afford to neglect the ordinary means of earning subsistence. Government aid, however, although given with a careful hand, would afford the means of solving many difficult questions, each of which at this moment stands in the way of greater profit or larger returns to the dairy farmer.

Germany is splendidly equipped as regards agricultural education, from the humblest to the highest degree; and it is now within the means of every Hanoverian farmer or Pomeranian peasant to obtain instruction in the elementary science as well as the practice of dairy work. The universities and schools, where the dairy is but a passing subject, are supplemented by the *Wanderlehre* or travelling lecturer, the forty dairy schools

German Dairy Schools.

Name.	State.	Subjects.	Pupils.	Land and Stock.	Terms.	Fees.	Grants, &c.
Badbergen, . .	Hanover.	Dairying and housekeeping.	girls.	10 cows.	6 months.	£7, 10/.	£150.
Lensahn, . .	,,	Dairying.	men.	300 cows.	3 to 4 months.	£12, 10/.	..
Nortrup, . .	,,	...	...	1320 gallons milk daily.	3 to 6 months.	...	...
Gross Himstedt, .	,,	Dairying and housekeeping.	girls.	180 acres, 40 cows.	1 year. ½ year.	£22, 10/, incl. £12, 10/, incl.	120 girls have passed through this school.
Banke, . . .	,,	,,	,,	340 acres, 40 cows.	9 months.	£17, 10/.	£50 from Government—£75 in all.
Paese, . . .	Luneburg.	,,	,,	60 acres. 65 gallons daily.	¼ year. ½ year.	£7, 10/. £10.	£25.
Grunlichtenburg, .	Saxony.	,,	,,	30 cows.	4 to 6 months.	£10 to £12, 10/, inclusive.	State aid.
Rotha, . . .	,,	,,	,,	100 cows.	6 months.	55/ month.	£75 yearly.
Freibergsdorf, .	,,	,,	,,	60 cows.	,,	50/ month, inclusive.	£75 to £120 per annum.
Ober Cunnersdorf, .	,,	Dairying.	,,	A dairy.	3 months.	...	...
Heinrichsthal, .	,,	Dairying and housekeeping.	,,	220 gallons daily.	,,	£3 monthly, inclusive.	...
Lentwitz, . .	,,	Dairying.	...	...	6 months.	30/ do. do.	...
Sachsenhausen, .	Brandenburg.	Dairying and housekeeping.	girls.	27 acres.	3 months.	£5.	No grant.
Radolfzell, . .	Baden.	,,	,,	...	5 months.	30/ per course.	£70 from Government, and £275 donations.

Kleinhof-Tapiau,	Prussia.	Dairying.	girls.	Cows and dairy.	6 months.	25/.	Various grants amounting to £270.
Do.	,,	,,	men.	,,	,,	£7, 10/.	
Warnikam,	,,	,,	girls.	...	1 year.	50/.	£60.
Luisenhof,	,,	,,	,,	...	,,	Some free.	£60.
Ober Emmelsum,	,,	Dairying and housekeeping.	girls.	50 acres.	6 months.	£22, 10/.	£50; 12 pupils.
Bolkershof,	,,	,,	,,	145 acres.	6 to 12 months.	£30.	...
Lundsberg,	Bavaria.	...	peasants' sons.	...	4 months.	£7, 10/.	Some free pupils.
Weihenstephan,	,,	Dairying.	young men.	A dairy.	8 weeks.	£2, inclusive.	...
Rastede,	Oldenburg.	Dairying and housekeeping.	girls.	62 cows.	6 months.	£15.	...
Casekow,	Pomerania.	Dairying.	...	60 cows.	6 months.	30/ month; some free.	£475 per annum.
Grothe,	Osnabruck.	,,	girls.	125 acres.	3 months.	£7, 10/.	£155.
Proskau,	Silesia.	,,	young men and girls.	30 gallons daily.	6 to 8 weeks.	10/, for instruction only.	£470, including £200 from Imperial, and £250 from Provincial Government.
Cservink,	Westphalia.	,,	girls.	A dairy.	1 year.	£7, inclusive.	£60.
Insel,	,,	,,	both sexes.	...	6 to 12 months.	£7, 10/ per qr.	£10.
Brunswick,	...	Factory dairying.	,,	Factory.	...	£6, 5/ per month, inclusive.	...
Kiel,	...	Dairy school and experimental station.	,,	10 cows, and milk from 20.	3 months. 1 month. 14 days.	50/. 30/. 20/.	£375 from Central Government, and £300 from Provincial Government.
Emmelsum,	Wesel.	Dairying and housekeeping.	females.	55 to 90 gallons daily.	$\frac{1}{2}$ year.	£7, 10/ quarterly.	£50 from Agricultural Union, and subsidy of £150.

Where the amount of the grant is not stated the amount has not been ascertained.

and institutes and the numerous societies, most of which take the deepest practical interest in education. These societies are —the Dairy Association, the East Prussian Dairy Society, the Danzig Cattle-Breeding and Dairy Society, the Glatz Dairy Society, the Dairy Society of Posen, the Schleswig-Holstein Dairy Society, the Berlin Dairy Association, the Dairy Farmers' Society of Berlin, the Berlin Cheesemakers' Society, the Wurtemburg Dairy Society, and several others.

We have received letters and printed details in, if possible, too great numbers from many of the German schools and stations, and from these we have selected those of the greatest importance, in order to show the systems adopted. In many cases details of the Government grants made are given, but up to the time of concluding this report particulars which have been promised by the officials of the agricultural departments at Berlin, Dresden, Carlsruhe, and Munich have not arrived. This is the only essential information which is incomplete. From the very many letters which we have received from directors and others connected with the schools, we have no hesitation in believing that the attendance of pupils is almost invariably great, especially during the winter session, and the benefits which they derive are very considerable. The farmer is able to control a business the better from his greater acquaintance with its details; the farmer's daughter is fitted to take charge of the house and dairy of her future husband, with greater economy on the one hand and profit on the other; while the remaining classes are fitted to commence life as teachers, factory hands, or dairymaids.

According to the statistics of 1886, kindly furnished by the Minister of Agriculture of the Imperial Government at Berlin, there appeared to be eleven royal agricultural colleges, sixteen agricultural schools (Landwirthschaftschulen), thirty-two lower agricultural schools (Ackerbauschulen), and forty-five winter agricultural schools, in addition to forty-three special schools and courses of instruction, in addition to many others in Saxony, Bavaria, Wurtemburg, and Baden, which appear only in the statistics of those Governments. Dairying is taught in some form at the great majority of these institutions, almost all of which receive State grants, thus:—The total Government grants to the colleges, as we have extracted them, amount to £36,124, or over £3000 each, Berlin absorbing £10,000 for the Royal High School, and £5000 for the practical course in connection with it; whereas Kiel, with its important dairy experiment station, receives only a few hundreds. The agricultural schools receive £12,750, or about £800 each, exclusive of grants from other sources; whereas the lower schools receive £6850, or about £210 each, in addition to other grants in many cases. The grants made to the winter schools vary between £60 and £400, but there are grants from provincial governments and agricultural societies which make their income considerably higher.

Berlin.

I am indebted to Professor Lechmann of the Royal Agricultural High School of Berlin for the following information regarding his course as Professor of Dairying. The course of instruction is divided into two terms; two hours weekly only being devoted to book study. The production and management of milk is chiefly treated upon during the summer season; cream, milk, and cheese being the subjects of study during winter. Lectures are given, which are illustrated with models of the machines and appliances used in dairying. There are also weekly examinations of milk, rennet, and dairy produce, when experiments are made in order that the pupils, who are well-educated young men, may become intimately acquainted with them. The class numbers from twenty to fifty pupils; but there is no practical instruction in dairy work or dairy farming, a laboratory only being provided, and for this a small annual grant is made by the Government.

Pomerania—Casekow.

This school was founded in 1880, and is supported by the Government and the two Pomeranian agricultural associations. Some 250 individuals have already passed through its curriculum, and considerably benefited by what they have learned. Some of these have already been employed as directors of larger schools, and others as stewards or managers of estates or farms. The director of the school, Mr Du Roy, is the official adviser of the province, and he studies to develop dairy work, which has so long been foreign to the country. The course of instruction lasts six months, and there are two sessions yearly, commencing in January and July; young men being taken for one course, and young women for the other. The teaching is entirely gratuitous, but pupils are required to pay 30s. per month for board and lodging. The subvention received from the State is £225, and from the province £250. Pupils, before entering the school, are required to possess some knowledge of the management of milk and of dairy cattle; they are required to do the work of the dairy and farm in accordance with the direction of their teachers; certificates are given them at the conclusion of each course, and these are found to materially assist in preparation, as they are valuable by reason of good behaviour and the knowledge they display. A certain sum of money is provided for the instruction of three pupils. The scheme of the management of the school is to improve the knowledge of those who intend to take up practical dairying, and to obtain employment for pupils upon their removal. The theoretical instruction combines or includes (1) chemistry of milk, (2) management of milk, (3) the utilisation of milk, (4) the preparation of butter and cheese, (5) dairy-book and record keeping, and (6) the importance of a knowledge of fodder plants. Demonstrations are given in the laboratory in connection with the first subject. Experiments are regularly made in the raising of cream for butter manufacture and exportation upon four systems—the centrifugal separation, the Swartz or ice system, the Holstein system, and the churning of milk. In the cheese department pupils are taught the manufacture of Tilsiter Romatour, a popular Continental variety, Camembert, and Backstein. In order to obtain a knowledge of calf-rearing upon skimmed milk, pupils are required to bring up calves, taking their entire management until they are weaned; they are then shown, by the value of the milk and the regular weight of the calves, what is the weekly and general gain. Pig-feeding is also taught, the buttermilk and whey from the dairy being used for the purpose. The school is provided with a herd of 60 cows, and a steam dairy with a capacity to deal with 4000 litres of milk per day.

Kiel.

The Kiel Institute and Experiment Station at Kiel is one of the most important in Germany, and it has been mentioned by some of the German authorities, with whom we have been in correspondence, as an establishment the full details of which should be thoroughly known. It appears to receive a grant of 7500 marks (£375) from the Minister of Agriculture, and adopts a system of teaching with practice of a kind which is certainly not followed in many other places. Milk is regularly handled from 30 cows—20 the property of a neighbouring farmer, and 10 (5 of which are Angeler and 5 Holsteins) the property of the station. The dairy is provided with a two-horse-power steam-engine and a Laval separator, which like the churn is worked by steam. One of the chief objects of the station is to encourage the manufacture of cheese. It appears that, in consequence of the establishment of so many co-operative cheese factories, cheese-making had almost gone out of existence; and this fact, combined with the cramped condition of the butter trade, has induced the officials to push cheese-making forward. A large number of rules are printed in the Report of the station respecting the entrance of pupils, who must have already been actively engaged in dairying, and who have been taught both theory and practice; they must be at least eighteen years old, and those coming from Schleswig and Holstein are preferred. The two courses last three months each—November 1 to January 31, and April 1 to June 30. The pupils are required to take part in the whole work of the farm and dairy. The science teaching is regular, and they have the opportunity of doing laboratory work under the chemist of the station, and they are subsequently sent, if necessary, to country dairies in the province for practice. Pupils are not boarded or lodged, but their comforts are looked after by the director. The fee for each course is 50s. Students of another class are also permitted to study at the station for long or short periods; they are recommended to attend during the months of January and February, when the director gives a fourteen days' course and a four weeks' course, which is also attended by the students of the Kiel University and the officer of the Agricultural Confederation. These students, who have every advantage of practice and laboratory work, pay 30s. per month, or 60s. with private instruction. There is also a third course of instruction, lasting fourteen days, in January, which is intended for the study of the basis of dairy farming, its value to landowners and tenants, and of milk examination. The instruction, which is divided between the principal and his assistants, deals with a large range of technical dairy science. The fees in this case amount only to 20s. The students and scholars in the first and second branches are permitted to join this branch if there is room in the lecture hall. The latter pay similar fees to these, but the former pay nothing in addition.

The work of the station does not stop at teaching pupils; it embraces a very large range of instruction; and in the past year or two twelve different works, showing the aim of the experiments, have been published. These experiments dealt with the making of cheese, the value of butter, the dairy trials, the value of hay and oats as fodder, the value of malt and palm-nut cake, the changes of milk in freezing, &c. A series of complete analyses were also made of a number of feeding stuffs.

There were also—

350 experiments upon milk produce under different systems of feeding.
14 experiments in frozen and normal milk.
12 experiments to determine the composition and volatile fatty acids of butter.
2 analyses of sediment obtained from "cheesy" milk.
90 experiments with purchased milk.
90 experiments with Soxhlet's method of determining fat in skimmed milk.
720 experiments with the milk of the cows of the station.

There were also experiments with samples of milk and other products which were submitted to the station; these included 360 samples of milk produced by a dairy company. In this case 30 samples arrived monthly, also 57 samples of other milk, 13 of skimmed milk, 9 of butter, 5 of rennet, 4 of colouring matter, 1 of condensed milk, 1 of whey, and 1 of milk sugar. Of the 57 samples of new milk, 47 per cent. were adulterated with water. The result of their experiments induced the officials at the station to recommend buyers to pay for milk according to its fatty contents. One experiment was made with a mixture of butter and fat which contained 20½ per cent. of water. This mixture was manufactured by the American who attempted to demonstrate in England how to produce four times the normal quantity of butter from a given quantity of cream. The article he produced in Germany, when analysed by the experts at the Kiel station, proved to be practically valueless as well as an imposture. The most important work, however—that in connection with experiments—was with the cattle of the station, which are kept upon 22½ acres of rented land and 1¼ acres of its own. Records of the work conducted were kept throughout the whole year, and not only were the ordinary operations of the dairy recorded, but analyses were regularly taken, together with the specific gravity, morning and evening. Comparative accounts were carefully kept, showing the profit both in practice and by analyses, of cream-raising and butter-making by each of the leading systems; as well as of the manufacture of different kinds of cheese, including the Limburg, Camembert, and Holstein. Taking the work of the Kiel Institute as a whole, and estimating its value as a medium for teaching pupils direct, and the country at large, through the practical experiments which are conducted, and the assistance it appears always willing to give, it would be hardly possible to speak too highly in its praise.

Saxony.

Saxony is very closely connected with the dairy branch of agriculture, and this will be seen very closely when we state that the number of cows amounts to 440,000, against a population of 3,180,000, or one to every 7¼ persons, whereas the productive area is 2,530,000 acres, chiefly arable. The value of these animals is about £12 per head; they average 794 lbs. in weight, and are chiefly of the Dutch and Oldenburg breeds, the bulls used being principally Algauers—a leading milking race.

Rotha.

The Dairy Institution at Rotha is under the control of the Agricultural Association of Leipzig, which occupies a large manor and maintains 100 cows, which are taken with it. It receives from the Association £75 annually, also the money paid for the instruction of the pupils—all of whom are females—viz., £2, 15s. monthly. The Association also assists some of the girls by the payment of £1 a month, if they prove worthy during their first month. In this way about £25 to £30 is annually given. The monthly bonus is to be increased to 30s. monthly. The course of instruction last six months. The pupils engaged upon one subject do not exceed four, or, at the highest, six at the same time, so that each may have the advantage of every branch of study. The Association also maintains at Wurzen an agricultural school for young men. Every fourteen days (Wednesdays) a scholar—always the same—goes from this school to teach the theory of book-keeping, dairying, and cattle-breeding, for which the Association pays £10 yearly. The Farm School at Rotha is also called a husbandry school, for not only is dairy farming taught, but all matters concerning husbandry that a woman or a female farmer in the country should know—dairy farming, management of cows, calves, and pigs. There are no pastures in the district, but the cattle are stall-fed both in winter and summer; the care of fowls, cooking, washing; the care of the sick in light accidents, and the cultivation of vegetables in the garden. The pupils must be strong and healthy, and be at least sixteen years of age. In the dairy four systems of creaming are taught—the centrifugal system, the shallow setting, the Swartz, and the Reimer's system; so that the girls are able to work at either when they are placed upon a farm where this or that operation is adopted. They also learn butter-making and cheese-making. I owe my best thanks to Herr Francke, of Leipzig, for the above. The following is the course of study:—1. Dairy management and work in general, with book-keeping; 2. The feeding and management of cattle, calves, pigs; 3. The management of poultry; 4. House-keeping; 5. Cooking; 6. Washing; 7. Vegetable cultivation.

Freiburgsdorf.

The Dairy School of the Agricultural Society of Dresden is at Freiburgsdorf, near Freiburg in Saxony, and was opened in 1885 under the direction of Mr Lorenz, who teaches the practical work of the school, the theoretical instruction being given by the secretary of the society, Mr Münzner. The instruction comprises the departments of the dairy, the dairy cattle, the garden, and the house, and is intended for the daughters of middle-class farmers. In connection with the school is a herd of 60 cows, and butter and cheese, both of new and skimmed milk, are largely made. The pupils are fully taught in the theory and practice of milk, butter, and cheese management, cattle and pig breeding, dairying, book-keeping, writing, and arithmetic. The course lasts six months. The fees for instruction, board, and lodging amount to 50s. monthly. The sum received from the State amounts from £75 to £120 per annum, which is paid for the instruction of pupils whose parents are unable to afford it for themselves. The farm in connection with the school comprises 312 acres of ploughed land, with 62 acres of meadows and garden; the cattle are of the Oldenburgher race; 15 horses are also kept, and 20 fattening pigs. One-half of the milk produced is sold direct. The half-year's course is divided equally into two parts; in the first, the pupils learn the dairy work and book-keeping, and in the second, the management of the stock. Pupils must be at least sixteen years old, and those who do not desire to go through the full course can enter the school as "hospitantinen," when they are required to pay higher fees.

Grunlichenberg Dairy School.—This school, which is one of three of the kind controlled by the agricultural societies of Dresden, Leipzig, and Chemnitz, is for the instruction of young women in practical dairy work and housekeeping. The course lasts for from four to six months; the pupils pay £10 for the first period and £12, 10s. for the second period, which includes board and lodging. Instruction is practically free, although it costs the school from 50s. to 60s. per month, one-half the expenses being provided by the State. The girls must be at least sixteen years old, and they are taught book-keeping, the feeding of cattle, poultry, and swine, milking, the manufacture of butter and cheese, and the various duties of the house, including—and this is worthy of notice, for it is the first case of the kind in which we have found such subjects form part of the curriculum—the preservation of fruits, the manufacture of fruit-wine and the system of drying fruit, which instruction is of a most valuable kind. Among the clothing which they are required to bring must be wooden shoes. The farm comprises 125 acres, on which 30 cows, 10 young cattle, and 20 pigs, with poultry, pigeons, and ducks, are kept. The cattle are stall-fed throughout the year, and the calves are hand-fed by the pupils from birth. The butter, sold in ½ lbs., is not touched by the hand, and realises a high price. The cheese made includes Neuchâtel, Romatour, sweet milk, and curd cheeses. We thank Director Schulze for his very full account of the school.

Ober Cunnersdorf.—The Dairy School of Ober Cunnersdorf was established for the purpose of instructing the daughters of small proprietors in the management of cattle, manufacture of cheese and butter, and general dairy work. The course of instruction lasts three months.

Heinrichsthal.—The important school of Heinrichsthal, near Radeberg, was founded in 1880 for the instruction of young women. Practical lessons are given by the wife of the proprietor of the farm attached to the school, and include a knowledge of the breeding of cattle, of complete dairy work, and of general farm details. The dairy is fitted with a steam-engine and appliances, capable of dealing with 1000 litres (220 gallons) per day. There is a Laval separator, and the creaming system of Swartz, Reimers, and Holstein, and soft cheeses, in imitation of the French, are a special product. The prospectus states that the following subjects are included in the course:—1. General dairy work and book-keeping. 2. Breeding of cattle, the care and management of calves, cows, and pigs. 3. Cooking. 4. Housekeeping. 5. Poultry. 6. Market gardening. The course lasts for three months, and pupils are required to show that they possess a practical knowledge before entrance. Pupils desiring to take situations after leaving are recommended to stop from six to twelve months. The fees, which include instruction, board, lodging, and washing, are £3 per month for the three months, or 50s. per month for the six months' course; others unwilling to stay the whole course are charged £5 per month. Payment in advance in all cases.

Leutwitz.—The Dairy School of Leutwitz, near Demitz, was opened in 1884. Practical and theoretical instruction are given in butter and skimmed-milk cheese-making. The course lasts six months, and the fees, including board and lodging, are 30s. per month.

Päese—Lüneburg.—This school was formed in 1884 with the assistance of the Provincial Union in the principality of Lüneburg. A sinking fund of £250, lasting for ten years, was provided by the province for the erection of the school, but there is no other help given beyond a subsidy of £12, 10s. from the Royal Agricultural Society. The school includes instruction in dairy work and housekeeping, and the fees payable by the pupils are £7, 10s. per quarter, £10 for the half year, or £15 per year. The instruction is thus quite free, the money not even covering board and lodging expenses. One half of the girls are daily occupied in housework, and the other half with the dairy and the cows until mid-day, alternating from time to time. In the afternoon instruction is given in theoretical subjects, including arithmetic and cattle work, and of course the theory of dairying and book-keeping. Cattle are kept, and there is an average of 300 litres of milk passing daily through the dairy, which is made into cheese and butter, the calves being fed with the skimmed milk. The systems adopted are the Holstein, Swartz, and the Laval hand separator.

Badbergen Dairy School.—This school was opened in April 1880, and is intended for the instruction of young women in dairy work and housekeeping, under the management of Mrs

Anna Heye. From ten to twelve cows are kept, and dairying of a varied nature is conducted. The school receives £150 from the State, and each pupil is required to pay £7, 10s. per quarter, £12, 10s. per half, or £30 per whole year. The butter is made from sweet cream, and is sent in boxes of 12 lbs. each by post to Hanover, Bonn, and Bremen. The cheese made includes Mecklenburg, Edam or round Dutch, Camembert, and Limburg,—the two former being hard, and the two latter soft cheeses. A native cheese is also made from sour milk. The pupils spend three months in the cheese-room, in accordance with their hours of instruction, three months in the butter dairy, three months in the house, and a similar term in the garden. We are informed by the directress that other schools to be conducted upon this basis are now being created in Germany.

Nortrup.—The dairy school of Nortrup was opened in 1885, and 6000 litres (1320 gallons) of milk is passed daily through the dairy attached to the school. The implements and machinery are of the newest description, including Lefeldt's 1885 model separator, Laval's 1886 model, and a Pasteuriser for assisting in the preservation of milk, also a complete equipment for butter and cheese making. The pupils are taught milk-testing by means of the lactocrit and the lacto-butyrometer. The courses are respectively for three, six, and twelve months, but pupils are received at any time.

Gross Himstedt.—This admirable dairy school, which is near Hildeshenn, was opened in 1879 for the instruction of young women in dairying and housekeeping. Attached to the school is a farm, supporting from 35 to 45 cows. Butter is made upon the Swartz system in summer and the Holstein system in winter, and a variety of new-milk and skimmed-milk cheese and butter is made. The directress is Mrs Anna Lohmann. The courses last a whole year and a half year respectively, commencing 1st April and 1st October. The fees for instruction, board and lodging, with washing, are £22, 10s. for the whole year, or £12, 10s. for the half year. For three months' teaching the girls are charged £10, and two months £7, 10s., and for one month £5.

Banke.—This school, which is in Hanover, is conducted upon the estate of Mr Harn, receives an annual grant from the State of £50, and is intended to prepare young girls for their future position as wives of dairy farmers, or positions where dairy knowledge and housekeeping will be necessary. Instruction is both practical and theoretical. The pupils learn cattle management, dairying, gardening, and housekeeping. Mrs Harn is conductress of the school, assisted by teachers provided by the Provincial Union. The course lasts from 15th February to

15th November. Pupils are preferred who belong to the district, and must be over sixteen years of age, and already competent in the work they are to be further instructed in. The fees for the course are £17, 10s. The whole of the work in the house and dairy, as well as in the farm branches in which they study, is performed by the pupils. In many of these cases, where the schools are upon farms, the pupils are restricted to a small number, such in fact as can be properly engaged. The cows number from 35 to 40, and the extent of the farm is about 340 acres.

Wurtemberg.

One of the leading agricultural schools of Germany is that at Hohenheim in Wurtemberg, where dairying forms a part of the ordinary course of studies; but there are no dairy schools or stations where special instruction is given in this branch of agriculture. There are, however, associations for the manufacture and sale of dairy produce, which are assisted by the Government. These are of two classes:—

1. *Genossenschaft Molkereien*, *i.e.*, the association of farmers for the manufacture and sale of butter and cheese, and for the sale of milk at a central market. These institutions receive Government subventions for the erection of suitable buildings and the provision of plant, and an additional subsidy proportionate to the quantity of produce sold. They are situated at Aichstetten, Heldenfingen, Gestellen, and Gerabrann.

2. *Sammel Molkereien*.—These are associations of a similar kind, conducted for the manufacture of butter only, and involving no expense in the erection of dairies or plant. They receive Government subventions, which are based upon the quantity of cream produced, the milk remaining for consumption on the farm. Sir Henry Barron, of the British Legation at Stuttgart, kindly informs us that there is no separate grant for the special purpose of encouraging dairy education, although an aggregate sum of 10,000 marks (£500) is annually granted for the promotion of cattle-breeding and dairy farming, the amount allotted to the latter branch varying from year to year. An important official paper, relating to the organisations to which reference has been made, is published by the Government. It shows the work which is conducted at the four first-class associations and at the societies of the second class, the details being of the most interesting nature. It also contains the rules for the conduct of these associations.

It may be added that there are in Wurtemberg 460,000 cows, or about one to every four persons, and 117 head of cattle to every square mile. The value of the cows varies between £17, 10s. and £25, and their weight between 670 lbs. and 1020 lbs.

per head. Forty-eight per cent. of the population is engaged in general agriculture and dairy farming. The first impulse given to the co-operative movement above referred to was by means of an exhibition of dairy produce, with a working dairy and a lecture, which was given by one of the agricultural instructors who visited Heldenfingen in 1881.

East Prussia.

The Dairy School and Experimental Station of Kleinhoff-Tapiau.—The experiment station of Kleinhoff-Tapiau is of considerable importance, and is under the direction of Professor Fleischmann of the University of Königsberg, formerly at Raden, and who is one of the chief German authorities upon scientific dairy matters in general. The station receives a subvention of £75 a year from the Government, a similar sum from the province, and a sum of £40 from each of the three agricultural central unions. The dairy school attached to the station receives no subvention, and is partly self-supporting, the responsibility resting with the Dairy Farm Union. The director, Herr Schrew, receives from each pupil £6 half-yearly for board, the gross sum paid half-yearly being £7, 10s., the balance of £1, 10s. going to the education fund. A certain number of persons desirous to study at the experiment station are allowed to do so free of cost, providing themselves with board and lodging in the town of Tapiau, which is less than a mile distant. The scholars are at liberty to assist in the practical work, but only upon the condition that it is performed regularly and punctually. They also receive one hour's theoretical instruction daily, and private instruction if they desire it, but for which they pay. Pupils are also afforded opportunities of making experiments and research, and when competent they may obtain an order for the pursuit of similar work in chemistry. The fees payable by other than free scholars is 25s. per term of one month, or with private instruction 50s. per term. An extra fee of 5s. per month is paid by those who assist in the practical work of the station. The rules of the dairy school are drawn up by the general assembly of the East Prussian Dairy Farming Union. Pupils are required to provide certificates of ordinary education and of practical activity for at least two years' duration in the dairy department. They are required to be proficient in reading, writing, and arithmetic, to possess strong and healthy constitutions, and to be at least twenty years of age. The course of instruction is six months, and during this term one hour's theoretical instruction is given daily, thus embracing the united dairy departments and the most important questions connected with cattle management and forage cropping. In the dairy, the centrifugal system of creaming is fully taught, together with the system of refrigerating, the manufacture of butter and different kinds of cheese. Pupils are also taught dairy record and book keeping, and they also have practical experience in the management and feeding of cattle and pigs. The director is assisted in the course of instruction by competent masters, and the pupils are required to display diligence and zeal, and to preserve a decent and modest behaviour, otherwise they are expelled from the school, and the fees which have been paid are forfeited. At the end of each course examinations take place, and certificates are awarded, which contain notes upon the behaviour, diligence, proficiency in practical work, and theoretical knowledge of the pupil. There is a farm in connection with the school upon which the pupils are enabled to work.

Warnikam.—The dairy school of Warnikam, in East Prussia, was founded in 1883 by the Dairy Society of the province. It is intended for the practical and theoretical instruction of young women intending to follow dairy work. The course lasts one year, and the fees payable amount to £2, 10s., which include board and instruction, but without bed and washing.

Luisenhof.—This school is similar to that above mentioned, and two scholars are provided with gratuitous instruction by the Dairy Society of East Prussia.

Grothe — Osnabruck.—The dairy school of Grothe was founded by the Agricultural Society of Osnabruck in 1880. It is intended to supply young men and young women with a knowledge of dairying, that they may be able to take charge of dairies or farms in future years. They must be at least sixteen years old, and pay fees, including board and lodging, of £7, 10s. for the three months' course, or £12 for a course of six months.

Bavaria.

Landsberg.—The important agricultural school of Landsberg affords a separate course for dairying instruction, which extends for three months twice in each year, and is under the director of the school. It is intended for the sons of farmers, who are boarded, and who are required to perform the whole of the work in connection with the dairy and the cattle. Young men are received after sixteen years of age, and are required to pay £7, 10s. for the course; but this sum is returned to them in payment for their work to pupils from Upper Bavaria, if they are found to be sufficiently competent. Pupils are received in small numbers—only sufficient to do the actual work of the school. The instruction comprises milking and management of cattle, including elementary veterinary instruction, a knowledge of forage and feeding, the management of pastures and of manures of all kinds, dairy book-keeping, and general dairy work. Professor Bischoff informs us that dairying is taught in nearly all the agricultural schools of Bavaria.

Weihenstephan Institute and School.—This institute is conducted in connection with the School of Agriculture and Brewing, and is at once theoretical and practical, dairying being conducted upon distinct lines to the exclusion of purely agricultural details. The theoretical instruction comprises the chemical and physical study of milk and the dairy in general, the breeding of dairy cattle, the economy of the dairy, the formation of syndicates for the employment and sale of milk, and the management of businesses or farms connected with the dairy industry. The practical instruction is divided into four parts. The first includes laboratory work; the second, manipulation of milk in the steam dairy, creaming, and the manufacture of butter and cheese; the third, discussions upon different questions relating to the dairy under the direction of the teacher; and the fourth, excursions, and visiting farms to which good dairies are attached. The institute is provided with an admirable dairy and a good chemical laboratory. The dairy comprises two large apartments; in the first are the refrigerators or deep-setting vessels upon the Swartz system of cream-raising, the Laval separator, the Holstein churn, a butter worker, and the necessary appliances; in the second department is the steam-engine, the cheese vat or kettle, and all the accessories necessary for the manufacture of different varieties of cheese. There is also an admirable school-room and a cowhouse. There are three courses in the year, lasting about eight weeks, and commencing on the 1st December, 1st February, and 1st May. At the end of each course the pupils have the opportunity of passing an examination, and obtaining a certificate when they are considered worthy. The fees payable, which include lodging, are £2 each for the winter courses, and 30s. for the summer courses; without lodging, the cost is £1 for each course. The pupils must be eighteen years of age, and provide certificates of good conduct and a practical knowledge of agriculture.

Westphalia.

Cservink.—The dairy school, founded in 1879 by the Central Agricultural Society of Westphalia, is at Cservink. Instruction is given in the theory and practice of dairying, including the manufacture of butter and cheese, dairy records and accounts, and all questions in connection with the dairy herd. The school is especially for females, four of whom belonging to the provinces are instructed gratuitously. The course lasts for one year, and commences on the 1st October. Pupils must be at least seventeen years old, and furnish certificates similar to those already referred to. The fees payable, which include instruction, board, and lodging, are £7; but each pupil is required to furnish his own bed, and to pay washing expenses. The subvention granted by the State amounts to £45. The school is provided with a separator and admirable appliances.

Silesia.

The establishment of a Government dairy school in Silesia has had the effect of promoting considerable study of dairy work, and of enhancing the number of dairy farmers, and increasing their returns. Milk factories and co-operative associations have sprung into existence, and are now numerous. Silesian butter, always in great repute, can now compete with that of the more celebrated northern states; while the cheese industry, which has always been in the background, is likely to be revived, and the more extended manufacture of the many foreign varieties consumed in Leipsic and Dresden in particular attempted. The population numbers 4,110,000, and no less than 810,000 cows are maintained, although many of these, being used for draught, can be reckoned as of little use in the dairy.

Proskau.—One of the most important dairy science institutes with which is connected a dairy school in Germany is that of Proskau in Silesia, which was opened in 1878, and was founded by the Central Agricultural Society of the province. There are two principal courses of instruction for the benefit of persons of all classes who desire theoretical and practical instruction in dairy work, who must be above the age of sixteen years, and provided with the requisite certificates of good conduct and education. The other courses last from six to eight weeks, and are three in number; the first course is for young men during the months of January and February, and the second and third for young women during May and June, October and November. Intermittent courses of dairying last only from eight to ten days, and are designed for the benefit of persons who are practically acquainted with the dairy industry, but who desire to be perfected upon any particular point. In a similar manner the courses are three in number, one of which is for males, and the other two for females. Pupils are required to pay 10s. for instruction, the board and lodging being obtained in the neighbourhood at the rate of about 1s. 3d. per day. The average number of pupils varies from 20 to 30, and over 200 have passed through the institute. The subsidy received from the State is £200, and from the province of Silesia £250. Produce is made from milk, which is dealt with at the rate of about 30 gallons per day.

Brandenburg.

Sachsenhausen.—This dairy and housekeeping school is

4 miles from Berlin, near the station of Oranienburg, and was opened for young women (over fifteen years old) in 1844, under the management of Mrs Johanna Budbech. It is provided with a dairy admirably fitted up with a Laval separator, the Swartz and Holstein system of creaming, and the appliances necessary for the manufacture of butter, and new and skimmed milk cheese. The fees for the dairy course, including board and lodging and instruction, are £5 per quarter, and £7, 10s. per half year; other pupils are allowed to enter the school for shorter periods upon payment of a small sum (20s.), and 2s. 6d. per day for board and lodging. There is no subvention granted to this school.

Brunswick.—The instruction given at the Brunswick Dairy School, which is under the direction of a well-known German expert, Mr Flaack, is of a very different kind to that given in the schools of dairying throughout Germany; and having had an opportunity of inspecting the factory with which it is connected, which was one of the first started in Germany, and which is of a very elaborate and yet practical kind, we are well aware of the advantages which pupils must enjoy. The equipment of the factory includes two steam boilers, one of which is a 14-horse-power; two large Danish and one Laval separator, a Pasteuriser, and suitable apparatus for milk-cooling, cheese-making, butter-making, the whole being capable of dealing with the yearly receipt of 3,000,000 litres of milk. There are three depôts in Brunswick, and fourteen vans constantly delivering the dairy produce, and it is the management or manufacture of this that the pupils under Mr Flaack are able to study. The cheeses, which are made are both hard and soft, French and German, and every pupil passes through the entire course of work if his stay is sufficiently long. They are required to learn the use of the implements and machinery, to actually make the butter and cheese, to test milk by the Soxhlet, Marchand, and other well-known processes, including the lacrocrit of Laval. Besides this instruction, the pupils have every opportunity afforded them for making themselves acquainted with the system of keeping the accounts of the factory, also with the trade-books, records, and tables which are kept in connection with the work. They board with the director, and are required to comply willingly with all orders given by him. There is no fixed course as regards time, its duration being arranged in accordance with the requirements of pupils, as well as by the zeal and industry they display. The fees, which include board and lodging in the institution, are £6, 5s. for one month, £10, 10s. for two months, and £13, 10s. for three months, and suitable terms for residence of shorter duration. The idea of the control is to educate persons to enable them to become directors, teachers, or experts in the future, and every effort is made to provide them with situations upon leaving.

Baden.

Radolfzell.—This is an important school for the instruction of girls in dairying and housekeeping. The course commences in November and concludes in March, extending over five months; and again commencing in May, and ending in September. The winter course is conducted at the cost of the Grand Duke of Baden—similar instruction being given at Binningen and Mainau. The system has proved so successful that the various schools now receive 123 pupils from sixteen years of age and upwards, for the first course. From the founding of the institution in 1886 the monies, grants, and donations received, including those from the Grand Duke and Duchess, the Ministry of the Interior, and fifteen mayors of towns in Baden, amount to 4497 marks. Each pupil pays for lodging the sum of £1, 10s. per course. The payment for board is based on the actual cost of which pupils are required to keep an account. On the average, this amounts to 9d. per day. Each pupil also pays £1 for entry, towards general expenses and for books. There are other charges, including the use of materials and washing, bringing up the total cost per course to from £7 to £8. The institution itself costs the sum of £1670, and is held under the security of thirteen burghers of the town. One of the chief objects is to procure dairy appliances and machines which are not found in dairies of the better class of farmers, even though they may not be suitable for the special wants of the school. The inventory furnished to us shows that these are valued at £325.

Winter pupils are the most numerous, more applications being received than can be provided for, but all summer applicants are generally received. The instruction in theory lasts two hours daily, and this includes the use of the microscope, the knowledge of elementary chemistry, instruction in such sciences as deal especially with temperature, steam, weights and measures, feeding stuffs, fermentation, and dairy farming in general. The text-book on dairying is by Mr Schafer, the director of the institution. The general receipts by the management from the pupils is £120; the rent of the institution is £80, in addition to sums provided by the town, the agricultural societies, and the subscribers named above.

Oldenburg.

Rastede.—The Dairy Institute of Rastede, which was opened in 1875, is for the instruction of young women in dairying and housekeeping. The milk of from 12 to 16 cows is daily converted into butter, and new and skimmed milk cheese. Instruction is given in general dairy work and calf-feeding. There is also a theoretical course under Herr Becklinsen. The fees are £15 per half year, or £25 per year.

HOLSTEIN.

Lensahn.—The Dairy School of Lensahn, which was opened in July 1883, is intended to prepare young men to be efficient dairy farmers, and to instruct farmers themselves in dairy work. The milk passed through the dairy daily is from about 200 cows, and it is chiefly separated by Lefeldt's new separator and the cold setting systems. This milk is manufactured into the finest butter, and Holstein, Luneberg, and Dutch cheeses, the refuse going to swine. Pupils commence with theoretical instruction, which is given by Mr Gavel, the director, who subsequently introduces stock management, and the technical subjects, with book-keeping. There are three courses yearly, commencing 1st May, 1st November, and 1st January respectively, the first course being devoted to theoretical study. The fee, which includes lodging and board at the director's table, is £20 for the six months' course, of which £15 is paid on admission, and the balance at the end of three months. For a three to four months' course, the fee is £15; arrangements can also be made for a longer or shorter residence.

ITALY.

For the very voluminous information which we have received with regard to the system of agricultural instruction in general and dairying in particular, we have especially to thank Dr Miraglia, the Director-General of Agriculture, who very generously supplied us with the most complete published details which we have seen in connection with any country; Professor Zanelli, the director of the Government Dairy Station at Reggio, in Emilia; and Dr Jacopo Rava, of the Dairy Experimental Station at Lodi—these being the two leading institutions in Italy in connection with dairy farming. Italy of all countries is wonderfully provided with means of practical and theoretical study in all that concerns agriculture. There are twenty-one royal agricultural schools and seven special schools, of which one is solely for the instruction of students in dairy farming and dairy work. There are also seventeen superior and five inferior normal schools of agriculture, as well as ten schools for females. In addition to these there are twenty elementary schools of various kinds, designed for the study of various branches of Italian farming and crop growing. This, however, does not exhaust the list: there are six agricultural chemical stations. Italy is also provided with a system of instruction by means of lectures, which are carried on in a very complete manner, and the whole system is under the Ministry of Agriculture. The total cost of the Agricultural Department is shown by the copy of the Budget for 1887–8, which we have received, to be 5,385,943 lire (about £215,000). Of this sum the subsidies to the schools, stations, and agricultural committees amount to 1,579,000 lire (about £63,000), to which a number of smaller and special grants might be added. In this report, however, we are concerned only with the dairy instruction which is provided, and we are fortunate in having been able to see in previous years the chief stations to which reference has been made.

Reggio-Emilia.—Professor Zanelli, in answer to some questions put to him, says that the students at the dairy school of Reggio follow a biennial course of instruction in the theory and practice of dairying and cattle management. The instruction has the double end of teaching milk manipulation and the breeding of farm stock. For that purpose pupils are taught the theory of anatomy and physiology, which serve to introduce them to the study of zootechny. Following this question on its practical side, the students work daily in the cow-house and piggery, and among the sheep. For assistance in the dairy they are instructed in the elements of physics and chemistry, and obtain practice in the use of the instruments of milk control, and analysis.

The pupils are divided into two squads—one remaining a week among the stock, and the other for the same period in the dairy. Each squad is under a teacher, who daily designs the work to be undertaken. Four and a half hours daily are devoted to theoretical study, and the remainder to practical work. There are upon the average 30 pupils, of whom five only are externes, lodging in the town of Reggio. The fees for pupils who board and lodge in the school amount to £16 per annum, and there is seldom a vacancy. Up to this moment every pupil leaving the school with his diploma has found employment when he has desired it, so highly is the course esteemed.

The Government provides a sum equal to three-fifths of the entire expenditure, but we find by the Budget above referred to, *Stato di Provisione Della Spesa, del Ministero di Agricoltura*, that the total cost is estimated at 40,900 lire (£1636), while the Government contribution is put at £600, and the contribution received from local authorities is £400. The authorities of the school especially desire still further means of investigation, and of making experiments both in the laboratory and in the dairy, and the extension of the land attached to the school; there is also great anxiety on the part of the staff to extend the number of teachers to six, instead of four as at present, so that the pupils may have the full benefit of more complete instruction.

Upon the farm there are 60 head of cattle and 37 of swine, of various races, these having considerably increased since our visit three years ago. Some most important experiments have been made with the Shorthorn, the Dutch, the Swiss, and the native cows, as well as with English and native swine; and in the very elaborate reports prepared by Professor Zanelli, Italian farmers are shown the special values which can be attached to each, from actual work performed in their own country.

The pupils are taught to milk, to clean the cattle, to prepare the food, and to rear calves. The daily quantity of milk passed through the school in the manufacture of cheese or butter varies between 25 gallons and 120 gallons. In the autumn of the year of our visit the students made or assisted in making 7200 lbs. of Gorgonzola, and in the following winter they made 10,690 lbs. of a variety of cheese called Crescenza; while in the months of March and April half fat Gruyère and whole milk Emmenthaler (the best Gruyère), amounting to 6400 lbs., native Parmesan cheeses of two varieties—the "Grana" and the "Parmigiano,"—amounting to 15,400 lbs., were made. In addition to this quantity of cheese, the school sent out 4650 lbs. of butter, and 450 lbs. of another native cheese called "Caciocavallo." From the accounts of the various workings we make the following extract:—

March 3.	Milk used, 357½ litres, cost . .	£1	14	4
,,	Wood and coals, ...	0	2	0½
,,	Labour, &c., ...	0	1	4½
		£1	17	9

The receipts from this working were as follows:—

March 3.	Butter made, 13½ kilos at 1·80 lire, .	£0	19	5
,,	Cheese made, 21·8 kilos at 0·80 lire, .	0	14	0
,,	Butter, milk, and whey, 320 litres at ·02 lire,	0	5	4
		£1	18	9

The whole of the work is performed in this practical manner, that the students may know exactly what they are doing from a business point of view. Separators are used, and at first much difficulty was found in Italy in dealing with the skimmed milk for cheese-making, but the school has overcome this, and shown how to make cheese worth 8d. per kilo of 2¼ lbs. The students are required to keep note-books showing full details of their work, and especially of what takes place among the cattle, giving the weights of the rations, and dates of the birth of calves, &c. They also provide the director with a weekly report of their proceedings. It is a noteworthy fact that the staff pay more regard to the in- than the out-students.

We find that the money spent during four years for books, appliances, models, &c. has been nearly 14,000 lire (£560), and it appears that money is regularly saved from the yearly grants for this purpose, the amount being divided between the chemical, the physiological, and the zootechny collections. The course of study is altered or improved yearly, and the director desires that more time should be given to the study of obstetrics, as well as to scientific feeding.

From one of the tables of examinations, we find that of 74 pupils, 32 were sons of small proprietor farmers, 19 were sons of farmers or agents, 12 were sons of professional men, and 11 of business men. The great majority are successful in obtaining their diploma, chiefly because they must have a knowledge of the subject before entrance, and because they have, from a liking of their work, adapted themselves specially to receive information. As a general rule, it is found that the superior scholars, who are younger, are beaten by inferiors who are older, for this very reason, that they have not such a taste for the course of study they are required to pass through. The students are found easy to manage, because they are always under surveillance, but when cases of bad conduct occur, it is generally the younger students who are in fault. Purses are given yearly, but are forfeited for bad conduct, and this has an important bearing upon the maintenance of discipline.

Examinations take place at the end of six and twelve months, and unsuccessful candidates are unable to go up again for certificates. The examinations are verbal as well as in writing. Of 24 who succeeded out of 32, 15 are now engaged as directors of important dairies in different provinces, three are in the army, five are assisting their fathers, and one has attained a high position. The director of the school usually has more applications for assistance than he can provide.

The influence of the school upon the well-known dairy farming system of the district has been considerable. The small farmers, some of whose cheese dairies we were able to see with the help of Dr Maffei, have already commenced to apply the best systems of manufacture, because they know that they are adopted in the school. Others make great efforts to obtain a course of education for their sons, but generally fail on account of age; they try, however, to get the best advice, especially with regard to implements and appliances. In some cases they ask the director for permission to see the work of cheese-making as it is practised, especially in the winter, that they may be able to follow it at home. This chiefly applies to the utilisation of small quantities of milk which the small farmers produce. Considerable help in the maintenance of the high character of the school is obtained by the sale of its produce, which is known to be of the very highest quality.

Professor Zanelli considers that, to be successful, a dairy farming school should be provided with cattle, especially as these help very largely to keep up communication between the school and enlightened farmers throughout the country.

Lodi.

The Experiment Station and Dairy School of Lodi (Caseificio Sperimentale) pursues two objects—the instruction of young men in the science and practice of dairy work, and the chemical investigation of matters connected with the science of milk, cheeses, and butter. We find by the Budget that the annual expenditure is 13,400 lire (£536), by no means a large sum for the maintenance of a director and two assistants (all of whom are scientific men), and a practical cheese-maker. Of this sum the Government provides £256, the balance of £280 being divided between the province of Milan and the Commune and Chamber of Commerce of Lodi. The Commune also provides the building, which is a large one, and which was at one time a barracks. One-half of the total sum is spent in the purchase of utensils for experimental purposes, the other half being divided among the staff above named. The director and the chemists at the Lodi station are Professor Besana, Dr Jacopo Rava, and Dr Sartori. According to the programme and the station, the course of instruction consists of practical exercises in the art of cheese-making upon the best methods and with the best utensils. Milk is skimmed upon every well-known plan; butter is made from cream, from milk, and from whey; cheeses of all the best types are manufactured; and the system of making the well-known Italian preparation, "ricotta," is taught. In the department of physics the students are required to study milks in general—its character and composition, and the fat globule of the cow, sheep, and goat; the influence of colostrum, of feeding, of race, and of labour upon the composition of milk; the diseases of milk, the various methods for testing the purity and richness of milk, the examination of soured and adulterated milk, condensed milk, fermented and preserved milk; cream, the influence of the separator and of the various systems of cream-raising. The composition of butter—its preservation and artificial colouring, artificial butter, curd and rennet; the Lombardy and Swiss methods of preparation, methods of determining the rennet required, the theory of coagulation. Classification of cheeses—manufacture of various species, the utensils employed, the various forms of pressure, the chemical and physical changes before maturity, the conditions influencing the ripening of cheese, the cheese fungi and parasites; the utilisation of whey and milk refuse. Zootechny.—The principal differences in the internal and external conformation of different animals, their structure, form, and age by the teeth; breeding farm stock, the influence of race upon milk, the principal methods of milking cattle and the distinctive character of each, crossing and selection, the influence of food upon milk production, feeding rations, studies of the various forage plants, the cow-stall, the best types of cow-houses and stalls. In connection with this branch of study, the pupils make various excursions to farms in the neighbourhood. Another department of study is the organisation of the dairy, and this deals with what is termed "latterie sociali," or the co-operative dairying of the country, showing the benefit to the members which may be derived from co-operation—how to organise, what rules to adopt, and what plans to follow to succeed. During the past few years a large number of special papers have been printed by the Government, descriptive of the work done at the Lodi station, these having been written by the three professional men of the staff, and the majority being by Professor Besana. It is a misfortune that the Italian language is so little known in connection with our agricultural press, and that the results of the experiments which have been conducted have not been published in this country. The consequence will probably be that much of the work which has been determined at Lodi will be done over again. The value of the plant at this station appears to be £1000, a useful scientific dairy library being included. Each course of instruction lasts for three months, and students are required to be already well acquainted with the dairy industry and able to comprehend the lessons which they receive. The majority of those who attend receive grants from the Ministry of Agriculture.

Dr Rava says "that the Italian Government is well disposed to assist the dairy industry. Naturally the fruits of its efforts are not quite perfect, but the results already obtained in the little time that Italy has been a nation are sufficient to permit us to hope that its progress will yet be very much greater. Important dairy shows, as you know, have already been held in some of our large cities, with Government assistance. In six years the Ministry has contributed £2000 and 56 gold and silver medals, besides making a grant to Sardinia for a similar purpose of £400. It is intended to open another dairy school, similar to that at Reggio, in the department of Foggia, probably at Lucera, in the immediate future." In addition to the schools already named, there are nine dairy observatories, which were created for the purpose of exercising an influence upon the progress of the dairy industry, and as the centres for the propagation of knowledge and "rational rules" in connection with milk production. They are provided with the best known implements and utensils by the Ministry of Agriculture. These stations are at Carpendola (Brescia), Meano (Baluna), Villa di Villa (Baluna), Taibon (Belluno), Talamona (Sondrio), Via Dano (Mantua), Caltagirone (Catania), Scoto Cremone (Cremona), and Maniago (Udine). The course of instruction at these stations is held in April, May, and June in each year, and the Government generally sends 20 pupils, selected by the agricultural committees of the districts of Italy in which dairy industries play the most important part. Dairying is very little taught at the principal agricultural schools of Italy, but in many of the practical schools, such as those of Caltagirone and Todi (Peruguia), courses of instruction have been instituted.

In concluding our remarks upon the system adopted in Italy, we can only add that, from what was shown to us in practical work, we believe that the experiments at Lodi are of the greatest value, and that the practical teaching at Reggio could scarcely be excelled, the building and the prescribed course of instruction being as nearly perfect as we have anywhere found it. Taking this institution as the typical dairy school of Italy, we are of opinion that it might serve as a model upon which to found provincial schools in Great Britain.

SWITZERLAND.

Upon inquiry at the Department of Agriculture at Berne, we received the following information from the Minister, to whom we are greatly indebted. He states that the dairy industry is taught in all the establishments of agricultural instruction in Switzerland. These establishments are—

1. The agricultural division of the Federal Polytechnic School at Zurich—director, Professor Dr Kraemer. 2. The School of the Theory and Practice of Agriculture at Strickhof, near Zurich—director, M. Lutz. 3. The School of the Theory and Practice of Agriculture at Rütti, near Berne—director, M. Klening. 4. The School of the Theory and Practice of Agriculture at Cernier, near Neuchatel—director, M. Lederrey. 5. The Winter School of Agriculture at Sursée, canton Lucerne —director, M. Moos. 6. The Winter School of Agriculture at Brugg, canton Argovie—director, M. Abt. 7. The Winter School of Agriculture at Lausanne, canton Vaud—director, M. Bieler.

There are, besides, three establishments where the dairy industry is extensively taught. These are—

1. Dairy school of Rütti, under the same direction as the establishment above mentioned. 2. Dairy school of Treyvaux, canton Fribourg, which is under the direction of the authorities of the canton. 3. Dairy school of Sornthal, canton St Gall—director, M. Diethelm.

The whole of these schools, with the exception of the first named, which is subventioned only by the Swiss Confederation, are under the direct surveillance of the respective cantons from which they receive subventions. They are also granted sums of money by the Government, which are as follows for the current year:—

1.	The school of	Strickhof,	£406
2.	„	Rütti,	340
3.	„	Cernier,	647
4.	„	Sursée,	104
5.	„	Brugg,	196
6.	„	Lausanne,	104
7.	Dairy school of	Rütti,	131
8.	„	Treyvaux,	120
9.	„	Sornthal,	160

There are in Switzerland numerous farms and cheese factories upon a model system, which are frequented by young people desiring to develop their knowledge from the point of view of essential practice. These exploitations belong to particular individuals, and receive no Government assistance. The various societies of agriculture in Switzerland occupy themselves, among other things, with the amelioration of the dairy industry, in organising courses of instruction, lectures, and exhibitions of the produce and the appliances of the dairy; and they receive on this account pecuniary aid, both from the cantons and from the Confederation. Finally, the Government grants other subventions to those cantons which undertake regular inspections of the cheese-making establishments in their district. These inspections are made by experts, whose mission it is to give advice to those who are interested. We were also informed that upon application to the directors of the various schools, they would with pleasure communicate details of the instructions they give, and of the rules by which their pupils are governed, but both personal and written applications to these gentlemen have, to a very large extent, remained unanswered. At the same time, we have to thank the Swiss, like the French, probably because of a close acquaintance with them, for very considerable assistance.

A considerable amount of information respecting Swiss agriculture is contained in a book of 100 pages, in the form of a message from the Federal Council to the Federal Assembly. In the year 1881 Dr Krämer of Zurich was ordered to visit other countries, and report upon the measures taken by their respective governments in the creation of institutions for the amelioration of agriculture. He reported upon France, Prussia, Saxony, Bavaria, Wurtemburg, Baden, Austria, and Italy. In the first part of his report he treated upon the diffusion of agricultural science and the organisation of schools, of agricultural experiments, and of the establishment of model farms, and particularly of the dairy industry. In the second part the leading features were with regard to the establishment of a minister of agriculture, of the perfection of agricultural statistics, of the improvement of the Federal Polytechnic School by means of scholarships, and of special instruction in the dairy industry by means of special subventions to winter schools, for the establishment of agricultural stations, and for prizes for farm stock. In Switzerland the cantons are self-governing in matters such as agriculture, and they were therefore invited by the central Government to report upon the suggestions made in the message with a view of carrying out those which were found to be the most beneficial. It appears that by the constitution of the Swiss Confederation the Government can only interfere in agricultural matters in a few instances, such as the surveillance of forests, of sporting in the mountains, and with regard to sanitary control with reference to live stock and disease. The Confederation has no right to interfere in other matters. From year to year, however, the sums of money, which are granted voluntarily, have augmented from 4000 francs in 1859 to 200,000 francs in 1884, and in almost every case it is required that the cantonal governments shall themselves grant equivalent sums to those which they have received. Complaints were made that the dairy industry received no attention in the chief government school at Zurich, and consequently scholarships were instituted for the instruction of persons who would themselves become teachers of dairy work. In Switzerland such men are badly paid, and many cantons and agricultural societies in their replies deplore the poverty of the instructors in dairy and other schools. The message continues, that with regard to dairy farming it is necessary for the Swiss to maintain their position in a branch which is their *spécialité*, and which is an industry indicated to them by the nature of their soil and their climate, and it proposed to create further dairy stations, especially those connected with practice in the milk industry, and in the practice and theory of cheese-making. We find, upon the authority of Dr Krämer, that the money spent by the governments of the undermentioned countries is in the following ratio per thousand persons, and per square kilometre of land utilised for the purposes of agriculture:—

	Per 1000 Inhabitants. Francs.	Per sq. kilometre of Land. Francs.
France,	413	46
Prussia,	411	48
Saxony,	200	53
Bavaria,	196	21
Wurtemberg,	295	44
Baden,	423	42
Austria,	299	35
Italy,	65	12

The empire of Germany, like Switzerland, is composed of federated states, which are sovereigns in agricultural matters, and the writer, like ourselves, failed in consequence to obtain full details of the imperial grants made by the central German Government. So far as the Swiss Government itself is concerned, it makes its grants under a moral obligation, for it receives no direct taxes which could be judiciously employed in such payments. The Government pays to the Federal School at Zurich 45,000 francs (£1800) per annum, and it offered a further sum of £400 for additional instruction in the dairy and some subsidiary industries. The two schools of Rütti and Strickhof receive from the cantons of Berne and Zurich each £880, while the Confederation proposed to grant £1000 for these and one other school, and a similar sum for winter schools, special instruction, and itinerant lectures. For the installation of the dairy school at Rütti 10,000 francs were granted, with annual subventions of £120. The same sums were proposed for two other schools; for the experiment station 18,000 francs per annum is granted, while a proposition made in the message was that 100,000 francs (£4000) should be granted for the improvement of the soil.

We have referred thus far to this voluminous report inasmuch as in Switzerland almost everything tends to assist the dairy, excepting where in some cantons the vine is the leading industry. The next thing in the report are the sums paid by each canton for agricultural improvement. Zurich expended £2400, Berne £1520, including a grant to the Swiss dairy station, besides which £42 was granted to the Society of Public Utility for a course of instruction in cheese-making. The majority of the other cantons spent much smaller sums, but among them grants were made for dairy instruction in some form by the cantons of Zug, Fribourg, Bale, Schaffhouse, Appenzell, Grisons, Argovie, and Vaud. The last named recommended the establishment of a dairy school in their canton, while the Swiss Agricultural Society declared that a dairy station should be maintained in French Switzerland.

We extract the following notes from a "Federal Order concerning the amelioration of agriculture, principally dairying, by the Confederation, June 27, 1884":—Art. 1. The Confederation will adopt the following articles in favour of agriculture, and will assist them with subsidies as they are warranted by the activity of the cantons and the agricultural societies. The articles then provide—that the federal council will grant purses of 400 francs per year to scholars destined for agricultural instruction, on condition that they have practised agriculture for at least a year; that the cantons to which they belong grant them purses at least equivalent to those given by the Confederation; that the holders of purses engage themselves to consecrate six years of their lives to the active service of Swiss agriculture when they have reached the end of their studies. The Federal Council will also grant subsidies to enable scholars to travel, in order that they may make researches and gain knowledge in connection with agriculture.

Art. 3 provides—that subventions may be granted to those cantons which already possess or which create schools of agriculture, and summer or winter courses of instruction, providing that their programme is submitted for the sanction of the council.

Art. 4 provides—that the Confederation may grant subventions for the creation and conduct of dairy stations, of model dairies, and of stations for agricultural analyses. The Federal Council is authorised to negotiate with the cantonal authorities, who desire to found stations of this kind, and to grant, by way of a budget, the sums of money by means of which the Confederation would participate in the establishment and conduct of these stations.

The cattle of Switzerland are principally dairy cattle, and they are bred and encouraged by the Government for their milk production. The Government annually grants a credit of at least 100,000 francs (£4000) for the development and amelioration of cattle. This sum is required to assist, above all, in the feeding and improvement of bulls. It may also be exceptionally employed to encourage Swiss breeders to participate in cattle exhibitions in other countries.

By Art. 7 the council is authorised to assist enterprises intended for the improvement of the soil or for its exploitation (cultivation). Requests for aid must be remitted by the cantonal authorities, and accompanied with details as to the nature and importance and cost of the work; and such work must be subsidised by the canton, commune, or corporation, to at least the same extent. This subsidy must not exceed 40 per cent. of the total expense. The payment of the federal subsidy is only made after the execution of work and its inspection by the authorities.

Art. 11 provides for annual subventions to the Swiss Alpine Society, for the maintenance and development of dairy stations, for prizes in favour of distinguished farm holdings, which are chiefly dairy farms, and for itinerant lectures upon the manufacture of cheese.

Art. 12 provides for annual subventions to the principal agricultural societies, for lectures and special courses of instruction, for the composition and distribution of dairy literature, and for the improvement of small cattle, including milking goats.

On the 5th July 1886 the Federal Department of Agriculture sent a circular to the cantonal governments, in which they quoted a passage from the message of the Federal Council to the Assembly upon the budget of the year. This passage was as follows:—"Excellent results might perhaps be obtained if well-qualified men were to visit the cheese dairies wherever they are required, and where they would not be refused admittance, in order to give advice upon their installation, the utensils they use, and the methods of manufacture they employ, as well with regard to the members of cheese associations as to the small contributor (fruitier) himself. We should have willingly voted a certain sum for employment in this sense, but we reserve ourselves in accord with the committee of the Swiss Society of Agriculture to carry to the next budget a sum for this end."

"Since this passage was written [continues the message] (September 1885), the state of the dairy industry, particularly favoured as it is by nature, not only is not improved, but has become disturbed in an important degree. It is useless to discuss the numerous causes to which this sad state may be attributed, for we can only exercise influence upon them in a small degree. We can only repeat the unanimous opinion of skilled men, that dairy products of the first quality will always find open markets and remunerative prices; that our people must so apply themselves above all to improve the quality of our cheeses and of our butter. It would be an injustice to charge the fruitiers (the small milk producers) solely with responsibility for the great quantity of inferior produce which inundates the markets of the interior. With us it is rare that the factory man is at the same time an owner of cattle, but the interests of those who buy milk and of those who furnish it do not march in the same direction. Whilst the factory owner determines only to receive the best milk, produced under the most favourable conditions and treated in the most rational manner, and whilst he deals with it and preserves its products in the most suitable premises, the farmer has an especial aim in producing the largest quantity at the smallest expense. It is not, therefore, possible under some existing conditions, where there are negligence of management and fraudulent acts on the part of the farmer and his servants, to manufacture an article of the first quality. Contracts for the best goods cannot be guaranteed, because of the absence of efficacious control, particularly with regard to the manner in which the milk is produced, and because the verification of the milk often gives no result, and in any case only gives one too late to avoid loss. For this reason the department is to-day more than ever persuaded that skilled instructors, acting between the factory owner and the farmer, will be able to render important services. On the other hand, for different reasons it would appear to be the rôle of the cantons, rather than that of the agricultural societies, to take up this means of assisting the dairy industry; we therefore recommend the question to your notice, and we declare ourselves willing, wherever such an act can be shown to be useful, to propose in the budget a credit for subventions corresponding to the necessities of the case. We recommend you strongly to be prudent in the selection of teachers, in order that the system of instruction may obtain the confidence of the public."

Resolution of the Government concerning the Establishment of a Dairy School, March 18, 1887.

Art. I. It is determined to open a dairy school on the Government property of Rütti, from the 1st May to the 1st November of the current year, as one of the divisions of the agricultural establishment.

Art. II. The school will be united with the Cheese Association of Zollikofen. (It appears that milk is purchased by this association under contract, between 1st May in one year and the 30th April in the year following. In this case it would seem that the Government require to ratify the contracts before they are concluded.)

Art. III. The Government require to ratify the arrangement made for the management of the factory, which must be provided with a qualified first-class cheese-maker and an assistant, both of whom will be required in an exemplary manner to impart instruction in the manufacture of milk products.

Art. IV. On the 1st May, four to six young men will be taken for the six summer months as dairy scholars, all of whom will be required to submit to the rules and laws of the agricultural school of Rütti.

Art. V. The cost of instruction of each pupil will, like that of the agricultural scholars, be fixed at 150 francs (£6) for the half year; one, two, or three scholars will in some cases be selected.

Art. VI. Outside teachers will be provided for the instruction of the pupils in the theory of milk management. The pupils will be able to take up other branches of study, and their hours will be arranged that they may be in common with pupils of the agricultural school.

Art. VII. A commission, composed of three persons specially selected, will be formed for the purpose of exercising control over the cheese-maker and his assistants, the management of the milk, and the manufacture of the produce.

Art. VIII. The general superintendence of the dairy department will belong to the committee of the agricultural school.

(Signed) In the name of the Government, The President,
Dr Gobat.

Rules of Instruction in the Dairy School of Rütti.

I. Special instruction for dairy scholars.—1. Herr Jutzeler undertakes instruction in the practice of the collective work of the dairy. The instruction comprises—(1) The management of the cheese cellar, salting, temperature, heating—one hour. (2) Book-keeping, especially with regard to cheese-book management; milk management, manufacturing, and cheese accounts—one hour. (3) Demonstrations with improved and old utensils and vessels.

2. Herr Professor Anderegg gives instruction in the theory of cheesemaking—two hours weekly, usually on Mondays, after the round of instruction. (1) Dairy management, especially with regard to the requirements of the canton of Berne; statistics. (2) The arrangement of cheeses, the choice of buildings and their internal arrangement, the out-houses of the farm. (3) The implements of the dairy, the cheese kitchen and cheese cellar. (4) Dairy produce, Emmenthaler (Gruyère). The extraction of the curd from milk, the preparation, management, and natural changes of rennet; artificial rennet; the working of the curd; the pressing, salting, fermentation, and the maturity of the cheese. Skimmed milk cheese, butter and cream, and the methods of obtaining both by milk setting, and cooling, and the centrifugal systems; the working, management, and packing of butter; the preservation of milk, cream, and butter. (5) The profit of milk made into cheese of various kinds, and into butter. (6) The sugar of milk. (7) Conversion of the refuse sugar; buttermilk. (8) Contracts for selling milk. (A copy of the contract provided by the institution was sent, but want of space prevents us translating and adding it to these details.) (9) Cheese-making regulations.

3. Dr Schaffer.—(1) Milk, its origin, properties, and composition; the different ingredients and their respective attributes. (The Professor gives demonstrations, and makes experiments upon these points.) The defects of milk and their causes, milk adulterations; physiological influences upon the secretion of milk and its constituents; the period of lactation, age, life, race, nourishment, temperature, exercise, and healthy condition; the comparison of the milk of the cow with the milk of other animals. (2) Milk examination, the various instruments for

AGRICULTURAL AND DAIRY SCHOOL OF RÜTTI.—*Time Table for the Winter Session* 1887–1888.

Hours.	Monday.			Tuesday.			Wednesday.		
	Farming Division.		Dairy Division.	Farming Division.		Dairy Division.	Farming Division.		Dairy Division.
	Class I.	Class II.		Class I.	Class II.		Class I.	Class II.	
6 7	Stock Breeding. Director Kléning.	Use of Implements. Hofer.	Stock Breeding. Director Kléning.	Land Management. Christen.	Geometry. Schmid.	Work.	Stock Breeding. Director Kléning.	Manures. Christen.	Stock Breeding. Director Kléning.
8 9	Use of Implements. Hofer.	Bookkeeping. Schmid.	Work.	Soils. Christen.	Work.		Geometry. Schmid.	Work.	Work.
9 10	Book-keeping. Schmid.	Fruit Culture. Locher.		Physics. Schmid.			Special Plant Culture. Christen.		
10 11	Fruit Culture. Locher.	Arithmetic. Schmid.		Housekeeping. Christen.			Chemistry. Dr Schaffer.		Chemistry. Dr Schaffer.
11-12	Arithmetic. Schmid.	Stock Breeding. Director Kléning.		Book-keeping. Schmid.					
1 2	Feeding. Christen.	Work.	Feeding. Christen.	Feeding. Christen.	Physics. Schmid.	Feeding. Christen.	Physics. Schmid.	Stock Breeding. Director Kléning.	Written Work.
2-3	Management of Stock. Prof. Berdez.		Management of Stock. Prof. Berdez.	Forestry. Stähly.	Agriculture. Christen.	Written Work.	Rural Law. Lerch.	Chemistry. Dr Schaffer.	
3 4					Mineralogy. Christen.				
5-6	Management. Christen.	Arithmetic. Schmid.	Work.	Bee-keeping. Christen.	Forestry. Stähly.	Work.	Management. Christen.	Use of Implements. Hoffer.	Work.
7-8½	Recreation.			Recreation.			Recreation.		

Hours.	Thursday.			Friday.			Saturday.		
	Farming Division.		Dairy Division.	Farming Division.		Dairy Division.	Farming Division.		Dairy Division.
	Class I.	Class II.		Class I.	Class II.		Class I.	Class II.	
6-7	Book-keeping. Schmid.	Housekeeping. Christen.	Work.	Management. Christen.	Arithmetic. Schmid.	Work.	Fruit Culture. Locher.	Agriculture. Christen.	Work.
8-9	Work.	Manures. Christen.		Soils. Christen.	Work.		Drawing. Christen.	Arithmetic. Schmid.	
9-10		Vegetable Work. Locher.		Land Management. Christen.				Geometry. Schmid.	
10-11		Drawing. Schmid.		Feeding. Christen.			Plant Culture. Christen.	Fruit Culture. Locher.	
11-12				Stock Breeding. Director Kléning.		Stock Breeding. Director Kléning.	Stock Breeding. Director Kléning.	Bee-keeping. Christen.	Stock Breeding. Director Kléning.
1-2	Housekeeping. Christen.	Work.	Written Work.	Fruit Culture. Locher.	Bee-keeping. Christen.	Chemistry. Dr Schaffer.	Practical Demonstrations.	Work.	Work.
2-3	Stock Management. Prof. Berdez.		Stock Management. Prof. Berdez.	Forestry. Stahly.	Housekeeping. Christen.				
3-4				Arithmetic. Schmid.	Forestry. Stahly.				
5-6	Geometry. Schmid.	Agriculture. Christen.	Work.	Plant Culture. Christen.	Physics. Schmid.	Work.	Bee-keeping. Christen.	Stock Breeding. Director Kléning.	Work.
7-8½	Singing.			Recreation.			Recreation.		

examining milk, their value and accuracy; simple and practical methods of examining them; practice in the use of instruments for the analysis of milk. (3) Experiments in fermentation and other decompositions of milk; cleaning the cow-stalls, and examination of the cheeses, associated with practical hints for prevention of faults in milk and abnormal conditions in cheese; comparison of demonstrations in the chemical analysis of milk. Lesson hours on Wednesdays and Saturdays.

II. Jointly with the Agriculture School at Rütti.—1. Herr Director Kléning.—Breeding of cattle, animal life, distribution of matter in the animal's body, formation of substance; breeding, race, methods of breeding; production and transmitting of characteristics, preparation of the fodder, varieties of fodder and the nourishing properties they contain; feeding, rearing, and management of stock.

2. Herr Christen.—(1) Cultivation of crops; importance of improved culture of the chief fodder grasses and plants; annual fodder plants; mixture of grass seeds, seed-time, sowing, methods of making hay; preparation of green fodder; value of natural meadows. In summer, excursions to be made as often as possible for the collection of the most important fodder and grass plants. (2) Knowledge of the use of implements; management and description of the most important and most generally used implements and machines, with special consideration for the means at the command of the small farmer.

III. To supplement the theoretical and practical teaching, excursions take place for the inspection of good cattle management; of the arrangement of cheese rooms, centrifugal dairies, whey rooms, and appliances for heating milk, &c.

Order of Practical Dairy Work:—(1) Three pupils; morning, $4\frac{1}{2}$ to 11 o'clock. Butter and cheese making. The pupils are dismissed after completing their work until the next day at 9 o'clock, when they continue the process of finishing and salting the cheese, &c. (2) Three pupils; evening, 5 o'clock. Practical work; butter and cheese making. (3) One pupil; morning, at 5 o'clock, for a week, in the management of milk and manufacture of cheese, distribution of the whey, &c. (4) One pupil has stable work for a week.

Fribourg.

When in Switzerland in the month of September last, we learned that an important dairy school was to be opened at Fribourg, and that a programme had been drawn up by a well-known Swiss expert near Interlaken. We paid a visit to this gentleman, who promised to forward a copy of the same for the purpose of this report; but, like some other busy men connected with dairying, he has not been able to find the time up to the completion of our manuscript. The Fribourg Institute is, however, opened, and we are indebted to M. Vevey for the following particulars. The dairy station of Fribourg, with the school and cheese factory at Treyvaux (Gruyère), was opened on the 1st January as an establishment of instruction. Properly called, Treyvaux is situated among the richest pasturage of the Gruyère mountains, and milk is produced in abundance during the whole of the year. At the school and dairy factory six Gruyère cheeses are made daily, of an average weight of 90 lbs. each, except in the winter season, when only about three cheeses are made per day. The buildings and arrangements are large and complete. So far as the manufacture of Gruyère is concerned, there are three *chaudieres*—which are Swiss cheese-kettles—of beautiful construction; they are in copper, and sometimes between 4 and 5 feet in diameter; in this case they hold as much as 1000 litres. These *chaudieres* may be fixed in a somewhat similar manner to an English copper, or movable, being lifted out of their place by a crane. At the school both plans are adopted. When the copper is fixed, the fire underneath is movable, the fuel being placed in a little car-like receptacle, which runs upon tram-rails, and can be sent along the gutter-shaped cutting in the dairy floor from one *chaudiere* to the other. The various systems of skimming milk are taught in a special department. Among those which are chiefly followed are the shallow-pan system, common throughout Switzerland; the Schwartz, and the Danish separator of Burmeister and Wain. We are sorry to hear that the pupils are taught to churn with the Swiss churn, of very great diameter and very narrow width, like a millstone; but they have so far advanced as to teach the use of the butter-worker. The system employed prevents the acceptance of more than six pupils, or two to each chaudiere. These pupils employ their time in the manufacture of cheese and butter, the testing and examination of milk, book-keeping, and the management of pigs. These practical duties occupy the morning; whereas in the afternoon lessons are given in the theory of dairying, and in the various branches of agriculture which bear upon dairy farming. The course of instruction lasts one year, and the students are submitted to an examination in both theory and practice before leaving, when they receive a diploma as experts if their knowledge is judged sufficient. The instruction is entirely gratuitous, but each pupil is required to provide himself with board and lodging, which he does with one of the families in the village. Books and other articles required for instruction are found. The pupils we have referred to are practically apprentices, but there are others who are irregular pupils, who come for some days' or weeks' instruction, and who are assisted in any particular branch of knowledge they desire to master. Lectures are given in the country districts from time to time by the teachers at the station. At Fribourg itself there are two important laboratories, where milk forms a special study, although the other important departments of dairy farming are dealt with in as complete a manner as possible. There is also a bureau in the same building as the laboratory, which exists for the purpose of affording instruction or information to members of the agricultural public. The institute, then, consists of a practical dairy school at Treyvaux, and of the bureau and laboratory at Fribourg. The establishment is entirely official, and costs 9000 francs (£360) per annum, of which half is paid by the Federal Government, and half by the cantons of French Switzerland—Fribourg, Valais, Neufchâtel, and Geneva.

St Gall Dairy School and Experiment Station at Sornthal.

I. General.

1. The design of the St Gall Dairy School at Sornthal is the furtherance and improvement of dairying, especially as regards cheese and the cheese interests, with the assistance of advanced knowledge, and by means of instruction and direction in the cheese-making business.

2. The institution is placed upon the following basis:—(1) In a greater measure to assist in furnishing cheese-manufacturers with steam, centrifugal, butter, cheese, and heating apparatus, with cheese store-houses, presses, and milk-rooms, with the ordinary and deep-setting systems upon the newest principles and the most excellent methods; (2) The improvement of farm cheese dairies, with fixed and movable cheese-presses and vats: (3) A laboratory, with all physical and chemical apparatus for milk, butter, and cheese tests, and the examination of whey, forage, &c., and for practical and theoretical instruction; (4) A library furnished with the best works on milk, breeding of cattle, forage, &c., and the best and newest journals; (5) An exhibit of implements and models bearing on the milk department, also newer and older implements and machinery for correct and practical demonstrations; (6) A good farm, with 60 head of cattle and a similar number of pigs. The farm to be placed near the institution, conducted upon practical principles, and therefore to serve to demonstrate to the pupils the management of the cattle, feeding, milking, &c., and the utilisation of the whey refuse; pig-breeding, pig-fattening; and above all, to make the pupils practically acquainted with cattle-breeding, and the influence of feeding on milk production both as to quality and quantity; (7) Study and sleeping-rooms for the pupils; (8) A common dining-room.

II. Plan of Studies.

3. The instruction to be divided into theoretical and practical parts. The theoretical instruction to take place usually in the afternoon and evening hours, and to include the following subjects:—(1) Special study of milk; (2) Special study of cheese preparation; (3) Special study of butter; (4) Milk testing and milk defects; (5) Management of milk and milk products—management of cheese-rooms, heating, and ventilation; (6) Cheese-room fittings, management of fuel; (7) Milk book-keeping and arithmetic; (8) Implements, with demonstrations in their use; (9) Utilisation of the whey and waste; (10) Cultivation and knowledge of forage plants, natural and artificial—water—salt; (11) Physiology of the cow and pig; (12) The health and disease of farm stock, especially concerning birth and contagious diseases; (13) Dairy cattle on the Alps—Alpine farming, Alpine stables and milk products; (14) Stables, and their fittings for cattle and pigs; (15) History and development of cheese and butter—manufacture and trade; (16) Literature on dairy farming.

The practical instruction includes all the works on the dairy farm, viz.:—(1) Weighing, testing, and cooling of milk; (2) The rennet; (3) Skimming and churning—centrifugal separation; (4) Cheese and its general working—fat, half-fat, and skim; (5) Pressing the cheese; (6) Management in the cellar—salting; (7) Packing cheese and butter; (8) Zieger manufacture (a Swiss product composed of the solids of the whey); (9) Utilisation of the remaining solids and waste; (10) Cleaning the milk utensils; (11) Milking and feeding; (12) Pig and calf feeding.

III. Experiment Station.

4.. The experiment station exists for the explanation of fundamental knowledge of dairy farming and the realisation of practical results, so as to enable the farmer to recognise the most correct methods and implements with which to conduct and learn cheese and butter making. The practice of the station will be marked by—(1) Knowledge of the experiments and examination of produce, with the aid of new apparatus and improved methods; (2) Special experiments for improvement in the application of implements and in the practice of physical and chemical expedients; (3) Employment of the milk refuse; (4) Influence of the food on milk and its products; (5) Examination of milk produce.

IV. Reception of the Scholars.

5. The course of instruction lasts six months—from the 1st of May and November in each year.

6. Pupils must have reached their seventeenth year, and be of strong bodily constitution, possess a good primary education, and at least have worked one year in a practical cheese dairy. The following must be attached to applications:—(*a*) a certificate of birth; (*b*) a school certificate; (*c*) a statement of practical work. Upon entrance into the school the pupils must undergo an examination in reading, writing, and arithmetic.

7. The instruction is gratis for Swiss citizens. The expenses amount to 350 francs (£14) for the half-yearly course, and must be paid quarterly in advance. The president will decide upon the admission of strangers, and the terms for the same.

8. On application for free places by those who cannot afford to pay, qualified pupils receive the decision of the council.

9. On the receipt of the details, the commission of inspectors decide the general payment of fees.

10. For special courses, separate rules will be issued.

11. The pupils have each to exhibit a moral and respectful conduct, which shall help them to perform their allotted work, conscientiously to fulfil the arrangements of their particular masters, as also the course of house rules.

12. Pupils who for any repeated violation of house rules, or for any other grounds before the conclusion of the course, are dismissed from the institution, will be deprived both of the State grant and of the money they have paid.

13. At the close of each course each pupil is submitted to a practical and theoretical examination. On leaving the institution, pupils receive a certificate for conduct during the course, as also for the result of the examination.

V. Direction of the Institution.

14. The direction of the dairy school is in the hands of the Council of St Gall. For special inspection they choose a commission of five members, whose president and first member is the director of the agricultural department. The director of the institution undertakes the place of secretary to the commission. The duration of the office of the commission of inspectors falls together with those of the council.

15. The immediate superintendence of the institution is placed in the hands of the director, who has (*a*) the control of all affairs —books, cash-box, correspondence with the magistrates, scholars generally and privately. (*b*) He must so act that the school and farm work together, and seek to establish by word and deed a harmonious union of factors, teachers, employés, and scholars. (*c*) He designs the teaching plan, makes the propositions for the collection of models and instruments, and conducts the theoretical and practical instruction in the class-room, laboratory, cheese dairy, and cattle houses. (*d*) He prepares the programme for

the beginning of each course, and takes care that by arrangement in groups and weekly change each pupil goes through the whole practical work of the programme prepared under the commission of inspectors. He also writes on the conclusion of each course a detailed report. (*e*) He has the discipline of the institution to control, and to superintend the employés and pupils as regards their behaviour, deportment, and cleanliness. For breaches of discipline he is first required to give a warning, and on repetition to inform the relations of the pupil and the commission of inspectors, and eventually to place the proposition of dismissal before them.

16. All paid assistant teachers are appointed by the commission of inspectors of the council.

17. The cheesemaker and his assistants are specially under the inspector of the directors.

18. A special set of house rules is issued by the commission of inspectors.

Instruction Plan at Sornthal.

Winter Course, 1887–88.

	Subjects.	Hours.	Teacher.
I. *a*.	Special lesson upon milk,	18	Director Diethelm.
	Instruction in cheese-making,	18	,,
II. *a*.	Milk testing and examination,	30	,,
b.	Demonstrations with dairy utensils,	18	,,
	Skimming and handling milk,	12	,,
III. *a*.	Special lessons upon cheese,	65	,,
b.	,, butter,	50	,,
	Management of dairy books,	6	,,
	History of the dairy,	4	,,
	Literature,	4	,,
	Practical milk testing,	45	,,
I. *a*.	Swine breeding,	5	Vet. Siegrist.
b.	Natural history of cattle and pigs,	5	,,
II.	The health and disease of cattle; disease of the udder,	30	,,
III. *a*.	Cow-houses of the Alps,	5	,,
b.	The management of the cow-house,	5	,,
	Food and feeding,	50	Verw. Grieder.
	Repetition,	30	
	Total,	400	

Daily Programme of the Winter Course, 1886–87.

Monday, April 25, 1887.

I. *Practice*.

Hours.		Teachers.
6–7.	Milking and feeding cattle,	Siggenthaler and Wyss.
7–7½.	Treatment of milk,	Director Diethelm.
7½–8.	Rest.	
8–10.	Cheese-making and management of the steam apparatus,	Christen and Wyss.
10–11½.	Skimming with the separator for butter-making,	Schweizer.
11½–12.	Salting the cheese,	Christen.

Hours.	II. *Theory.*	
$1\frac{1}{2}$–2.	The properties of milk,	Director Diethelm.
2–$2\frac{1}{2}$.	The science of cheese-making,	Director Diethelm.
$2\frac{1}{2}$–3.	The science of butter-making,	Director Diethelm.
3–$3\frac{1}{2}$.	Management of cheese and of dairy implements,	Director Diethelm.
$3\frac{1}{2}$–4.	The breeding and management of cattle and pigs in health and disease,	Vet. Siegrist.

The director at Sornthal states that an examination is held during each summer, when twelve persons compete at a time. This commences about July 18, and lasts two days, the competitors paying 3s. 3d. per day for board at the farm. The pupils at the school pay £14 for the half year for board, instruction being free, except in some cases, in which only £6 to £8 is charged. The expenses, which are borne by the Federal and Cantonal Governments, amount to 12,000 francs per annum, or £480. The cheese-making and farm are, however, private, but as soon as the institution has developed it is stated to be the intention of the Government to purchase the whole, and convert it into an experiment station. For these particulars we are indebted to Mr M. Diethelm.

Sursée School.

Herr Moos, the director of the winter school of Sursée, near Lucerne, says—"Our institute is established by the canton of Lucerne, with the assistance of a subvention from the Swiss Confederation. It is a theoretical school, which exists for the purpose of giving to young men of our agricultural canton a necessary knowledge of the theory of dairying. The young men who are admitted to our winter courses are well accustomed to the work of the fields, and they possess considerable knowledge of the natural duties of the farm. The instruction lasts only during the winter, on account of the special position of agriculture in our country. In order to live carefully and to gain time from work, the pupils are lodged in the establishment, where they are under the surveillance of the director and his assistants, who are always ready to help the scholars in their duties. The instruction is divided into two courses, in the following order:—1. A study of the natural sciences, so far as will enable the students to understand agricultural chemistry, zoology, botany, arithmetic, geometry, physics, the German language, zootechny, the cultivation of plants, the physical and climatic properties of the earth, and the means of modifying methods of culture and manuring; 2. The cultivation of agricultural plants, principally forage plants—the feeding and breeding of cattle—the dairy, with many practical demonstrations—rural economy, and agricultural accounts. All these branches of study are specially taught from the point of view of the agriculture of Switzerland. We have this year 45 pupils, who pay 1s. a day for their board, and this is their only expense, because the school furnishes lodgings at the expense of the State, together with linen, washing, &c. The budget of the school amounts to about £300, two-thirds of which is paid by the canton of Lucerne, and one-third by the State. The town of Sursée provides the buildings. &c. The school is found to answer the end which was proposed for it, and it has become very popular. If more considerable assistance were given, the money would be used to augment the apparatus and instruments which are required in the demonstrations, more especially in connection with the analysis and examination of milk."

Austria.

So far as we have been able to ascertain, there are only two important dairy schools in Austria, both of which are fully referred to below. Courses of special instruction, however, are given at the *locale* of the Agriculture Society at Rotnolz, in the Tyrol, by director Dr Tollinger, for seven weeks during January and February, for four weeks in May, and six weeks in November and December; at St Michele, in the Tyrol, by director Mach, Mr J. Samek, and Mr R. Rizzoli, in the German and Italian languages for eight weeks, sixty gallons of milk being used daily; and at Voralberg, with the assistance of the officials of the experiment station of Feldkirch. Here butter-making, cheese-making, and Alpine dairying in theory and practice are taught. Assistance is given by the Austrian Government, which also maintains a number of travelling teachers and lecturers.

The Dairy School of Söhle, Moravia.—This school was established for the instruction of young women in dairy work, cow management, gardening, and housekeeping, and commenced its course on 1st October 1887. For its equipment it received a sum of £500 from the Government, and a further sum of £500 from the Margravate of Moravia, the balance being paid by the Agricultural Society of Neutitschein, and the whole cost having been £1200. The annual cost of conducting the school is expected to reach £150, of which £50 will be paid by the State. A dairy is attached to the school, and a herd of cattle, numbering 36, which are of the race of the country; these are supplemented by pigs and poultry, in the management of which the pupils are instructed. The pupils at the school are limited to 12 in number, and each pays a sum of 72s. per quarter for board and lodging, with a 10s. entry fee, the teaching being gratuitous. The director is Herr Karl Kolb, who is also director of the Agricultural School of Neutitschein. The course of instruction includes the breeding and management of cattle, pigs, and poultry, milking, butter and cheese making, vegetable and fruit gardening; and the girls are required to work in the house, stall, field, and garden in regular order. In addition to the theory of dairying, gardening, and cattle management, they are taught to read, write, and cipher. The theoretical teaching extends over eighteen hours weekly, two hours each being given to dairying, stock-breeding, arithmetic, and writing; four hours to housekeeping, and one hour each to morals, book-keeping, gardening, and one or two other subjects. There are also two courses, one of which is called the house-course, and the other the stall-course. The latter is given as follows in the prospectus of the school:—

Hours.	*Winter.*
5 to $6\frac{1}{2}$	Feeding, cleaning, and milking the cattle, weighing and testing the milk, feeding the calves and pigs; the poultry-house.
7 „ 8	Work in the cow-house and food-room.
8 „ 10	Theoretical instruction.
$10\frac{1}{2}$ „ 12	Work in the milk-room.
12 „ 1	Feeding and milking the cows, testing the milk; feeding the calves, swine, and poultry.
$1\frac{1}{2}$ „ 2	Work in the cow-house.
2 „ 4	Theoretical instruction.
$4\frac{1}{2}$ „ 6	Work in the cheese-room.
6 „ 7	Feeding and milking the cows, testing the milk; feeding the calves and pigs.
7 „ 9	Supper; report, writing the day's work, repetition, reading.
	Summer.
$5\frac{1}{2}$ to 6	Same as in winter.
7 „ 9	Theoretical instruction.
9 „ 12	Work in dairy and garden.
12 „ 1	Same as in winter.
$1\frac{1}{2}$ „ 3	Work in cow-house and food-room.
3 „ 5	Work in the dairy or gardening.
$5\frac{1}{2}$ „ 7	Continuance of necessary work.
7 „ 8	Feeding, cleaning, and milking the cows, testing milk; feeding calves, pigs, and poultry.
8 „ 9	Same as in winter.

The Dairy School of Pichlern-Marienhof.—This important school, which is near Klagenfurt, was founded in 1883 by the Agricultural Society of Kärntner, and is intended for the instruction of females between the ages of sixteen and thirty-five years. The course of instruction lasts one year, from the 1st October. The buildings were provided by the Count Franz von Evlmann, and the yearly cost, over and above the receipts, amounting to from £100 to £120, is provided by the State, the Agricultural Society, and the authorities of Klagenfurt. Twenty-three cows are kept in connection with the school, and the instruction includes breeding and management of cattle, pigs, and poultry; dairy work, gardening, and housekeeping. The teachers include a housekeeper, a dairy instructor, and a gardener; while the director of the Agricultural Society of Klagenfurt gives instruction in the *theory* of dairying and stock management. Help is given to the daughters of peasants, especially those who are intended to follow the occupation of dairying; and where pupils are unable to pay for instruction, they are assisted by the society. The course of instruction includes butter and cheese making, as well as ordinary work among the stock. The fees are at the rate of 24s. per month, which includes board and lodging, light and fire, the teaching alone being entirely gratuitous. The theoretical instruction is most comprehensive, and the subjects are so selected that pupils who prove themselves capable of grasping what is taught them are able to leave with a good knowledge of the elementary science of stock-feeding, milk management, and butter and cheese making. The outdoor or stall course is as follows:—

Hours.	
5 to 6½	Feeding and milking the cattle, feeding the calves, testing the milk, feeding the pigs and poultry.
7 " 10	Instruction and practice in butter-making or cheese-making.
10½ " 12	Feeding and milking the cattle, feeding the calves, testing the milk, feeding the pigs and poultry.
1 " 4	Butter and cheese making.
4½ " 6	Work in the cow-house.

In winter, from 6 to 7, feeding, cleaning, and milking the cows, feeding the calves, testing the milk, feeding the pigs and poultry. In summer this work lasts until 8 o'clock. Special theoretical instruction is giving on Wednesday afternoons, and during the summer months excursions are frequently made. The house time-table is as follows:—

Hours.	
5 to 6½	Work and instruction in the house or in the stall.
6½ " 7	Breakfast; work in the dormitory.
7 " 10	Special instruction or work, according to the lesson time-table.
10 " 10½	Recreation.
10½ " 12	Instruction and work.
12 " 1	Dinner and recreation.
1 " 4	Instruction and work.
4 " 4½	Recreation.

In winter, 4½ to 7, instruction or work. In summer, 4½ to 8, instruction or work. In winter supper is at 7, and in summer at 8. In winter, 7½ to 8, report and repetition. In summer, 8½ to 9, report and repetition. At 9 the pupils go to bed.

The meals are arranged upon the following plan:—

Breakfast—coffee, with bread, &c.; lunch—bread, with butter and cheese or fruit. These meals are the same daily. Monday, for dinner, barley soup, with beef; supper—milk, with butter and "meal meat." Tuesday, dinner—vermicelli soup and beef; supper—bacon and sour milk. Wednesday, dinner—dumpling, soup, and beef; supper—rice, milk, or butter, "meal meat." Thursday, dinner— rice soup and beef; supper—milk and "meal meat." Friday, dinner—Lent soup, "meal meat," fish, and cabbages, Polenta, potatoes; supper—milk soup and potatoes. Saturday, supper—liver with sauce, beef, &c. Sunday, dinner—vermicelli or rice soup, beef, and various dishes; supper—coffee, beer, butter, bread, and cheese.

Hungary.

The dairy inspection department of Hungary was established in 1883, as a branch of the Ministry for Agriculture and Commerce, and we are indebted for the following details to Mr Edward Egan (who is descended from a family which went over from England at the end of last century), the chief of the department, for most of the following details:—The duties of this department are—(1) To urge farmers to keep dairy cattle instead of, as hitherto, chiefly oxen—to encourage private dairying and dairy enterprise; (2) to support existing dairy farms and dairy associations; (3) to provide outlets for the butter and cheese produced; (4) to introduce a practical system of Alpine dairy husbandry in the mountainous parts of the country; (5) to organise technical dairy instruction; (6) to found a national dairy literature; (7) to promote the rearing of dairy cattle in those parts of the country where suitable breeds exist; (8) to develop the utilisation of sheep and buffalo milk; (9) to assist foreigners in establishing dairy farms and dairy enterprises; (10) to organise police inspection of the milk trade in cities; (11) to encourage the home manufacture of dairy machinery and appliances; (12) to procure special State assistance and protection in the interests of dairying; (13) to develop self-help in connection with dairying.

The following results may be mentioned:—(1) During the first three years of its existence the department induced 268 farmers to take up dairying. In the same space of time twelve large dairy associations were formed through its efforts; these associations handle the milk of 6000 cows, 4000 sheep, and 200 buffaloes. The farmers who formed these associations contributed 335,844 fls. (£33,500), while their annual turnover amounts to 666,487 fls. (£66,500). The money invested in the same period by the farmers for dairy purposes, owing *directly* to the efforts of the department, exceeds 1,000,000 fls. (£100,000); while the investments for dairy purposes, due to the examples thus created, and therefore *indirectly* due to the action of the department, amount to two or three times as much. (2) The department is the centre of dairying activity throughout the country, and all interested in dairy undertakings turn to it for advice and help. (3) To facilitate the trade in butter and cheese, a central depôt was established at Buda Pesth in January 1887 through the efforts of the department, under the title of the Farmers' Dairy Supply Association. (4) At various points on the Carpathians, model Alpine farms have been erected. (5) Yearly courses of instruction are given—(*a*) in cow-keeping, (*b*) in cheese and butter making, (*c*) in the management of dairy establishments. Special courses are given in Alpine husbandry. The instruction is practical as well as theoretical. (6)

Twelve treatises on dairying, in which the most important questions of the day relating to dairy matters are discussed, have been published for circulation. (7) Foreigners wishing to start dairy factories or companies apply to the department, and have localities allotted (? indicated) them by it. The department also holds it to be a duty to assist such people with the best advice until they become acquainted with the local conditions. (8) It is probable that the police control of the milk trade in all the towns of Hungary will be organised according to the suggestions tendered by the department. (9) The department has been the means of providing a central depôt for the sale of dairy machinery and appliances, by inducing an eminent firm of manufacturing engineers (Stefan Röck, Buda Pesth) to make this a special branch of its business. (10) The following special measures of State assistance may be mentioned—cheap railway transit, the manufacture of a special quality of salt at the State saltworks; and a bill dealing with butter substitutes, drafted by the department, is under consideration. (11) Under the auspices of the department, a dairyman's benevolent society has been founded.

It will be difficult to point to any country or province in the agricultural world which has created a department calculated to be of such use as that which has been formed by the Hungarian Government. From what we learn, Mr Egan is the right man in the right place, having a perfect mastery of the subject which he is appointed to direct, and making the very best uses of his knowledge, and of the powerful means which are at his disposal in the interests of the dairy farming community of his country. So far, we have never heard one word in this country respecting this really extraordinary and liberal national scheme, and yet the above indicates that a people, who have been almost supposed to be outside the fringe of the modern dairying system, have actually adopted a course which is distinctly in advance of anything we are doing in more advanced agricultural countries. The lesson is a good one, and should be taken to heart. It once more shows the nature of the tremendous effort which Continental people are making to advance with the times, and to fight for their agricultural existence.

Mr Stefan Röck, whose name is mentioned by Mr Egan, sends us various examples of dairy appliances and engineering literature which fully support Mr Egan's remarks. They are prepared in different languages, and the illustrations show that not only are the best appliances which we know in Great Britain used in Hungary, but many others which we have not as yet seen in this country. In a word, in spite of what has been done during the past few years, we have not outstripped the Hungarians, from whom we may take a lesson.

Stock-raising is conducted to a considerable extent in Hungary. The various breeds of cows average about 1000 lbs. in weight, and the yield of milk contains from 3·50 to 6 per cent. of butter. It has of late years been ascertained that dairying is the most profitable branch of stock-keeping, and cows have consequently been increased to a large extent, the present number being about 2,000,000, in addition to some 90,000 buffaloes. Experiments with regard to the improvement of cattle for milk production have of late been made with the assistance of the Government, which has provided grants and afforded means of instruction in various ways. It has also established model breeding farms upon State property in various districts, some of which it manages. In this way the most suitable kinds of stock are produced for the benefit of the farmers. In all there are 76 of these farms, in one of which alone there are 400 bulls. Cheese and butter is made in Hungary to a much larger extent than formerly.

Denmark.

Although Denmark is known as one of the countries which have taken the lead in dairy education, it is a striking fact, borne out by our personal investigations on the spot, and by the voluminous details we have received, that there are no large, no expensively-conducted schools, no high salaries to officials, and no heavy grants made by Government. As in Sweden, Norway, and Germany, it is found that a great deal can be done with a very little money in the way of plain practical instruction, which is the kind of teaching to be found, not only at the few public schools we are about to describe, but at the many farms throughout the whole of Denmark, which accept pupils upon the recommendation of the agricultural authorities. Some time ago we stated, in the *Manchester Guardian*, that we could find no properly qualified person in England willing to accept a payment of £150 for teaching cheese-making in Scotland during the months of the present summer. The remark elicited a response from an officious factory man, who declared that no such salaries were yet offered as would induce competent men to undertake these duties. Undoubtedly, while foreigners are willing to undertake work of this nature at low wages, Englishmen, who only know half as much, require very high payment; but the time is now coming when the industrial classes will be trained in England also to undertake the very agreeable labour of the dairy and the cheese factory.

Mr Jenkins, in his report on technical instruction, stated that £11,000 per annum was devoted to the promotion of agriculture in Denmark. How much of this sum finds its way directly for the furtherance of the dairying interest we cannot say; but although the amount is not large, the means furnished by the Danish Agricultural Department for indirect instruction and help are very considerable for so small a country. This fact was strongly impressed upon us at the National Exhibition at Aalborg five years ago, when, as we fully stated in the *Field* at the time, the most complete means which ingenuity could devise were adopted in the exhibition of butter, and in the method of showing the farmers how to improve their herds, their feeding, and the dairy goods they produced.

The system adopted in the education of young people upon the best Danish dairy farms in many respects resembles that which the French Government conducts at its farm schools, and the Germans in connection with their dairy farm schools. Pupils remain for periods of from six months to two years; they pay small fees, varying from £3 to £5 a year, and work both in the dairy and on the farm as hired servants. In some cases, however, higher fees are paid by young men and women of better position; and upon farms where both classes are taken, the latter take their meals at the farmer's table, which is not always the case with the former. We have had the great advantage of inspecting, among others, two farms which well represent the system of practical teaching of young men and young women respectively. The first was the farm of Elkjæer in Jutland, the property of Mr Harold Branth. Here there were 160 cows and 20 pupils or apprentices, who do almost the whole work of the farm, and who are taught their duties in the best possible manner, being required to keep record-books, which are inspected weekly, and which quickly show, when compared with the results of the pupil's work, whether he has done his duty or not. Full details of this farm school, and of the farm school of Mrs Hannah Neilsen at Harvartigaard, may be found in our book, *British Dairy Farming*. Upon our visit to Mrs Neilsen we found ten young women engaged in cheese-making, each taking her turn at the work under the personal direction of the farmer's wife, —as Mrs Neilsen is,—the dairy being her especial charge. The Danes have the advantage of the advice of some of the best living dairy scientists—Professor Segelcke, who told us that he had studied at Rothamsted: and Dr Fjord, who is continually educating the Danish dairy farmer through the medium of the experiments which he is enabled to make in their interest.

For details connected with the following schools we owe thanks to Mr H. C. Petersen, of Danish separator fame, who personally wrote to the directors for information; to Mr Axel Malmquist, and to Sorensen Brothers of Long Lane, London, who were among the Danish butter pioneers in our markets, and who gave us most valuable assistance in some very difficult translations. In only one instance was there any unwillingness expressed to answer our questions, and in this the director "did not think it wise to tell foreigners what they were doing, as they might copy the system to their detriment." The schools upon which we remark are those only which are connected with dairy farming to any considerable extent, and from one of these, the school of Næsgaard, we append an extract from an important statement we have received, which in itself is one of the most valuable educational tables which could possibly be furnished. The results alone are interesting, but the method of arriving at a knowledge of these results, which are everything to the farmer, should be perpetuated wherever dairying is taught. The table conveys several new lessons and much food for reflection, and is generally connected with English weights and values.

At the laboratorium at Copenhagen, considerable work is undertaken in connection with the milk industry. We were shown the whole plan of investigation in 1883, the year in which the new building was opened by the director, Professor Storch, who has now four assistants.

Næsgaard School.—This school is of considerable importance in Denmark, as it is not only a school but an educational farm, and provides instruction in dairying by means of lectures and demonstrations for thirty hours weekly. The pupils are required to take their turn at the practical work in the dairy for nine months, each pupil receiving two courses of ten days each in summer, and two courses of fifteen days each in winter. They are not required to have any special knowledge of dairying before entering the school, as is often the case. The instruction given is claimed to be as extensive in the dairy department as in the other department of the farm, but the director says that the school does not profess to give pupils more than a thoroughly good grounding. Young men only are received, and they must be not less than eighteen years of age. The course lasts for two years, and the fees payable are £11 for the first year, and £9 for the second. The school is endowed with a sum of money which was left in 1792 by General Classen.

From the rules and regulations of the school we extract the following particulars:—The object is to impart such knowledge to young men of the peasant class as will be useful to them in after life upon the farm or in the dairy. The manager, who is also the head-master, must be a practical instructor. The school is managed by trustees appointed under the will of the founder. The pupils are divided into two classes, one class for each year, and they devote one half the day to practical and the other half to theoretical study. Each pupil is bound during the hours devoted to the purpose to carry out the ordinary work of the farm, the various duties being subdivided among the pupils in such a manner that each may be able to acquire the necessary instruction and practice in them all. Each class receives daily during the summer two hours', and during the winter three hours' theoretical instruction in the following subjects:—First year — Writing, mathematical drawing, arithmetic and geometry, botany, natural history, chemistry, and natural science. Second year — Danish composition, map-drawing, book-keeping, and instruction on soils; botany, science of farming, and the breeding and management of live stock and their structure.

The remainder of the half-day is devoted to theoretical instruction, and is utilised according to the time of year as under:—(1) Self-employment in reading or writing, given out by the teacher; (2) walks about the farm and field, to afford the teacher opportunities of demonstrating from nature what had been taught in-doors; (3) work in the garden under qualified supervision; (4) instruction in the carpenter's shop and the smithy bearing on farm work, under the direction of competent men: (5) practice in judging farm animals, and in applying the ordinary remedies at the command of farmers to the most common diseases of animals.

Theoretical instruction ceases during harvest, in which all pupils take part, and during the 10 to 14 days' holiday at Christmas. Examinations are held during the latter half of April, and the results are published in the newspapers. The school receives eighteen pupils, nine being admittted every 1st May. Doctors' certificates may be required, to show that each candidate is healthy, and has the strength necessary to carry out at least most of the duties necessary on a farm. Each candidate must produce a certificate from his parish and school, to show that he possesses fair abilities, and is of good morals, on which latter point satisfactory evidence of his habits after his leaving school must also be produced. Candidates must apply for admission in their own handwriting. Application for admission, with certificates required, are to be sent in before the end of November. Should less than nine applications be received from peasants' sons, pupils from other classes may be admitted.

The terms include instruction, books, and writing materials, board and lodging, besides medical attendance and medicine in case of illness. Washing is extra, and bedclothes are provided by the pupil. Should any pupil during his course fall a prey to any disease which would prevent his admission under the rules, he is bound to leave the school as soon as he can do so without danger to his health. The fees are returned for the unexpired portion of the half-year.

Pupils are bound implicitly to obey the teachers' instructions. Should any pupil have any cause for complaint, he may take it to the principal, who, on being required, is bound to lay the matter before the management. In the case of disobedience or misconduct, the teacher under whose notice it comes must give the pupil due warning. Should this not prove sufficient, the managing director is apprised, and in presence of the teacher seriously reprimands the pupil, and warns him that a repetition of the offence will be followed by expulsion. In case this has finally to be resorted to, the fees for the unexpired portion of the half-year are returned.

Comparison of the different Years' Dairy Yield (taken from October 1 *to September* 30, 1885–6).

1.	Number of cows,		87
2.	Weight of milk, per cow,	(English) lbs.	5934
3.	" " at milking trial,	"	334
4.	Butter taken from churn, per cow,	"	218
5.	Butter actually sold, per cow,	"	209
6.	Butter, equivalent (value) of new milk used,	"	$17\frac{1}{2}$
7.	Cheese made per cow, new,	"	64
8.	" " ripe,	"	40
9.	Live weight of pigs sold, per cow,	"	130
10.	New milk used per lb. butter taken from churn,	"	27·70
11.	Shrinkage on butter,	per cent.	3·89
12.	New milk used per lb. butter sold,	lbs.	28·74
13.	Skim milk and butter milk used per lb. cheese, new,	"	17·7
14.	Shrinkage on cheese,	per cent.	18·50
15.	Price obtained for butter sold—		
	In summer, per lb. Danish,		1s. 0d. stg.
	In winter, "		1s. 2d. "
	Average, "		1s. 1d. "
16.	Price obtained for cheese sold, per lb. (Danish),		$1\frac{1}{3}$d. "
17.	" " pigs " "		$3\frac{3}{4}$d. "
18.	Value of cheese obtained from 1 lb. (Danish) skim milk,	·07d.	in decimals of 1d.
	" whey obtained from 1 lb. do.,	·09d.	"
19.	Value of 1 lb. skim milk,	·16d.	"
20.	Value of butter obtained from 1 lb. (Danish) = $1\frac{1}{10}$lb. English, new milk,	·493d.	"
	" skim milk from do.,	·12d.	"
	" buttermilk from do.,	·03d.	"
21.	Value of 1 lb. (Danish) new milk,	·64d.	"
22.	1 lb. whey and butter milk, equal	·10d.	"
23.	Gross returns per cow,		£14, 6s. 3d.

(1) During the last few years about 35 calves have been fattened per annum.

(2) Separators have been used for the last four years.

The profits, per cow, in 1882 were £17, 2s. 9d.; in 1883, £15, 19s. 5d.; and in 1884, £15, 17s. 9d.

Fodder Estimates for the Herd of Cows for the Winter 1886–7 *(average per diem).*

UNITS OF CORN AND ARTIFICIAL AND OTHER FODDER USED.

Month.	Corn and artificial Foods.	Roots. (Stated as artificial Food.)	Hay. (Stated as artificial Food.)	Total.	Weight of Milk.	Artificial Fodder used per 100 lbs. Milk.
October, .	338	156	71	565	642	88
November, .	372	151	68	591	748	79
December, .	451	170	100	721	994	72
January, .	485	177	112	774	1173	65
February, .	481	159	129	769	1207	64
March, . .	491	119	140	750	1164	64

In calculating the equivalent values of roots and hay it is estimated that 10 lbs. roots or $2\frac{1}{2}$ lbs. hay = 1 lb. artificial food. The milk from and the food given the fatting cattle are not included.

The above are Danish pounds = $1\frac{1}{10}$ lbs. English.

Fattening of Shorthorned Cattle reared on the Næsgaard School Farm.

		1882.	1883.	1884.	1885.
Number of cattle, ...		5	17	23	20
Age at sending out, ...	days	519	551	541	550
Weight at sending out, . .	lbs.	890	875	883	893
Net proceeds of sale in Leith, .	kr.	309·39	309·35	298·59	258·93
Per lb., ...	ore	34·76	35·24	33·82	29·01
Grain per day during life, .	lbs.	1·71	1·59	1·63	1·63
Cost of feeding, ...	kr.	334·46	324·96	295·38	293·98
Calf—calculated cost, . . .	,,	15·00	15·00	15·00	15·00
Total cost of animal, . . .	,,	349·46	339·96	310·38	308·98
Cost of manure, ...	,,	40·07	31·61	11·79	40·00
New milk per lb., ...	ore	6	6	6	6·00
Skim milk ,, ...	,,	2	2	1·5	1·3
Corn, ...	,,	6	5·7	5·7	5·7
Cotton cake, ...	,,	7·2	6·9	6·8	7·0
Roots, ...	,,	0·6	0·6	0·5	0·5
Hay, ...	,,	2·0	2·0	2·0	2·0
Calculating skim milk with roots as in 1884, the animal costs	kr.	324·46	314·46	310·38	
In each case the manure costs	,,	15·07	6·61	11·79	
Highest price obtained per lb.	ore	40·39	38·33	36·59	32·54
Lowest price ,, ,,	,,	32·18	31·18	31·59	24·90

(100 öre = 1 krone = 1s. $1\frac{1}{3}$d.).

The animals sold in 1885 consumed per head 270 lbs. new milk; 2930 lbs. skimmed milk; 998 lbs. cotton cake; 765 lbs. of grain; 1349 lbs. of hay; 2586 lbs. of grain fodder; and

Dairy Instruction Time Table for November and December 1887.

Hours.	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.	Teacher.
8–9	Gymnastics.						J. Jorgensen.
9¼–10¼	Structure and Habits of Domestic Animals.						M. Nielsen.
10¼–11¼	Dairy Book-keeping and Engineering.						N. Pedersen. Jens. Johansen.
11¼–12¼	Chemistry.						N. Pedersen.
	Dinner.						
2–3	Writing and Drawing.						M. Nielsen.
3–4	Natural Science.	Practical Dairying.	Natural Science.	Practical Dairying.	Natural Science.	Natural Science.	J. Johansen.
4–5	Danish.	Arithmetic.	Danish.	Arithmetic.	Danish.	Arithmetic.	A. Hansen. J. Johansen. M. Nielsen.
5–6	Arithmetic.	Natural Science.	...	Natural Science.	...	Danish.	

Dairy Instruction for January and February 1888.

Hours.	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.	Teacher.
8–9	Gymnastics.						J. Jorgensen.
9¼–10¼	Feeding Cattle and Pigs.						M. Nielsen.
10¼–11¼	Engineering and Dairy Instruction.						N. Pedersen.
11¼–12¼	Chemistry.						N. Pedersen.
	Dinner.						
2–3	Practical Testing of Milk.	Machine and Mathematical Drawing.	Danish.	Machine and Mathematical Drawing.	Practical Testing of Milk.	Machine and Mathematical Drawing.	N. A. Hansen. J. Johansen. M. Nielsen.
3–4			Arithmetic.				
4–5	Danish.	Geography.	Natural Science.	Geography.	Natural Science.	Danish.	J. Johansen.
5–6	Arithmetic.	Practical Dairying.	Book-keeping.	Practical Dairying.	Book-keeping.	Arithmetic.	J. Johansen.

13,401 lbs. of roots—the Danish pound being 10 per cent. more than the English.

Ladelundgaards Landboskole.—In addition to the three weeks' course of milk control instituted by Professor Fjord, a five months' course is given at this school, in order to impart complete instruction in practical dairying to the pupils. Although the cost of teaching and of apparatus is considerable, the payment required from the students will be the same as at the agricultural school, viz., 165 kroner, or about 30s. per month, which includes board, lodging, teaching, and light and fire; a single month is charged 45s. The course commences on 3rd November, and students are required to bring their bed-clothes. (See Time Table, p. 84.)

In the month of March, teaching will be continued in Danish, arithmetic, stock-feeding, dairying, science, and physics, the remainder of the time being devoted to the practical treatment of milk. At the end of the course an examination will be held in the presence of practical men.

Odense.—The Theoretical Agricultural Institute of Odense receives assistance from the State of £75 per annum, of which £55 comes from the Home Department, and £20 from the Department of Education. It also receives a grant of £55 from two societies. The instruction given is purely theoretical, and is intended as a preparation for actual practical work. The students, who are young men only, receive dairy instruction, which is preceded by a six months' course of chemistry and physics of the dairy, a knowledge of the structure and treatment of live stock, and the various agricultural subjects which are connected with dairy farming. The hours devoted to study are fifty per week, but one-third of the time is occupied by examinations. The course lasts for six months, and during the winter only. The fees payable are £4 per course. We are informed that about 10 per cent. of the students who pass through the Odense Institute obtain situations as dairymen.

Lyngby.—The elementary school of Lyngby, something like that of Odense, is intended for the preparation of pupils, young men only, for practical work. It appears that upon entrance into the school they usually have some acquaintance with the practice of dairying or dairy farming, but no theoretical knowledge, and they are therefore first passed through a course of agricultural chemistry. The course of instruction, which extends from 15th October to 30th September, includes dairying and the feeding and management of dairy stock, and the pupils are employed in their studies from forty to fifty hours per week The cost of instruction is 11s. per month, and for board, lodging, light, and fire, 28s. per month, but the pupils are required to furnish their own bed linen. The grant from the State amounts to £72.

The following is the plan of studies:—

Lesson Plan from 15th October 1887 to 1st February 1888.

Hours.	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.
8 - 9	Chemistry.	Soils.	Chemistry.	Soils.	Chemistry.	Soils.
9 -10	German.	German.	Geography.	Anatomy.	History.	Farming.
11 -12	Anatomy.	Chemistry.	Anatomy.	Chemistry.	Anatomy.	Anatomy.
12 - $1\frac{1}{2}$	Accounts and Gymnastics.	Drawing.	Accounts and Gymnastics.	Drawing.	Arithmetic.	Drawing.
$3\frac{1}{2}$- $4\frac{1}{2}$	Soils.	Geography.	Implements.	History.	Farming.	...
$4\frac{1}{2}$- $5\frac{1}{2}$	Current History.	Cultivation of Land.	Gymnastics.	Farming.	Geography.	...

Tune.—At the Elementary Agricultural School of Tune there is a course of dairying for girls, which lasts from 1st September to 1st November. The girls, of whom about fifty pass through the school in a year, are divided into two batches, which in turn perform the ordinary work of the dairy, under the direction of the dairywomen and one of the masters, the other batch meanwhile receiving instruction in writing, geography, and needlework. The work of the dairy concludes at eleven o'clock, and from this time the whole of the pupils are taught reading, history, literature, and arithmetic, the latter including dairy record and book-keeping. This school claims to provide a practical all-round course of training for farmers' daughters rather than special training for dairymaids, and 20 cows are kept. In the school proper, in which boys alone are received, there is a course of instruction in the theory of dairying. The cost of the dairy course for the girls is 33s. per month, this including board and lodging. The grant from the State is from £40 to £45 per annum, and from the funds of the parish £55 per annum.

Veile.—This school provides a preparatory course of instruction for those who intend to go through a higher course of education. As in the case of the school at Lyngby, the pupils are first taught chemistry, the directors of the school, from whom these details have been received, appearing to believe that where there is no previous theoretical training, it should first take the field. The course lasts for six months for both males and females, who receive thirty hours' instruction weekly, but the young men alone are taught chemistry, and these frequently apprentice themselves to dairy farmers after leaving the school. The cost of instruction is 11s. per month for males and 15s. for females.

SWEDEN.

The earliest efforts in the direction of organised instruction commenced in the year 1851, when the Government sent out two dairy teachers, who were appointed for the whole of Sweden, paying them salaries of £200 a-year, in addition to free tickets, and an allowance of 6s. per day when they were travelling. If a dairymaid desired to improve her practice, it was the duty of the instructor to go to the farm, and stay as long as was found really necessary, in order to instruct her fully either in butter-making or cheese-making; and at the same time to assist the farmer, especially showing him how to feed the cattle, in order to produce the most and richest milk and the best butter. At the age of sixty-five, or when he has been thirty years in the Government service, the instructor is pensioned.

Connected with the two royal agricultural colleges (Alnarp and Ultuna) are dairy schools, started by the Government in the year 1883, each receiving a grant of £280 yearly. Young men are admitted to these colleges either as in-students or out-students. There is no entrance examination, but the best preparation is a good education at the royal agricultural colleges or some good dairy farm. The number of students averages about 6 in-students and 15 to 20 out-students at each college. There is now room for more than 6 in-students, who all lodge and board in the college. As a rule, they are required to be at least eighteen years of age. The fees for in-students are £70 per year, which includes chemical apparatus, and all college charges, except bed, laundress, light, books, and damages. Out-students are admitted at any age, and either married or unmarried. If not proceeding to the diploma, they have the option of taking up either all or only one or more of the obligatory subjects. They have also the option of staying as short a time as one month, the fees being £4 per month. Out-students lodge and board in the neighbourhood, or by special permission sometimes in the royal agricultural colleges. The course extends over a year, from the 1st of November to the end of October, but a student may remain two years.

The dairy students have the use of implements, the dairy, the cow-house, piggery—in one word, of *everything* necessary, including the lecture theatre and class-rooms belonging to the agricultural colleges.

Outline of Syllabus of Instruction.

Dairy Farming.—Systems of dairy farming, Swedish and foreign. Dairy Pastures.—Selection of grasses, general management, dairy management, dairy buildings, utensils, implements, and machinery. Dairy Stock.—External form, breeds and their characteristics; breeding and rearing for dairy purposes, feeding and fatting; calving, rearing and management of calves; summer and winter management of dairy stock; the principal diseases. Milk and Cream.—Good and bad milk, milk-tests, milking, yield of milk, raising of cream on various systems, management of cream, skimmed milk. Butter.—Characteristics of good butter and circumstances affecting it; its manufacture. Cheese.—Characteristics of good cheese, and circumstances affecting it; the varieties and their manufacture. Pigs.—Breeds and their characteristics, breeding and rearing, feeding and fattening; management of brood sows, the principal diseases.

Practical Work.—Four months in the dairy—weighing and cooling milk, cream-setting, butter-making, cheese-making, separating milk; two months in the cow-house and piggery—milking, rearing and management of calves and pigs; management of brood sows and cows with calves. Butter-testing at the wholesale butter warehouses in town. Book-keeping.—Uses and methods of book-keeping for dairy purposes.

Chemistry—Inorganic Chemistry.—Chemistry of the more common elements and their more important compounds; their occurrence, preparation, properties, actions, and uses. Organic Chemistry.—Organic compounds (natural and artificial), proximate and ultimate organic analysis; physical properties of organic compounds; general action of reagents on carbon compounds; classification of carbon compounds, alcohols, acids, carbohydrates and albuminoids, with their properties and composition.

Agricultural Chemistry—Plant Life.—Composition of plants, proximate and ultimate analysis; ash of plants, food of plants (its composition and sources); germination, functions of roots, stem, leaves and bark; assimilation of plant food, growth of plants. Farm crops of all kinds; conditions and changes affecting various processes. Animal Life and Nutrition.—Composition of the animal body—tissues, bone, flesh, and fat; waste, repair, and increase; respiration, nutrition, digestion and assimilation of food; decomposition. Cattle Foods.—Classification of cattle foods, food constituents and their functions. Feeding of Dairy Cattle and Pigs.—Principles of feeding, foods suited to different animals at different ages and under different conditions; relation of food to production of flesh, fat, and milk. Dairying.—Composition and properties of milk, cream, butter, and cheese, and conditions affecting the same as to quantity and quality; manufacture of fresh and salt butter, manufacture of cheese.

Practical Chemistry.—Quantitative analysis (gravimetric and volumetric), especially of feeding stuffs and dairy products.

Veterinary Science and Practice—Anatomy and Physiology of Cattle and Pigs.—Conformation, tissues, and apparatus of organs of cattle and pigs, and their position and structure; functions of the various organs, digestion, respiration, circulation, secretion, &c.; dentition, and data for determining age. Pathology.—Various kinds and causes of disease; general rules of diagnosis. General principles to be followed in acute disease in absence of professional assistance.

Architectural Farm Drawing—Design.—Designing the ground-plan for farm buildings, especially stables for cattle and pig and dairy buildings.

Management of steam-engine, separator, &c.

The Government pays every year thirty-two girls £8, 6s. each for learning butter and cheese making on good dairy farms. One or two go to each farm, which the Government travelling teachers go and inspect two or three times during the year. The girls are required to do every kind of work in the dairy, and also milk the cows and feed the calves. In Sweden women always milk, one girl being capable of milking from ten to seventeen cows. The farmer is required to teach the girls dairy management, arithmetic, writing, spelling, reading, and dairy book-keeping, and the management of the steam-engine and separators; and for this teaching he receives £5, 10s. for each girl, who lodges and boards on the farm, and pays the farmer with her work in the dairy.

These farms are situated in different parts of the middle and south of Sweden. They are fifteen in number, and the names of them are Runthsbo, Huseby, Ronnum, Ellerö, Blomberg, Degeberg, Kilagården, Saby, Brogård, Sahlsta, Trystorp, Stjernsund, Hedensberg, Berga, and Svensksund.

In the north of Sweden, where no good dairy farms are to be seen, the Government has started two dairy schools for girls. These are Robertsfors and Huså. There are six girls at each school, and the Government pays £106 yearly to each. The girls must do the whole work in the dairy, and milk the cows and feed the calves. They are taught dairy management, arithmetic, writing, spelling, reading, book-keeping for dairy purposes, and the management of the steam-engine and separators. The girls pay nothing for their education. These schools are also inspected by the Government teacher.

To an agent in Manchester the Government pays £335 yearly. His duty is to establish agencies or depôts for the sale of Swedish dairy produce. The whole sum paid by the Government for dairy purposes is about £2000 per annum; but there are also twenty-eight agricultural associations, each of which provides a travelling teacher. These teachers are entirely paid by the associations, so that in all the money annually expended for dairy education is £5000.

NORWAY.

Mr Chr. Tobiesen, the State Dairy Inspector, kindly informs me that only one State-aided dairy school exists at present, viz., the "Brandbo" Dairy School at Hadeland, for male pupils only. During the present spring (1888) two additional schools are to be opened—one in the north of the country for male pupils, and the other in the districts of the west for females. The Royal Society for furthering the welfare of Norway, "Det kongelige Selskab for Norgesvel," having for several years contributed towards the promotion of dairy instruction, supports five dairy schools for female pupils. The rules for the Brandbo Dairy School will show the plan on which they are arranged, and which is also intended to be adopted in the case of the other schools. No fees are required of the pupils at the dairy schools. The State contributes to the Brandbo Dairy School the sum of kroner 2000 (£111), and equal amounts will also be granted to the other schools. Of this allowance the sum of kroner 1250 (£69, 5s.) is applied to the board and lodging of five pupils, and the remainder, kroner 750 (£41, 5s.), to increase the salaries of the manager and the teacher. The State has granted for dairying purposes for the revenue year 1887–88 the sum of kr. 20,000 (£1111), to be applied to the dairy schools and to experiments in the making of cheese, Norwegian and foreign varieties, and to defray the expenses of dairy farmers and dairywomen studying dairying or cheese-making abroad. Mr Tobiesen also sends me annual reports on the measures taken by the Government to promote dairying, and of the Agricultural College of Aas, as well as official statistical returns and reports of the Royal Agricultural Society of Norway.

The report of the Society for the Promotion of the National Welfare gives complete details of the five dairy schools which are conducted under its auspices, and these details are of extreme importance, inasmuch as they show the practical nature of the dairying which is actually done, and in which the pupils are required to assist as though they were paid servants. The society receives from the State an annual contribution of 16,500 crowns (£907). It has 18 district branches and 4 special branches, and 13 of the first-named have 132 local subdivisions. The funds of the society were chiefly devoted to the promotion of dairying in 1886 and 1887. It maintains three dairy instructors, whose services are in constant demand, owing to the greatly increasing number of dairies which are being started. It is stated that, as the Government intend to make grants to these five schools, the society will gradually drop them, and leave them to the care of the State. The gross work, as regards milk manipulation at the schools in 1886, was as follows:—

Names of the Schools.	Quantity of Milk.	Butter made.	Proportion of Milk to Butter.	Cheese made.	Proportion of Milk to Cheese.
	Litres.	Kilogrammes.	Litres.	Kilogrammes.	Litres.
Rings, . .	217,495	8,584	24·20	10,896	14·34
Gaupen, . .	588,288	22,523	25·50	31,578	13·20
Veldre, . .	182,682	7,222	24·77	8,204	14·62
Sandnaes, .	335,070	8,450	37·79	4,822	13·72
Reinskloster,	48,802	1,571	28·80	1,025	13·08

A litre is about $1\frac{3}{4}$ pints, and a kilogramme 2 lbs. $3\frac{1}{4}$ oz.

The details of one of these schools are given further on. In the same year the society made grants to eight dairy exhibitions. We give an example of the work of the year as regards the Rings School, which is both interesting and instructive, as follows:—

Months.	Milk Handled.	Milk Churned.	Butter yield.	Proportion of Milk to Butter.	Skimmed Milk.			Proportion of Milk to Cheese.
					Skimmed Milk used for Cheese.	No of Cheeses.	Weight.	
	Litres.	Litres.	Kilos.	Litres.	Litres.		Kilos.	Litres.
January	17,830·2	17,550	679	25·85	12,861	59	956·5	13·45
February	19,159·2	11,940	478·5	24·95	8,960	40	641·5	13·97
March	19,422·1	19,180	761	25·20	14,546	69	1,036·5	14·03
April	26,106·8	25,850	953·5	27·11	18,580	89	1,179·5	15·75
May	27,132·9	26,920	1086	24·79	18,000	90	1,280	14·07
June	17,426·8	17,100	703	24·32	11,024	52	733	15·04
July	16,809·5	16,150	661	24·45	10,812	51	720	15·02
August	16,669·6	16,320	623	26·20	11,236	53	643	17·47
September	10,941·2	10,720	448	23·93	8,268	39	580	11·26
October	16,412·0	16,130	714	22·59	12,518	59	929	13·47
November	16,243·1	15,720	646·5	24·32	12,306	58	851·5	14·45
December	20,341·6	20,140	830·5	24·25	17,148	79	1,345·5	12·75

The course at these schools lasts one year, commencing 14th April. In addition to the instruction of practical work which they receive, the pupils are taught arithmetic, writing, spelling, reading, and book-keeping. The grant by the Government for the present year is fixed at £1111. From the voluminous report of the Agricultural High School at Aas, where dairying is taught, we find that the sum of £240 is received from the state, and that the produce sold—a large proportion of which was milk or dairy produce—was equivalent to 40,870 crowns.

Brandbo Dairy School.—This school was established under the authority of the Government for the training of dairy instructors and managers. Pupils are required to pass through a one year's course of practical and theoretical study in connection with the working of a dairy. The principal, who is a qualified dairy scientist, and the teachers, are appointed with the concurrence of the director of agriculture; the pupils also are selected by the same authority from applicants recommended by the management. The managing committee visit the school at various times to see that the teachers do their duty, to reform abuses if any arise, to support the principal in his action, and to generally forward the objects of the school. The pupils having passed through a certain amount of practical experience, take turns in the superintendence of the various operations in butter and cheese making, as well as in the management of the machinery and the stock. They are also required to keep records of the milk manipulated in butter-making. The butter is chiefly made from soured cream, although some sweet cream butter is made in order that the students may have the requisite instruction in dealing with each kind. They are also taught the systems of packing butter for the foreign markets: the various methods of cheese-making, both from new and skimmed milk: and they receive instruction in milking, the treatment of milk in all its branches, and in the feeding of cattle. The theoretical training of the pupils is included in the following syllabus:—

Norwegian language, writing, spelling, reading, arithmetic, and book-keeping for dairy purposes. Systems of dairy farming—Norwegian and foreign. Selection of grasses and general management of pastures. Dairy management; dairy buildings; dairy utensils, implements, and machinery. Dairy stock—external farm, breeds and characteristics; breeding and rearing for dairy purposes; feeding and fattening, calving, rearing and management of calves; summer and winter management of dairy stock, principal diseases. Milk and cream, good and bad milk, milk tests, milking, yield of milk, raising cream on various systems, management of cream, skimmed milk. Characteristics of good butter, and circumstances affecting it—its manufacture. Characteristics of good cheese, and circumstances affecting it—varieties and systems of manufacture. Pigs—breeds and characteristics; breeding and rearing, feeding and fattening, management of brood sows; principal diseases.

Practical Work.—Weighing and cooling milk, cream-setting, butter-making, cheese-making, separating milk, milking the cows, rearing and management of calves and pigs, management of brood sows and cows with calves.

Chemistry.—Farm crops of all kinds, conditions and changes affecting the various processes. *Foods*—Classification of foods, food constituents and their functions. Feeding of dairy cattle and pigs—principles of feeding, kind and quantity suited to different conditions; relation of food to production of flesh, fat, and milk. *Dairying*—Composition and properties of milk, cream, butter, and cheese, and conditions affecting the same as to quantity and quality. Manufacture of fresh and salt butter; manufacture of cheese.

Architectural Farm Drawing.—Designing the ground plan for farm buildings, especially stables for cattle, and pig and dairy buildings. Management of steam-engine, separator, &c.

The hours of work and of instruction are fixed by the principal, with the approval of the director of agriculture. At the end of each year an examination is held, and pupils who pass successfully receive certificates. Those pupils who do not pass through the entire course are entitled to certificates stating the length of their attendance at the school, but nothing more. The examiners are chosen by the directors of agriculture. The pupils have the right to complain to the principal, and through him to the managing committee. Where differences arise between the principal and committee, the decision rests with the director of agriculture, who has power to cause the school to be inspected at any time.

The course of instruction commences 14th April and concludes on 13th April, and is entirely free.

HOLLAND.

I am indebted to the consul for the Netherlands for some extremely useful information with respect to the prospects of dairying in Holland. Mr Maas states that at the Royal Agricultural College at Wageningen dairying is taught to some extent, but that special schools are being established, for which the sum of 28,000 florins (or £1666) has been applied for to the States General for the budget of the present year. A dairy school has already been established by the Agricultural Society of the Provinces of Holland, and there is a dairy experimental station in connection with the Royal College. More of these stations are to be established by the Government upon the proposal of the Agricultural Commissioners—viz., at Groningen, Hoorn, and Breda. The scheme of dairy instruction was first published at a meeting held at Gouda in 1844. The plan was advanced in the following year when the provinces of South Holland offered an annual subsidy of 1000 guilders (£83), another society 1500 guilders, whereas 20,000 guilders (or £1666) were subscribed by private individuals to meet the initial expenses. The work was not, however, completed, and the Government is now asked for 5000 guilders towards the initial expense, and 1000 guilders per annum as a subsidy: the province and the agricultural societies providing the remainder of the required sums. The school is to be conducted in a practical manner, butter and cheese produced and regularly sold in the market. The payment for instruction by pupils is to be on an extremely low scale. Since the above remarks were written we are informed by the consul that a school is to be established at Bolsward by the Agricultural Society of Friesland, and that the following subsidies have been either granted or applied for:—2000 guilders (or £166) from the Government, and 1000 guilders (or £83) from the province towards the initial expenses, and similar sums for the annual maintenance of the school. The Royal Agricultural School, which chiefly gives instruction in the science of agriculture, is controlled by a director and sub-director, under whom there are twenty-one teachers and thirteen assistants. The annual payment for instruction is £3, 6s. 8d. The pupils lodge at a boarding establishment in connection with the school, where they are required to pay a sum of £37, 10s. If pupils lodge with private individuals they are charged for board and lodging sums varying between £25 and £100.

Belgium.

There is no special school of dairying in Belgium, but the subject is taught during the course at the Royal Agricultural Institute at Gembloux, which receives a State grant varying from £4400 to £4800. The instructor—in science only—is the well-known chemist, Professor Chevron, who has contributed largely to our knowledge of the science of milk. He treats exclusively upon "the dairy, old methods of butter manufacture, the Swartz system setting in running water, centrifugal creaming, margarine butter, and the cheese dairy." The feeding and management of cows is taught by another professor. Demonstrations are occasionally given. At the superior school of agriculture connected with the Catholic University of Louvain, the dairy course is more complete, although based upon similar lines. At Herve a course of dairy instruction is given by two experts at the cost of the Government, and extends over forty lessons. The Government also organises special courses of lectures in different districts each year, with the view of instructing those who are interested.

United States.

Although our language, and to a large extent our agricultural systems, are based upon similar lines, it has been even more difficult to obtain details of the work pursued in the United States than in some of the countries of Europe; and but for the very generous and valuable aid of Col. F. D. Curtis, whose reputation is so well known in this country (and whose ancestors were Puritans), the information conveyed in this report would be but meagre. We are also largely indebted to Professor Henry, to Major Alvord, to Mr John Gould, and to many other celebrated Americans, who have managed to spare some of their most valuable time for a good object, a feature which is not so common with men of less conspicuous reputation. Col. F. D. Curtis kindly sent out for our benefit the following queries to leading agricultural officials in each of the principal States:—"1. Number and name of colleges, schools, or experimental stations where dairying is taught? 2. Grants made by your Legislature for agricultural schools or colleges and experimental stations? 3. Has your State held farmers' institutes—number of meetings last year or any year? 4. Appropriations made for this purpose? 5. Copy of the rules pertaining to dairy instruction, fees, &c.; any facts or reports gratefully received." Responses were obtained in the majority of cases, but in a few others they have not been received; there is no reply, for example, from Ohio, but in that State farmers' meetings are being held at a cost of only 50s. each, while the cost in Wisconsin is £30 each. On the other hand, in New York State the twenty institutes or more are to cost £1200. In dairy matters, Wisconsin and Minnesota have both active and useful associations, and are the rivals of New York. Each State has a university, the gift of the Government by means of land grants.

There are experimental stations in all the Northern States, maintained by State appropriations, as they are termed, of £4000 per annum. Last year the United States Government appropriated £3000 to each State for an additional experimental station in connection with a university. The farmers' meetings or institutes are chiefly carried on by the professors of the universities and stations, and in other cases by intelligent farmers. There are also county institutes, held under the auspices of the county agricultural societies. We give the information we receive, eliminating as far as is possible from direct reference agricultural matters other than dairying; but in the majority of instances the farmers' institutes chiefly deal with dairy farming subjects, as shown by the numerous handbills we have received from different States.

The Hon. Norman Colman, United States Commissioner of Agriculture, very kindly furnishes the following information, which we extract from his letter:—"The dairy system of this country is largely confined to creameries, worked upon the co-operative or associated plan. These establishments are in successful operation in the older dairy States, and are extending in the newer States west of the Mississippi River. Practical instruction in dairying has been undertaken at several of the State agricultural colleges, notably that of the State of Mississippi, near Starkville, and at Amherst, Mass. Experiments are being made from time to time in this direction at the several experiment stations, but no specific dairy schools are known to exist. The only appropriation thus far made by the National Government is to the States for agricultural colleges, and is known as the 'Land Scrip Donation,' which was passed in 1862. The enactment of the law is as follows:—'Be it enacted, &c.,—That there be granted to the several States, for the purposes hereinafter mentioned, an amount of public land to be apportioned to each State, a quantity equal to 30,000 acres for each senator or representative in Congress to which the States are respectively entitled by the apportionment under the census of 1860; provided that no mineral lands shall be selected or purchased under the provisions of this Act.' This law has been availed of by many States colleges, not agricultural in character, in establishing chairs of agriculture."

Major Alvord furnishes us with considerable information, much of which amply confirms that given by other correspondents. He knows of no fully-equipped dairy school as we understand it in England, although in some cases special attention is given, and provision made for dairy instruction, at the agricultural colleges. He also mentions that, at the Ontario college at Guelph, there is a special working creamery, to which the students have access, and in which they take part. The same is the case at the agricultural college at Hanover, New Hampshire, and the State college, Mississippi. At Cornell university there is a special dairy building for illustration and experiment, but this is only used a few months in the year, when the classes are considering the subject.

A practical dairy school, as it is termed, has been opened by Mr Valentine at Houghton Farm, New York, which under Professor Alvord was an experiment station. I learn that it is backed by an erratic but wealthy man, and doubts are entertained whether it will remain open long. The teacher is a very capable woman, who makes good butter, and is somewhat expert in fancy cheese-making, but there is no attempt to combine *theoretical* study or experimental inquiry. Mr Valentine himself informs us that his teacher is a trained Swedish dairymaid of large experience and "first-class quality." The school was only opened in December, but numbers of inquiries have been received from persons desiring to enter. Mr Valentine believes that he will catch some scholars, and do some good work in a pioneer way. He adds that it takes a long time to wake people up, even to avail themselves of their own privileges.

Major Alvord continues, that another form of instruction is that of the employment of experts, who go from factory to factory to criticise the work and to illustrate improved methods. Professor Arnold was at one time employed in this way, and, like his successor, was largely engaged in Canada. This winter too, the farmers' institutes in Wisconsin have been varied by the introduction of butter-making demonstrations under the supervision of Mr John Gould, "who is a good practical dairyman." Working dairies have also been made a feature at agricultural shows in different parts of the country, notably at Boston, where it was under Major Alvord's management, at New York, at Orange County Fair, and at St Louis. In some States the dairymen's associations have received grants of from £100 to £200 a year from the Treasury. The agricultural stations of America, which are growing rapidly in numbers and usefulness, all receiving State aid, do good work in investigating dairy questions; and more and more may be expected in this line. Major Alvord concludes as follows:—"Supposing myself to be pretty well posted on this subject, I regretfully generalise by saying that, with the exception of the spasmodic efforts which I have noted, there has been thus far no systematic or successful instruction in dairying in this country which has had an appreciable effect upon that industry."

Let us add to these remarks that the American agricultural press is the most valuable in the English language in communicating information upon dairy subjects. There are two leading journals especially devoted to the work—*The American Dairyman* and *Hoard's Dairyman*, while such journals as the *National Live-Stock Journal*, *Rural New-Yorker*, and the *Albany Cultivator* treat the subject in a first-rate style. The country, too, although admittedly large, can boast of scientific and practical men, whose teaching is so general and so valuable that the reading dairy farmer need scarcely demand further State assistance. Among the States from which we have not received more complete information quoted further on, are Georgia; the replies indicate that nothing is done in any way as regards instruction, and consequently no State assistance is received. Professor White of the State University considers this a mortifying admission.

We learn from President M'Bryde, of the South Carolina College at Columbia, that the Legislature last year granted £2000 for the establishment of two experiment stations, one in the upper and the other in the lower part of the State. Last summer a giant farmers' encampment was held, and a grant of several hundred dollars from the State bureau was made in connection with it.

As regards Pennsylvania, we are informed by Dr Armsby, so well known throughout Europe, that he knows of no specific dairy schools in his State, although the question receives attention in the college as well as in the experiment station. Like many other writers, Dr Armsby speaks very highly of the Massachusetts and Wisconsin stations, with the latter of which he was, until recently, connected. There are, however, twelve or fifteen institutes held yearly, the State granting them £600.

Professor Roberts, of the Cornell University, states that the instruction given at the various State colleges in dairy matters lasts from two weeks to two months, and in some instances practical work is done in the dairy-house. Instruction in practical and theoretical dairying is given by Professor Arnold; and in the feeding and management of stock, and the production and sale of milk, by Professor Roberts himself. He adds that all the Northern and some of the Southern States have one or more State dairymen's conventions, which, we may remark, are similar to the dairy conferences annually held in this country, as may be seen by the published accounts of their proceedings. Professor Roberts concludes by saying that "there is a great awakening among our people to the necessity of better trained men among the dairy farmers, and great efforts are being made not only to educate the people at home, but to induce young men and women to study those subjects which relate to this industry. The work is so new, and has grown so rapidly within the last two or three years, that the time has not been sufficient to formulate or to perfect our methods. There is much enthusiasm together with much crudeness, but this will right itself in due time."

The following figures show the value of the property, the permanent endowment, and the annual interest granted to eight of the most successful colleges in the United States:—

State.	Value of Grounds, Buildings, &c.	Permanent Endowment.	Annual Interest.
Illinois,	£80,000	£64,000	£5,300
Indiana,	60,000	68,000	3,400
Iowa,	200,000	127,500	9,600
Kansas,	22,000	72,000	5,700
Michigan,	67,800	68,000	4,700
Mississippi,	35,000	22,700	1,130
Ohio,	200,000	107,500	6,300
Texas,	52,000	42,000	2,800
Average for eight,	£90,000	£72,000	£5,000

In Vermont, dairy education is conducted at the Agricultural College at Burlington, for which institution there is an annual grant of £700. Farmers' institutes are held in every county of the State in each year, and for this purpose £500 is granted. There is a State dairymen's association.

New York State.—The secretary of the New York State Dairymen's Association, Mr Josiah Shull, says that there are really no dairy schools in the State, although the various meetings which have been held are in that direction—"to instruct, to educate." He adds, that last summer the first dairy conference in the State was held for the purpose of giving instruction, and to illustrate the practice of butter-making. Two dairies were selected in different parts of the State; a day was fixed, and all persons interested were invited to attend. The whole details of butter-making were demonstrated in the presence of a large assemblage of farmers, their wives and daughters, and, strange to say, some of the newspapers called this gathering a "dairy school." The State appropriated £400, which was handed to the Dairy Association for the year. It also granted £1200 for the purpose of holding twenty farmers' institutes during the season. These institutes lasted two days each, and were held in various counties; the most experienced and best-informed farmers gave addresses. Instruction in dairying and the feeding of cattle is given at the Cornell University, Ithaca. There is no direct subvention to the university, but some years ago the General Government made a land grant in which Cornell participated. Perhaps the most important institution as regards dairy farming in New York State is the experiment station. This was instituted, and £4000 was granted two years in succession, for the purchase of a farm and the equipment of a laboratory. The station now receives £4000 a year, and is in full working order, issuing its report, which is of the most comprehensive character, and furnishing scientific details with regard to dairy matters, which are perhaps of greater value than anything of the kind which has been published. The director of the station, Dr Sturtevant, has on two or three occasions very kindly sent us a copy of his report, and it may be mentioned that that of 1886, published last year, contains voluminous details with regard to the feeding of cattle and the manure they pass, to the production of milk from various foods, and to chemical investigations in milk, analysis of butter, and of butter constituents; in a word, the reports of the station, prepared by Dr Sturtevant and Dr Badcock, the chemist, are amongst the most valuable records with regard to dairy literature which exist at this moment. The station is under a board of control of ten gentlemen; there is an assistant-director, a botanist, chemist, and assistant chemists, two horticulturists, a farmer, and a stenographer. In 1866 the money spent was £4400, including the portion of a balance brought over from the previous year. The salaries amounted to about £1870, labour to £900 odd, permanent improvements to £350, supplies £230, printing £180, repairs £160, the laboratory £125, and the board of control expenses were £120; whereas the balance was divided between the botanical department, farm implements, cartage and freight, fuel, manures, postage, printing, and travelling expenses, and certainly no sum has been better spent. The establishment of an experiment station in this country could scarcely be made upon better lines than that of New York, to which English agriculturists already owe a very great deal, for appropriate extracts of the reports have contantly been published in this country. The New York State also grants an annual sum of £5000 for agricultural purposes, of which £1600 goes to the State Society, and the balance to several counties on the basis of a fair ratio.

Although so much is done by New York State, we learn from one of the most prominent men connected with it, and who is also a representative American, that it is very much behind, owing to the opposition of the late secretary of the State Agricultural Society, but that under the lead of the new secretary, Mr Woodward, it has entered on a new era of agricultural existence. A great deal of what has been done in dairy work is owing to Colonel F. D. Curtis, under whose advice the dairy conferences and meetings which have been held were undertaken. These conferences are being increased during the present winter with a large grant from the State. We have received several specimens of the farmers' institute circulars and programmes from various leading American dairy experts. Among them we find such subjects as the following set down for discussion:—

At Syracuse, 20th and 21st December—"Adulteration of Dairy Products; can we prohibit it?" by the Hon. J. K. Brown, New York Dairy Commissioner. To be followed by an "address of welcome" by the Chancellor of the University, and responded to by Colonel James Wood. "Nitrogen, Potash, and Phosphoric Acid—How to procure them, and how to sell them," by Professor Roberts of Cornell University. "Pig Feeding," by Colonel F. D. Curtis. "Ayrshire Cattle," by the President of the Ayrshire Association. "Saving our Fertility and Agricultural Study," by Major Alvord, Professor of the Massachusetts College. "Holstein Cattle," by the President of the *Herd-Book*.

At Sydney, 12th and 13th January, the papers were upon "Soiling," Feeding for a purpose," "Butter—gilt edged, gold quality," "Pig Feeding for Fat and Lean," "Cheese from Field through Factory to Market."

The new director of the State experiment station, Dr Peter Collier, who appears to have succeeded Dr Sturtevant, concluded with a paper upon "Our Experiment Station." We notice that several of these papers are read a second and third time at different meetings, and that the audiences are treated to singing and music between them. It is the custom to provide a question box, into which listeners may drop any questions they would like to have answered; this box is opened at the beginning of each session, *i.e.*, each day's proceedings. Reduced rates are provided by the railways and by the hotelkeepers for the benefit of farmers. In this line of education the Americans beat us out and out, and a more astonishing compilation of programmes and variety of subjects it would be almost impossible to produce.

Wisconsin.—To the State Dairy Teachers and Experiment Station we owe the very best reports upon dairy instruction that have appeared from the American press, excepting always the report of the New York Station. Professor Henry, director of the State College at Madison, says that he has a dairy-house and a dairyman, and that the students are expected to become familiar with butter-making, although cheese-making is not undertaken. Almost all the agricultural colleges take up the question of stock feeding very fully, and lectures upon dairying are regularly given. With the hundreds of co-operative creameries and cheese factories, there is little difficulty in obtaining fairly trained helpers, who in time become expert enough to take charge of factories themselves. He adds—" Here the co-operative system is gaining all the time, and one factory makes the butter from milk and cream from 20 to 500 farms. The most difficult class to teach is the foreign element, which follows the old style; they are not very clean, and make cheap butter, which they barter at the stores for other goods, but their produce is often disposed of as cheap grease. The State annually grants £2400 to run the farmers' institutes, and the attendance varies from 300 to 1000 people at each session, and good butter is becoming much more common in consequence. Wisconsin spends as much as any two other States to maintain these meetings."

Professor Henry sums up as follows:—1. There are very few separate schools in the United States. 2. Stock-feeding and dairying is taught by lectures in most of the colleges and schools. 3. The factory system affords instruction to many who work up from the position of helpers, especially in the north-west. 4. At the farmers' gatherings dairying is often a leading topic.

Professor Henry has our best thanks.

We add to these remarks some extracts from a long and valuable letter from Mr John Gould, superintendent of the Wisconsin Farmers' Institutes. He states that these meetings take him away from home twenty-two weeks out of the year. He has personal charge of 45 institutes as superintendent, and gives lectures upon dairying, butter-making, and ensilage as occasion requires, and assists generally in "keeping things lively," in bringing out a full discussion of the topics presented, and getting farmers themselves to express their views. The dairy, adds Mr Gould, is a most important feature of our meetings. This expert writes from Ohio, where 2,000,000 lbs. of butter and cheese are annually made, but where no special school exists. Next year, however, when the State celebrates her 100th birthday with a fifty days' exhibition of her industries, he, as director in charge of the dairy exhibits, proposes to start one. Mr Gould concludes by saying, "You see that while we are a great dairy country, we are largely self-educated, and it is this self-taught personal judgment that gives this country its 40,000 ideas of the quality of butter and cheese produce." The prospectus of the Wisconsin Institute for the past winter shows that arrangements were made for 82, which lasted from 1st November to the 29th March. It contains a list of the institute workers, *i.e.*, the speakers, which numbers over a hundred, and includes many of the most celebrated men in America. Of these the majority dealt with questions which directly related to the dairy. In a word, there were few papers which were not suitable to an English dairy conference.

Kansas.—Some interesting details with regard to education are given by Mr G. T. Fairchild, the president of the Kansas State Agricultural College at Manhattan. He says that in his college a ten weeks' course of an hour a day in the theory and practice of butter and cheese making is given to the second year girls. It appears that those who enter for the course of instruction must have some knowledge of organic and inorganic chemistry. The following extract from the college prospectus enclosed to us by Mr Fairchild will give some idea of the system pursued:—"During the spring term daily instruction and practice in the different branches of dairying are given the ladies of the second year by the instructor in household economy. Here the regular daily work is supplemented by a short course of lectures, intended to explain the best practice in the arts of butter and cheese making, and to give the reasons therefor. The following topics cover, in the main, the instruction given to the class:—Influences affecting the quality and quantity of milk, butter-making, creamers, 'deep' and 'shallow' setting systems, packing and preserving butter, the household and factory systems of cheese-making."

Mr Fairchild adds that dairying is taught to special students at Ames, Iowa, and at Madison, Wisconsin. It is also practised on a large scale at Storkville, Missisippi, the students doing a large portion of the work there; however, the factory system is uppermost. The total State subventions for the Kansas College from 1863 to 1888 amount to £62,000, nearly one-half of which has been paid for buildings and repairs. Farmers' institutes or meetings have been held for nearly twenty years. In 1881 the college commenced a series of conferences in many different counties, and has maintained this system ever since, having traversed the great part of the State, and left a local organisation in each county to do good work for all time. The college bears the entire expenses with the exception of local charges, and furnishes one-half of the programme.

Massachusetts.—Mr W. R. Sessions, secretary of the Agricultural Department at Boston, reports that the only place where dairying is taught to any extent is at the State Agricultural College at Amherst. This college receives an appropriation for the maintenance of an agricultural station to the value of £2000, and for the maintenance of eighty free scholarships a further sum of £2000. £1000 a-year is also granted for the purposes of investigating contagious diseases amongst stock.

The State Board holds three days' country meetings in December, when twelve lectures are given, and, in addition, the

Agricultural Society holds three meetings during winter, when discussions take place upon the papers read. The annual appropriation for lectures is £160.

To Professor Alvord of the State College, and who is so well known in England, we are indebted for these details.

Connecticut.—Mr T. S. Gold, one of the Commissioners of the Board of Agriculture of Connecticut, which appears to be composed of four gentlemen appointed by the governor and Senate, and eight appointed by the Agricultural Society, states that dairying is taught at the Sheffield Scientific School of Yale College, which netted £27,000 in 1862 by a land grant of 160,000 acres, upon which sum the State pays annual interest. In return for this, twenty-three free scholarships are provided, and dairying, in theory and practice, forms an important part of the curriculum. Mr Gold says that the experiment station does much work with feeding stuffs and dairy products, and that the laws for the control of oleomargarine would fail but for its aid.

Another school is at Mansfield, which receives a grant of £1000 for its support. Here pupils pay £5 per annum, or nothing if they are needy. They are taught practical dairying. The grant from the State board is this year advanced from £500 to £700. Lectures and meetings frequently occur, and 5000 copies of the report of what has been done are printed each year.

Missouri.—Professor Sanborn, of the Agricultural College at Columbia, Mo., says that there is only one institution in the State where dairying is taught, and that there is no regularly organised experiment station. He adds, however, that the State College carries on many experiments in connection with dairy work out of its own funds; there are no annual grants made, but the college participates in the National Congressional Land Grant of 1864. This, however, does not apply to the past year, when the Legislature of the State granted £5000 for the improvement of the college farm and the purchasing of stock. Last winter there were eighteen farmers' institutes or conferences held, and for this purpose £140 was appropriated from the grant to the Board of Agriculture.

Nebraska.—Professor Bessey, of the Industrial College of the University of Nebraska at Lincoln, says that dairying forms one of the topics of instruction in the four years' agricultural course at his college, and also in the elementary course of two years. With regard to grants from the State, he adds, "the Legislature simply grants a lump sum for the biennium." During the current year the subvention for the experiment station amounted to £1600. Conferences are held in the winter, but not in connection with State management; they number from three to five each year. There is a flourishing State dairy association.

California.—Mr Wickson, of the College of Agriculture of the University of California at Berkeley, says there is only one institution in the State in which dairying is taught, and that is the college in question. The chief of the department is Professor Hildgard, who commenced his work in 1875, and who is in charge of the experiment station. He secured a grant from the State in 1878, and then enlarged his corps of assistants. At that time he commenced his course of instruction in dairy husbandry. Details of this course are given in the report of the college, and are continued from year to year with such modifications as recent progress in dairy practices has rendered necessary. It has a lecture-room and laboratory course. There is no dairy herd, but visits are made to dairy farms in the neighbourhood, and the work is made as practical as possible. The course of education is provided for partly by general funds of the university and partly by grants. The general grant is £1500, but in the last session the Legislature arranged to provide a permanent income in lieu of grants. This is estimated for the coming year at from £15,000 to £17,000, but the agricultural department of the university will only receive about £3400.

Illinois.—Professor Morrow, of the University of Illinois at Champaign, states that dairy farming forms a portion of the instruction at the university. A dairy house was provided by the Legislature at considerable cost, but no grant has been made for an experiment station. During last winter many farmers' institutes were held, and during the present winter sixteen institutes are to be held. County institutes are also being promoted, but so far no grants have been made in their aid. The students pay a fee of 50s. per term in the college, in which there are two courses, one of four years and one of one year. The course includes the leading scientific subjects connected with agriculture.

Texas.—By Professor G. W. Curtis, of the State Agricultural College, we are informed that dairying is taught in that institute, as well as in the college of Iowa. The farm attached to the college of Texas has 2416 acres, mostly pasture and wood land. There are no farmers' institutes held in the State, but the "Farmers' Alliance" and the "Range" are both very active, and through them farmers hold meetings of great value. Professor Curtis says, that "although American text-books are used for instruction, they count most on practical knowledge obtained by the students doing the entire work in connection with the creamery, centifrugal separator, &c., and all possible instruction is given in this way." The grants to the State College from 1886 amount to £8250. The value of land and buildings is £52,000, and the permanent endowment is equal to £42,000, and this brings in interest amounting to nearly £3000.

Minnesota.—The Experimental Station and College of Agriculture of this State is situated at St Anthony Park, Ramsey County. There have been no special appropriations made for colleges or stations, but the Board of Regents of the State University has been authorised to use income from the national grants for their support, and by judicious management of these funds the college and station have now a capital of about £100,000. In addition to this, the farm, originally valued at £1600 in 1870, has increased in value until it is to-day worth £115,000. Figures like these account for the flourishing condition of the State colleges of America. It is proposed to commence the work of practical dairying on the 1st May in the present year. The farmers' institutes, which commenced in 1881, were inaugurated by this college, and last year Superintendent Porter of the college held 31 of these meetings, for which £1400 has been granted annually for two years.

Florida.—Mr A. Holladay, of the State Agricultural College at Lake City, Florida, says that there is not one place in the whole State where dairying is taught. "We are trying hard to get money enough to do just that very thing here, and if the means to be had through the Hatch Bill fall in as we hope, then we shall be able to do the thing properly." Mr Holladay adds, that until the last session of Legislature his college asked in vain for money to put the experimental station in fair operation, and then all they could get was £600. Farmers' conferences are held in many counties, and some have been meetings of importance.

Colorado.—The information conveyed in a letter from the State College—which is difficult to decipher—appears to show that a tax is levied for the support of the college, which receives an annual grant of £5600. It is also stated that the sale of some of the college land will in another year increase its income. There are numerous farmers' meetings or institutes held in different parts of the State, but no grant is made for their support. The butter-makers of Colorado are agitating in order to protect themselves, and they have formed an important association.

Iowa.—President Chamberlain, of the State Agricultural College of Iowa, writes that dairying is taught at his college, which since 1862 has received a trifle more than £80,000 from the Legislature. This year from eight to ten farmers' meetings are being held, and a grant of £30 is made by the college for each meeting. The Legislature is to be asked for £600 during the coming session.

Maine.—Dairying is taught at the State College of Agriculture, which has received at various times grants amounting in all to £50,000. There is also an experiment station to which £1000 a year is granted. Farmers' meetings are held each year to the number of from twenty-five to thirty, and for this purpose £420 is provided by the State. Mr Z. A. Gilbert, the Secretary of the Board of Agriculture, kindly furnished these particulars.

Virginia.—The Commissioner of Agriculture for Virginia, Mr Randolph Harrison, states that there are no institutions where dairying is specially taught. There are, however, State colleges, such as the Hampton Normal Institute and the Blacksburg Agricultural and Mechanical College, which receives grants of land from the Government. No farmers' meetings or dairy conferences appear to be held in the State.

Kentucky.—The Director of the Agricultural Station of Kentucky at Lexington, Mr Scobell, says that he knows of no dairy schools in his State, but that a $\frac{1}{2}$ cent tax upon every 100 dollars taxable property in the State was made for the State college and experiment station. One agricultural institute meeting is held yearly, but there has been no grant for its support.

Mississippi.—Professor Gulley, of the State College at Charlton, says that dairying is only taught at his college, which received during the past two years £5000 a year from the Legislature. During the past four years there have been from five to ten conferences each year, which have been conducted by the College Faculty. For the purpose of carrying out these meetings, £1000 a year has been granted. The students of the college have a regular course of instruction in the theory and practice of dairying.

Canada.

I have received from the Ontario Agricultural College a copy of the Report from the Professor of Dairying, addressed to the Commissioner of Agriculture of Canada. It would appear from this report that considerable work is being done, and has been done by the Professor, Mr Robertson, who was sent to England to the Colonial Exhibition in 1886, and who subsequently travelled through Denmark in order to master the system adopted there, and communicate it to interested persons in Canada. The report contains some useful information, showing the interest taken by the Government in connection with creamery management and dairy investigations in general. During the spring term lectures are given at the college upon dairying, and during the summer term practical instruction is given in butter-making. Mr Robertson suggests that during the winter term a special course of lectures on cheese and butter making should be arranged; and adds, that a desire has been expressed for the formation of a dairy class, to be trained in butter-making at the Ontario creamery during the forenoons, and to receive general instructions in dairying in the lecture-room during the afternoons. September would be the most suitable month. Farmers' sons and daughters, and others proposing to attend, are to address the Dairy Department, Ontario Agricultural College, Guelph. No fee will be charged.

[Since this Report was completed, we have received full details of Dairy Education in Canada, which is more extensive and more largely subsidised than is supposed—also from Spain, where the work has commenced. Additional information has also been furnished by the German and Danish Governments. We find also that in Finland there are about a dozen practical Dairy Schools.]

FISH FODDER FOR CATTLE.

By Dr ANDREW P. AITKEN, Chemist to the Society.

To feed a cow upon fish may seem at the first mention of it a very absurd, as it is a very unnatural, proceeding; but the absurdity vanishes when we inquire, in an unprejudiced way, into the nature of food and the transformations it undergoes in the animal body. Nothing is more evident than that cattle are intended to be fed upon a vegetable diet. Their deficient incisors and large grinding molars, their huge paunch and complicated digestive apparatus, their power of ruminating, and their very long alimentary canal, all indicate that they are adapted for utilising a bulky, somewhat brittle, difficultly digestible, and perhaps in great measure indigestible, kind of food, such as grass, hay, and the like. But although they are provided with the means of extracting nourishment from what may be called very refractory materials, that does not prevent their being able to make good use of easily digestible and concentrated food if they can get it. Whatever be the nature of the food an animal eats, whether it be a rough, poor, vegetable substance, such as wheat straw, or a rich one, such as young clover or oilcake, or whether it be an animal substance, such as milk or flesh, it owes its feeding properties to the presence of nutritive constituents, classified under the head of albuminoids, fat, and carbohydrates, and of course a certain amount of essential mineral salts, which we may overlook for the present. The business of digestion is to convert these substances into albumen, fat, and sugar, and these are either consumed in carrying on the functions of life, or are stored up in the tissues of the animal. The albumen, fat, and sugar extracted from a vegetable diet does not differ from that extracted from an animal diet. These substances are extracted more easily from one kind of fodder, and with more difficulty from another; but the mechanism of the digestive apparatus of different animals is modified to suit the food which is natural to them. It is necessary for a ruminant, with its capacious alimentary system, that it should daily consume an amount of fodder sufficient to fill its stomach, and thus enable the mechanical operations of digestion to go on in a healthy manner; but along with the rough fodder required for that purpose, some more concentrated fodder must be given if the animal is to progress rapidly in condition. Whether that concentrated fodder is derived from animal or vegetable sources is of no importance, so long as it is wholesome and nutritious, and we must not put too narrow an interpretation upon the definition that an animal is herbivorous or carnivorous. The dog is by nature a carnivorous animal, but we know that it thrives well enough when fed in great measure upon vegetable food. The young of all mammals are for a considerable period of their early life fed exclusively upon milk, which is a purely animal diet, and a calf or a lamb has only gradually to become accustomed to vegetable food. Day by day the proportion of grass which they eat goes on increasing, and their digestive apparatus undergoes a gradual change, and develops in accordance with the altered character of the food which they consume, until, in the space of a few months, they have acquired the mature stomach of a ruminant; but long after that period they may still, if permitted, drain the udder of the dam, and thrive in an extraordinary manner on their mixed animal and vegetable diet. Long after they have been weaned their taste for animal food does not desert them, and they only require to have it presented to them in a palatable form in order to exhibit their liking for it. At fishing ports in this country, where it frequently happens that a superabundance of herrings occurs, and a proper market cannot be got for them, farmers in the neighbourhood make use of them as manure by spreading them on the land, and it is a matter of common observation that cattle having access to these are very fond of them.

At the great fish-curing stations on the Norwegian coast the dried heads of cod fish have for a great many years been utilised by the farmers in the neighbourhood as a cattle fodder. The usual practice in these districts is to boil down the fish heads into a kind of soup, which is then mixed with straw, chaff, or other rough fodder. A very acceptable and nutritious food is produced in that way, and on account of the great abundance of this refuse material, the Norwegian peasantry are able to bring their cattle easily through the long winter in good condition, to greatly increase the number of their stock, and to correspondingly raise the fertility of their land.

This practice has prevailed in Norway for ages, but it does not seem to have attracted the attention of farmers in other parts of Europe less favourably situated for obtaining a cheap kind of animal food until a few years ago; and although the cod fisheries of Norway have much increased of late, and the means of establishing an export trade from the fishing stations should present no great difficulty, yet it cannot be said that an export trade in fish fodder has been more than originated in that country.

During the last fifteen years, however, an industry of a similar kind has arisen in a different quarter of the globe. In South America, where enormous numbers of cattle are annually slaughtered for the purpose of making Liebig's extract of beef, the residue derived from that manufacture, consisting of the wholesome and nutritive fibrin of flesh, is now being dried and ground into a powder, and sold under the name of Liebig's meat meal. This substance has now come to be recognised as a useful kind of concentrated fodder, which will be more appreciated as its nutritive qualities become better known. When first introduced into Europe it was regarded with much suspicion by farmers, who naturally considered such a substance as quite inappropriate for the feeding of cattle or other herbivorous stock. The only kind of farm stock to which it was considered proper to offer such a fodder was the omnivorous pig, and in 1873 Professor Lehmann experimented with it in that way. The pig is an animal that is able to make better use of starchy food than any other kind of farm stock, and it is therefore able to thrive fairly well on a diet consisting entirely of potatoes, which are composed chiefly of starch, and contain very little albuminoid matter. Flesh meal, on the other hand, contains no starch, but consists chiefly of albumen. By mixing these two substances together, a fodder may be produced containing the essential elements of food in such proportions as to constitute a very nutritious diet. Professor Lehmann fed four pigs on a mixture of flesh meal and potatoes, and one upon potatoes alone. The experiment lasted forty-four days, and the following was the result:—

	Food consumed per Head.		Increase in Live Weight per Head.
	Potatoes.	Flesh Meal.	
Lot 1, . . .	422 lbs.	$20\frac{3}{4}$ lbs.	$52\frac{1}{2}$ lbs.
Lot 2, . . .	$415\frac{1}{2}$ lbs.	None.	25 lbs.

The pigs that got the flesh meal in addition to the potatoes gained $27\frac{1}{2}$ lbs. per head more in weight than the one that got none; and since all ate about the same quantity of potatoes daily, the natural conclusion is that for every pound of flesh meal they ate they increased more than a pound in live weight.

Liebig's meat meal has very little flavour, as all the soluble salts have been dissolved out of it in making the extract, but this is easily rectified by the addition of chlorides and phosphates of soda, potash, and lime. That was done in the experiment mentioned above, and the great importance of giving some potash salts along with flesh meal has been shown from experiments made by Dunkelberg and Werner at Popplesdorf.

Later experiments by Haubner and Hofmeister have shown that flesh meal was almost completely digested by pigs, and that the increase of live weight was just about one pound for every pound of flesh meal eaten. The fodder was given along with barley meal, and it was reckoned that one pound of flesh meal was equal to $3\frac{3}{4}$ lbs. of barley meal in the production of live weight in the feeding of pigs.

In 1875 Dr Hofmeister, at Dresden, tried to feed sheep on flesh meal. It was long before they would take it, but eventually they did take it, and the quantity was gradually increased up to three-quarters of a pound per head per day, but the result was not so satisfactory as that with swine. There were six trials made, lasting from 20 to 38 days each, and these showed that on an average about 3 lbs. of flesh meal were required to produce 1 lb. of live weight. He reckoned that 4 lbs. of barley meal produced the same result as 3 lbs. of flesh meal, and as the latter was very much dearer than the former it could not be considered an economical diet for sheep. It may be that meat meal is not well suited for sheep, or perhaps we have not learned how to make it palatable for them, seeing that they are more shy and dainty in their feeding than other farm stock. It is not surprising, however, to find that other experimenters in different parts of the Continent in 1875 found that cattle and milch cows fed on meat meal readily enough. It was given in quantities ranging from 1 to 3 lbs. per head per day, and the results were very satisfactory both as regards increase of live weight and production of milk.

In 1874 H. Weiske, having heard of the success attending the feeding of cattle in Norway with *fish meal*, made some experiments with it on sheep. He obtained a quantity of fish meal which was being sold as fish guano, containing about 9 per cent. of nitrogen. The nitrogen in fish guano is derived from albuminoid matter, so that in this sample there was about 56 per cent. of albumen, and there was only about 2 per cent. of oil. Weiske found that the sheep made no difficulty about eating the fish meal, and he calculated that the albumen of the meal was digested by them to the extent of about 80 per cent. That is a very good result, just as good as would be attained with oats; but later experiments have shown that 90 per cent. of the albuminoid of fish meal is digested, so that as regards digestibility this form of fodder compares favourably with the majority of good feeding cakes. But it is characteristic of fish guano that it contains a large proportion of phosphate, usually from 20 to 30 per cent., and Weiske made some experiments to determine the relative manurial value of the phosphates before and after being fed to the animals. He found that the phosphate contained in the dung was much more valuable than that contained in the meal, and he therefore argued that the proper use of fish guano was not to spread it directly on the land, but in the first place to use it as a fodder, and that the manure obtained in that way was more available as plant food than when applied as insoluble fish powder.

Experiments made at the Highland and Agricultural Society's stations have shown that fish guano, although it is rich in nitrogen, is a very slow-acting manure, and suitable for supplying nitrogen only to slowly-maturing crops, such as roots. These experiments have also shown that the oil, which in many samples of fish guano ranges from 7 to 10 per cent., is distinctly disadvantageous in preventing the manure from rotting in the soil and yielding up its nitrogen to the crop. The oil itself contributes nothing to the value of the manure, and is simply wasted when applied to the land. There is therefore every reason in favour of the view that fish meal—or fish guano, as it is most improperly called—should be used in the first place as a fodder, and that it should not be spread on the land until it has been improved by passing through the digestive apparatus of farm stock. If farmers acted upon this principle, they would give preference to the purer kinds of fish guano rich in oil. At present, the kind of fish guano most in favour is that which smells most strongly, and resembles in that respect the strong smelling guanos from which it has borrowed the name. But the strong smell given off by samples of fish manure is no indication of their richness in manurial ingredients, it rather indicates the presence of a considerable amount of rancid fish oil, which distinctly detracts from the manurial value of the substance.

The composition of fish manure varies very much according to the kind of fish material employed in its manufacture. In the process of curing there is considerable loss, due to tearing and disfigurement of fish, rendering them unfit for the market, and there are the heads of fish which are chopped off in millions at the curing stations. These two kinds of fish material, if properly dried and ground to powder, would make a fodder which for cleanness and wholesomeness would leave nothing to be desired. It would form an excellent bye-fodder for young growing stock, as it would be rich in phosphates, and would thus supply the material for making bone. The viscera of fish, if rapidly dried and prevented from putrefying, would produce a fodder rich in oil and albumen, and would be useful for the production of fat and milk. According as these ingredients predominate in a fish manure, we have the nitrogen ranging from 5 to 10 per cent., the phosphates from 15 to 50 per cent., and the oil from 2 to 12 per cent., or more. From the great fish-curing stations at Loffoden there is now being annually exported about 50,000 tons of fish guano as it is called, and efforts are made to preserve a standard of quality, and produce a manure which for fineness of manufacture is very satisfactory; but it is quite evident that in all this industry there is a great waste of ready-made albumen and oil, which might be converted directly into flesh and fat if it were used as fodder instead of as manure.

If fish meal becomes, as it ought to become, a recognised and established article of fodder, there would be some grading adopted according to the sources from which it was derived, and methods of manufacture would be employed that would render the substance irreproachable as an article of diet. This is a matter that might profitably receive the attention of the Norwegian Government, and of those interested in the fisheries of that country.

In this country the curing of white fish is a comparatively small affair, but we have a very large and valuable herring fishery, and the curing of herrings is carried on on a large scale all around our coasts. The herring is a very oily fish, and the offal derived from the herring curing is also very rich in oil. This property should enhance its value as a source of fodder, but it adds considerably to the difficulty of making a fodder from it of good marketable quality. I am not aware whether any successful attempts to produce herring fodder meal have been made in this country, but two years ago there came under my notice a sample of such a meal, manufactured by Harald, Heiberg, & Co. in Christiania.

Through the kindness of Mr Anker Bödtker, the Swedish and Norwegian consul-general, a supply of the herring meal was obtained for the purpose of making an experiment. On analysis it was found to contain about 40 per cent. of albumen and 20 per cent. of oil. It smelt strongly of herring, and did not impress one as being likely to be relished by cattle. It occurred to me, also, that the strong fishy taste and smell of the substance might render it objectionable as a fodder for milch cows, by contributing a flavour to milk and butter. Accordingly, I was anxious to have the meal used as a bye-fodder in the diet of milch cows, and compared with linseed cake, cotton cake, or other bye-fodder. Mr Speir, Newton Farm, kindly undertook to make the experiment with his own dairy cows, and the record of that prolonged experiment given below will be read with much interest. It shows very distinctly that even so oily and rich a substance as herring meal may be given to cows in large quantities without in any way affecting the flavour of the milk, and that as a bye-fodder it is able to take the place of concentrated fodders such as oilcake, peasemeal, and the like. The price of the meal was £7, 10s. per ton two years ago. It will probably be cheaper now, but even at that price the meal is as good value as the ordinary feeding meals now in the market; and there need be no doubt that, when experience has shown how the meal should be fed so as to produce the best results, it will be found to be one of the most economical and useful of bye-fodders.

It is probable that, in the dry climate of Norway, the drying and manufacturing of herring meal is a much easier matter than with us, and that it can be produced there at a price with which we cannot compete. That is a subject for experiment, but there can be no doubt that, if the substance can be made profitably, it will be a boon not only to farmers, but to fishermen around our coasts, who from various causes frequently fail to find a market for their fish, and are compelled to put back to sea with their hard-won harvest, and throw it overboard.

THE VALUE OF FISH MEAL AS FODDER FOR CATTLE IN COMPARISON WITH OTHER KINDS OF CONCENTRATED FODDER.

By JOHN SPEIR, Newton Farm, Newton, Glasgow.

[*Premium—Fifteen Sovereigns.*]

THIS experiment was begun on 22nd May 1886, by selecting six cows in milk, all of the Ayrshire breed, and average samples of their class. Numbers 1 and 2 of these were cows which had been giving milk for about six months, 3 and 4 had calved about three months ago, while 5 and 6 were only recently calved. For the first week all were fed in the usual way—viz., at 5.30 A.M. they got 1 lb. of steamed meal each, mixed with water and a little draff; immediately after they were turned out to the fields, where they remained till 3.30 P.M., when they were brought in to be milked. After milking, another 1 lb. of meal and draff was given them, followed immediately after by an armful of vetches or cut grass. They were not put out after the evening's milking, and received nothing till after milking next morning, which was at 4 A.M.

The meal given to the ordinary stock was composed of equal parts of wheat, cotton cake, and $\frac{1}{6}$th each of Egyptian beans and muttor peas, all mixed together when being ground. The grinding was done at home by a Carter's disintegrator, and was very fine. Previous to feeding, all meal was submitted to the action of steam by being boiled to a thin porridge from one to two hours. It was then mixed with a little draff to give body to it, and make it easier handled and less liable to get into lumps. The milk from each cow was carefully weighed at each milking, and a record kept. At the end of the first week, each cow was passed over the farm steelyard and weighed.

	Average weight of milk in lbs. at each milking, week ending 29th May.	Live weight on 29th May.
Cow No. 1, . .	$18\frac{1}{2}$ lbs.	9 cwt.
" 2, . .	$13\frac{1}{2}$ "	$8\frac{1}{4}$ "
" 3, . .	17 "	$8\frac{3}{4}$ "
" 4, . .	15 "	8 "
" 5, . .	$15\frac{1}{4}$ "	9 "
" 6, . .	$15\frac{1}{4}$ "	$7\frac{3}{4}$ "

At the end of the first week, cows 1, 4, and 5 were selected to be fed in the ordinary way, and 2, 3, and 6 were set aside for the herring meal. At this date the three cows chosen for ordinary feeding in live weight and milk yield stood thus—

Live weight of the lot, . . . =28 cwt.
Average milking (twice daily), . =$16\frac{1}{4}$ lbs.

Those to get herring meal stood thus—

Live weight of the lot, . . . =$24\frac{3}{4}$ cwt.
Average milking (twice daily), . =$15\frac{1}{4}$ lbs.

At the commencement of the experiment, numbers 2 and 6 took the meal quite readily, but number 3 was very slow in beginning. The meal has anything but a nice look, being more like manure than anything else. It, however, has not much of a smell, and tastes fishy. At first, about $\frac{1}{2}$ lb. of herring meal was mixed with $1\frac{1}{2}$ lbs. of the ordinary meal, in a couple of days it was given half-and-half, in two more three quarters of herring meal was added, and by the end of the week it was given pure. Numbers 2 and 6 always cleaned out their troughs well, but until the experiment had been continued several weeks number 3 seldom did so. The 2 lbs. of meal, either of the herring or ordinary variety, was as much as each cow could be got to clean up readily, and no more was attempted to be given.

At the beginning of the experiment, when the cows were on the ordinary food, the milk of each was tested by the cream gauge, and again at intervals as the experiment proceeded, without, however, giving any positive results, other than that all the cows on the normal food gave normal milk, there being very little difference in the quality of any of them, which remained, practically speaking, the same after the one-half had been put on the herring meal.

This I accounted for by the grass being such a large quantity of their food, and of which they all got an equal share. To be a thorough test, the herring meal should be given during winter, when it would form a larger proportion of the total food given than is the case in summer grazing. I have still a considerable quantity of meal left, and intend to make a more thorough test of it shortly, when the quantity given will be at least twice if not three times as large as that used in this experiment. The milk at no time either smelt or tasted of fish.

Towards the end of the sixth week cow number 6, which was milking well and getting fish meal, took a sore foot. In spite of all we could do, it continued sore till about the end of the experiment. During the whole time it was unable to walk, and had to be fed on grass in the house, and in consequence of the pain it fell off greatly both in milk production and in live weight. All the cows were of about one age, only one cow, number 5, being four years, the others five years.

The following tables fully explain the details of the whole experiment:—

First Week.

	Ordinary Food.		Fish Meal.	
	Daily Milk Average.	Weekly Live Weight.	Daily Milk Average.	Weekly Live Weight.
	lbs.	cwt.		
No. 1, . .	37	9	...	...
,, 2, . .	27	8¼	...	...
,, 3, . .	34	8¾	...	...
,, 4, . .	30	8	...	...
,, 5, . .	30½	9	...	...
,, 6, . .	30½	7¾	...	...
Ordinary food average, .	32½	8⅔	...	...
Fish meal, .	30½	8¼	...	...

Second Week.

	Ordinary Food.		Fish Meal.	
	Daily Milk Average.	Weekly Live Weight.	Daily Milk Average.	Weekly Live Weight.
	lbs.	cwt.	lbs.	cwt.
No. 1, . .	36½	9	...	...
,, 2, . .	...	...	28	8¼
,, 3, . .	...	...	34	8¾
,, 4, . .	32	8	...	...
,, 5, . .	28	9	...	...
,, 6, . .	...	...	36	7¾
Average, .	32⅙	8¾	...	...
	...	...	32⅔	8¼

Third Week.

	Ordinary Food.		Fish Meal.	
	Daily Milk Average.	Live Weight.	Daily Milk Average.	Live Weight.
	lbs.	No alteration.	lbs.	No alteration.
No. 1, . .	37		...	
,, 2, . .	...		28	
,, 3, . .	...		35¼	
,, 4, . .	33		...	
,, 5, . .	30		...	
,, 6, . .	...		43	
Average, .	32⅓		35⅓	

Fourth Week.

	Ordinary Food.		Fish Meal.	
	Daily Milk Average.	Live Weight.	Daily Milk Average.	Live Weight.
	lbs.	No alteration.	lbs.	No alteration.
No. 1, . .	36⅔		...	
,, 2, . .	...		26⅔	
,, 3, . .	...		34	
,, 4, . .	31⅓		...	
,, 5, . .	28		...	
,, 6, . .	...		44	
Average, .	32		35	

Fifth Week.

	Ordinary Food.		Fish Meal.	
	Daily Milk Average.	Live Weight.	Daily Milk Average.	Live Weight.
	lbs.	cwt.	lbs.	cwt.
No. 1, . .	37½	9¼	...	...
,, 2, . .	...	...	28	8½
,, 3, . .	...	...	36	9
,, 4, . .	31½	8	...	...
,, 5, . .	30½	9	...	...
,, 6, . .	...	...	43⅓	7½
Average, .	33⅙	8⅔	35⅔	8⅓

Sixth Week.

	Ordinary Food.		Fish Meal.	
	Daily Milk Average.	Live Weight.	Daily Milk Average.	Live Weight.
	lbs.	No alteration.	lbs.	No alteration.
No. 1, . .	28⅔		...	
,, 2, . .	...		24⅔	
,, 3, . .	...		30	
,, 4, . .	23		...	
,, 5, . .	22		...	
,, 6, . .	...		32	
Average, .	24½		29	

Seventh Week.

	Ordinary Food.		Fish Meal.	
	Daily Milk Average.	Live Weight.	Daily Milk Average.	Live Weight.
	lbs.	No alteration.	lbs.	No alteration.
No. 1, . .	35		...	
,, 2, . .	...		25	
,, 3, . .	...		33	
,, 4, . .	24½		...	
,, 5, . .	22½		...	
,, 6, . .	...		32	
Average, .	27⅓		30	

Eighth Week.

	Ordinary Food.		Fish Meal.	
	Daily Milk Average.	Live Weight.	Daily Milk Average.	Live Weight.
	lbs.	No alteration.	lbs.	No alteration.
No. 1, . .	34		...	
,, 2, . .	...		23½	
,, 3, . .	...		31	
,, 4, . .	24		...	
,, 5, . .	20		...	
,, 6, . .	...		30	
Average, .	26		28⅙	

Ninth Week.

	Ordinary Food.		Fish Meal.	
	Daily Milk Average.	Live Weight.	Daily Milk Average.	Live Weight.
	lbs.	No alteration.	lbs.	No alteration.
No. 1, . .	29½		...	
,, 2, . .	...		19	
,, 3, . .	...		30	
,, 4, . .	20		...	
,, 5, . .	20⅔		...	
,, 6, . .	...		25½	
Average, .	23½		24⅔	

Tenth Week.

	Ordinary Food.		Fish Meal.	
	Daily Milk Average.	Live Weight.	Daily Milk Average.	Live Weight.
	lbs.	cwt.	lbs.	cwt.
No. 1, . .	34	9¼	...	...
,, 2, . .	...	...	15	8½
,, 3, . .	...	...	30	9
,, 4, . .	24	8	...	...
,, 5, . .	22	9	...	...
,, 6, . .	...	...	37	7½
Average, .	26⅔	...	27⅓	...

Table of Weekly Averages of lbs. of Milk of both Lots of Cows.

	Ordinary Food.	Fish Meal.
	lbs.	lbs.
1st week (prelim. trial),	$32\frac{1}{2}$	$30\frac{1}{2}$
2nd ,, . . .	$32\frac{1}{6}$	$32\frac{2}{3}$
3rd ,, . . .	$32\frac{1}{3}$	$35\frac{1}{3}$
4th ,, . . .	32	35
5th ,, . . .	$33\frac{1}{6}$	$35\frac{2}{3}$
6th ,, . . .	$24\frac{1}{2}$	29
7th ,, . . .	$27\frac{1}{3}$	30
8th ,, . . .	26	$28\frac{1}{6}$
9th ,, . . .	$23\frac{1}{3}$	$24\frac{2}{3}$
10th ,, . . .	$26\frac{2}{3}$	$27\frac{1}{3}$
	290	$308\frac{1}{3}$

If both totals are divided by ten, the number of weeks the experiment was carried on, it gives a mean of 29 lbs. per day for those on ordinary food, and $30\frac{4}{5}$ lbs. per day for those getting fish meal. At the end of the experiment only one of those cows on the ordinary food had gained anything, viz., 28 lbs., the other two remaining stationary; while of those on fish meal two gained 28 lbs. each, while another lost 28 lbs.; so that, taking the figures as they stand, both lots are on an equality as far as weight is concerned. It is, however, worthy of note, that of those on fish meal the cow which lost weight was the one which was the best milker. Owing to this she might have lost weight at any rate, but I am inclined to believe that the loss was principally caused by the sore foot, which, as every dairyman knows, brings down a cow very quick in both milk and body. Had this cow kept well all the time, the fish meal lot would have shown a much better return. It must also be pointed out that although the two recently calved cows 5 and 6 started each with the same quantity of milk, the one fell off very rapidly, while the other continued to increase until its foot became sore, at which time it was giving one-third more than the other, although a much smaller cow. On the other hand, the ordinary food lot, although kept back by number 5, were very much assisted by number 1, which at the termination of the trial was giving a daily average of 34 lbs. of milk, although then nearly nine months calved; while her neighbour of the fish-meal lot, which was about the same length of time calved, was giving a daily average of 4 lbs. less than the half of number 1.

It may here be remarked, that if every breeder was to keep a milk record of his cows, one and all would get their eyes opened, and such cows as number 5 would all soon be swept from the face of the earth. Undoubtedly the chief end of a dairy cow's existence is to yield milk, and when that point is sacrificed to some other one, she certainly deserves to lose the name of a dairy cow, and ought to be devoted to some other purpose.

This test undoubtedly proves that fish meal is of considerable value as a food for dairy cows, but until I get at least another trial of it on a more extended scale, I am not prepared to give it all the credit which the results of this trial would lead a superficial observer to suppose. Its smell and taste are certainly against its extensive use, but in my case neither was as great an obstacle as I had anticipated, and in ordinary practice their bark might turn out worse than their bite.

Another experiment was begun on 16th January 1887, and was carried on from that date for twelve weeks. The experiment already detailed, which had been carried through during the preceding summer, I had considered unsatisfactory, as the pasture formed so large a portion of the cows' food, and the meal given so small a part, that, besides the food used, many other causes might have contributed to falsify the results; therefore I determined to try the fish meal again on a more extended scale, when the total food given would be more under control than during summer.

During the first week all the animals were fed alike, the milk from each being weighed both morning and night. This was done so as to guard as much as possible against extremely good or bad milkers being put into either lot. The live weight of the cows was at the same time also taken, so that the division of the two lots might be the more equally done.

During the trial each animal was weighed the last day of each week, but from these weights little information can be gained.

The selected animals were all calved from 3½ to 4½ months, and in weight of body and quality might be considered fair samples of an average herd of Ayrshire cows.

Out of the ten animals, seven were selected to be fed on herring meal, and three to be fed similar to the ordinary herd, their milk, however, being each twice weighed daily, so that the rise or fall of milk of the one lot might be compared with the other. The larger lot contained two heifers, and the smaller one, one, the remainder of both lots being from four to six years old. During the experiment all the animals remained quite healthy, there being no sickness or other disturbing element at any time to mar the results of the trial. A note was kept of the mean outside daily temperature for a part of the trial, in the hope that it might give some results, but as nothing definite could be drawn from such, it was discontinued, and is not given here. During part of February the weather was extremely mild, while at other times it was very cold and stormy, and at such times the milk of both lots visibly decreased.

The meal of the ordinary-fed lot was always subjected to the action of steam for two or three hours before being fed to the animals, while the herring meal was not. Before use, the meal of both lots was mixed with brewer's grains (locally called draff), and given in a hot sloppy state to the animals. This and the silage appeared to contain about as much water as the cows required, as it was only on rare occasions that they would take any when presented to them.

The silage used was made from the second growth or aftermath of perennial and Italian ryegrass, and although well preserved was very sour. The crop, when growing, contained few seed stalks, and being mostly blades, it was very soft and damp when put in. In the silo it was allowed to heat up to 135° to 145° F., in the expectation it would come out sweet, as some of it had done the year previous with less heating. This year it was, however, sourer than usual, owing, I presume, to the damp nature of the material used. It was generally taken from the silo at least a day previous to being used, during which time it lost a large portion of its acidity, and whether or not better relished by the cows I cannot say; it was, however, more pleasant to handle. As taken from the silo, each cow got daily from 30 to 35 lbs., some a little more, others a little less. The quantities of draff, silage, and straw used is calculated from the total given to the whole stock, and therefore represents the average of what each was getting.

The mashes were given morning, noon, and night, the silage at the middle of the fore and afternoons, while the straw was given between each, and again the last thing at night.

The milk of both lots was several times tested by the cream tube, but without any definite results.

	Cows to get Herring Meal.							Ordinary Food.		
	No. 2	No. 12	No. 15	No. 16	No. 26	No. 31	No. 32	No. 1	No. 7	No. 14
1st Week,	Both lots fed alike in everything.									
Milk, .	202½	195½	177½	217	185	191	197	202½	202½	184½ lbs.
Weight, .	8	7	7¾	9	8	8	7¾	8	7¾	7½ cwt.
2nd Week,	What herring meal they would take, with 30 lbs. silage, ⅓ bushel draff, 7 lbs. oat straw.							7 lbs. of cotton beans, and wheat, with silage, draff, and straw.		
Milk, .	193½	181½	159½	203½	165½	167	187½	201½	183½	184½ lbs.
Weight, .	7¾	6½	7½	8¾	8¼	7¼	8	7½	7½	8 cwt.

	Cows to get Herring Meal.							Ordinary Food.		
	No. 2	No. 12	No. 15	No. 16	No. 26	No. 31	No. 32	No. 1	No. 7	No. 14
3rd Week,	7 lbs. herring meal, with silage, draff, and straw.							Same as last week.		
Milk, .	209	187	165	214½	181	188	194	198	193	171 lbs.
Weight, .	8¼	7	8	9	8¼	8	8¼	7½	7½	8¼ cwt.
4th Week,	6 lbs. herring meal, with silage, draff, and straw.							Same as last week.		
Milk, .	194½	182	179	207½	179½	191	184½	194½	195	172½ lbs.
Weight, .	8	6¾	8	9	8¼	8¼	8	7¾	7¾	8 cwt.
5th Week,	4 lbs. herring meal, with silage, draff, and straw.							Same as last week.		
Milk, .	188	162½	160	181½	159½	176½	162½	180	185	166½ lbs.
Weight, .	8	7	7½	9¼	8	8	7½	7¼	7½	7¾ cwt.
6th Week,	4 lbs. herring meal, with silage, draff, and straw.							Same as last week.		
Milk, .	179	157	143	179	159½	177½	170½	171½	183	176 lbs.
Weight, .	8	6¾	7¾	8¾	8	8¼	8	7½	7¾	8 cwt.
7th Week,	4 lbs. herring meal and 3 lbs. of maize meal, with silage, draff, and straw.							7 lbs. of beans, Paisley meal, and cummins, &c.		
Milk, .	174	159	142½	182½	153½	169	158	168½	181½	159 lbs.
Weight, .	8	7	7½	9	8	8¼	7½	7¼	7½	7¾ cwt.
8th Week,	Same as last.							Same as last.		
Milk, .	167	158	139½	175	152	171	152	149	169½	148 lbs.
Weight, .	8	6¾	7¾	8¾	8	8¼	8	7½	7¾	8 cwt.
9th Week,	Same as last.							Same as last.		
Milk, .	177½	161	141½	170	149	176	159½	157½	160	141½ lbs.
Weight, .	7¾	6½	7½	8½	7¾	8	7¾	7	7¼	7¾ cwt.
10th Week,	7 lbs. Paisley and bean meal, and cummins, with silage, draff, and straw.									
Milk, .	171½	161	144	171	148	172	157	145½	162	152 lbs.
Weight, .	7¾	6½	7½	9	8	8	8	7½	7½	8 cwt.
11th Week,	Same as before.							Same as before.		
Milk, .	154	132½	137	158	144	171½	153	147½	151½	142½ lbs.
Weight, .	7½	6¾	7¼	9	7½	8	8	7½	7¼	7¾ cwt.
12th Week,	Same as before.							Same as before.		
Milk, .	158	146	135	148½	140	163½	151	149½	152½	141½ lbs.

The foregoing tables clearly show the great differences there are in some cows, and what would be the ultimate value of a milk record. The actual value of each cow's produce could thus be put down in figures of which there is no doubt, whereas just now only the average of stocks can at all be guessed at, and hardly even that itself. The effect of the feeding is, however, more prominently shown in the table showing the weekly averages of each lot. There the good or bad qualities of each cow are counterbalanced by the opposite qualities in some other, so that the results obtained are more to be depended on.

The cows selected to be fed in the ordinary way, on an average weighed 28 lbs. less than those which were to get herring meal, but they were cows which looked likely to be better milkers, and during the preliminary week's trial they gave on an average 2·7 lbs. of milk per week more than the others. This difference in weight of milk is not great, but it acts as an offset against the slight increase of weight of the others, so that the two lots might, practically speaking, be considered on an equality. Very little dependence can, however, be placed on the live weights of milk cows gorged with food, as a retention in the stomach of any extra quantity is calculated as increase of flesh, which it is far from being. In the table of weekly averages I have therefore done away with the live weights, as they really contain nothing of any importance.

The first week, while the preliminary trial was going on, the food used showed an albuminoid ratio of 1 to 4. By many this is considered too concentrated. It, no doubt, is the limit of judicious feeding, and may border on that where risk begins;

Table of the Food of both Lots of Cows during the First Week.

Food daily.	Analysis.				Amount of each Substance used.		
	Weight.	Alb.	Oil.	Starch.	Alb.	Oil.	Starch.
Cotton cake (decorticated), . . .	2 lbs.	×33·2	×16·2	×17·6	=·664	·324	·35
Bean meal, . .	2 ,,	×23·0	× 1·4	×50·2	=·460	·028	1·00
Wheat meal, . .	3 ,,	×11·7	× 1·2	×64·3	=·351	·036	1·93
Draff, . . .	20 ,,	× 4·8	× 1·2	×11·3	=·900	·240	2·26
Oat straw, . .	7 ,,	× 1·4	× ·6	×40·1	=·098	·040	2·80
Silage, . . .	30 ,,	× 2·0	× ·3	× 9·0	=·600	·090	2·70
					3·073	·760	11·04

·76 of oi is equal to 1·9 of starch, so we have 1·9 + 11·04 of starch = 12·94, which ÷ 3·073 of albuminoids = a ratio of 1 to 4.

Weekly Returns of Experiment in the Feeding of Cows in Milk on Herring Meal, against Mixtures of Decorticated Cotton Cake Meal, Bean and Paisley Meal and Cummins, in the Middle of Winter.

Seven Cows.					Three Cows.					
Period in Weeks.	Concentrated Food used.	Bulky Food.	Milk Daily.	Milk Weekly.	Milk Weekly.	Milk Daily.	Bulky Food.	Concentrated Food.	Weekly Loss or Gain.	Period in Weeks.
			lbs.	lbs.	lbs.				lbs.	
1st, .	7 lbs. cotton, bean wheat,	Draff, 20 lbs.; silage, 30 lbs.; oatmeal straw, 7 lbs.	27·6	193·3	196·0	28·0	...	7 lbs. cotton bean and wheat,	+2·7	1st
2nd, .	Herring meal as desired,		25·7	179·9	189·7	27·1	...	,, ,,	+9·8	2nd
3rd, .	7 lbs. herring meal, .		**27·3**	**191·1**	187·4	26·7	...	,, ,,	**−3·7**	3rd
4th, .	6 ,, ,, .		26·5	185·3	187·3	26·7	...	,, ,,	+2·0	4th
5th, .	4 ,, ,, .		24·3	170·1	177·1	25·3	...	,, ,,	+7·0	5th
6th, .	4 ,, ,, .		23·8	166·4	170·8	24·4		,, ,,	+4·4	6th
7th, .	4 lbs. herring, 3 lbs. maize,		23·3	162·7	169·7	24·3	...	7 lbs. bean, Paisley, and cummins, . . .	+7·0	7th
8th, .	4 ,, ,, 3 ,, .		22·7	**159·4**	**155·7**	22·2	...	,, ,,	**−3·7**	8th
9th, .	4 ,, ,, 3 ,, .		23·3	**162·7**	**153·0**	21·9	...	,, ,,	**−9·7**	9th
10th,	7 lbs. Paisley bean and cummins, . .		22·9	**160·5**	**153·0**	21·9	...	,, ,,	**−7·5**	10th
11th, .	7 ,, ,,		21·8	152·8	147·0	21·0	...	,, ,,	−5·8	11th
12th, .	7 ,, ,,		21·3	149·0	148·0	21·1	...	,, ,,	−1·0	12th

The live weights of both lots of cows were at the end a little less than what they were at the beginning, the decrease being equal in both cases.

but for the production of milk alone I have always found an albuminous food most profitable.

The second week, the seven cows set aside for the change of food had their ordinary meals at once totally withdrawn, the mash being made up of draff and herring meal. This was given to each cow to any extent she cared to take it, which the first day would not exceed 2 lbs. each. Every following day the quantity was increased, till about the last day of the week their ration would be about 7 lbs. At this trial all the cows took to the herring meal better than would have been expected, there being no more trouble with them than with any other abrupt change of food. They, of course, fell off considerably in milk, which, if thought necessary, might have been in great part kept up by gradually withdrawing the ordinary food, and replacing it by herring meal. This week was, of course, no test of the capabilities of either food.

The third week the lot of seven cows took their full ration of 7 lbs. all the time, although never with any apparent relish, as few of them ever licked out their troughs as clean as they had been in the habit of doing, or as the other lot did. From this I concluded they were having a trifle too much, and lessened it accordingly the week following.

The increase this week is very noticeable, as will be seen from the table of weekly returns. This is the only week during which an equal weight of herring meal was used against a similar weight of mixed meals; and seeing that this lot of cows were so far down the week previous, it certainly compares very favourably for the herring meal. I feel certain, however, that, had I continued to use 7 lbs. of it daily to each animal, I would sooner or later have had several of the animals laid aside

Table showing the Weight and Composition of the Food of the Seven Cows getting 7 lbs. of Herring Meal daily during the Third Week.

Daily Ration.	Analysis.				Amount of each Substance used.		
	Weight.	Alb.	Oil.	Starch.	Alb.	Oil.	Starch.
Herring meal,	7 lbs.	× 40·0	× 18·5	× 0·0	= 2·8	1·29	0·0
Draff,	20 ,,	× 4·8	× 1·2	× 11·3	= 0·9	0·24	2·26
Oat straw,	7 ,,	× 1·4	× 0·6	× 40·1	= 0·1	0·04	2·80
Silage,	30 ,,	× 2·0	× 0·3	× 9·0	= 0·6	0·10	2·70
					4·4	1·67	7·76

As one part of oil is equal to $2\frac{1}{2}$ parts of starch, the 1·67 here found are equal to 4·15, which, added to the 7·76 of starch already found, equal a total of 11·91, which, divided by 4·4, gives an albuminoid ratio of 1 to 2·7.

by severe indigestion. The albuminoid ratio of this ration is 1 to 2·7, which is too rich, as is shown below.

A carnivorous animal, such as a dog, would in all probability remain healthy on this food, but for a herbivorous one, such as the cow, it certainly is by far too albuminous.

Fish meal being an animal product contains no starch, as is shown in the analysis, which is the main reason why this ration comes out so rich in albuminoids. It may here be remarked that one great difference between all animal and vegetable productions is that the former never contain any starch—starch being purely a vegetable product.

The fourth week the herring meal was reduced from 7 to 6 lbs. daily, for the reasons previously stated. The result appears to be that the average yield of milk was reduced four-fifths of a lb. of milk per day from what had been the average of the same animals the week previous with 7 lbs. of meal. Those fed in the ordinary way gave, however, this week the same quantity as the one previous, so that meteorological or other conditions must have been more than usually favourable to the production of milk. These conditions, therefore, seem to point out that the milk during this week was regulated by the available oil and starch in the food, or by the least plentiful ingredient, or, as engineers would say, "the strain which the whole can bear is regulated by the strength of its weakest part." So with any ration of food or foods, their value as meat or milk producers is regulated by the proper balancing of the whole, and not by an excess of any one ingredient.

At the end of this week I found I had little more herring meal than supply the seven cows for one week at the rate we were going on, and the experiment, to be of any practical value at all, would require to be carried on for some time longer; so application was made for as much more as would enable it to be carried on for at least a week or two longer. As this meal had to come from Norway, and was likely to be a considerable time before it was delivered, it was thought best to at once reduce the cows to 4 lbs. of herring meal per day, so that what was on hand would be sure to bridge over the interval between then and the new stock arriving, without the necessity of supplying the animals with any other variety of food. Cows in milk generally suffer loss in their milk whenever any change of feeding is introduced, so that by reducing the cows to 4 lbs. daily for two weeks less disturbance was caused than if they had been fed with 6 lbs. for a week and a half, and the remaining half week with some other variety of food, if the new supply of fish meal did not come forward till then. It was fortunate this course was adopted, because the new supply did not arrive until the very last day of the second week's feeding at 4 lbs.

The fifth and sixth weeks, therefore, the daily ration consisted of 4 lbs. of herring meal, without any addition of any other concentrated food. During these two weeks, therefore, 4 lbs. of herring meal were backed against a mixture of 7 lbs. of cotton cake, beans, and wheat; and although there was a saving of 3 lbs. of mixed meal per day, there was only a loss of 1 lb. of milk daily the first week, and ½ lb. the second week, so that the smaller ration was in fact the more profitable of the two. The falling off of the milk of the seven cows getting herring meal (4 lbs.) was certainly much less than had been anticipated, and appears to be accounted for by the food becoming better balanced by the herring meal being reduced from 7 lbs. to 4 lbs., the albuminoid ratio being now 1 to 3·3 instead of 2·7 as formerly, as is shown by the following table:—

Table showing the Weight and Composition of the Food of the Seven Cows getting 4 lbs. of Herring Meal daily during the 5th and 6th Week.

Daily Ration.	Analysis.				Amount of each Substance used.		
	Weight.	Alb.	Oil.	Starch.	Alb.	Oil.	Starch.
Herring meal,	4 lbs.	× 40·0	× 18·0	× 0·0	= 1·6	·74	0·0
Draff,	20 ,,	× 4·8	× 1·2	× 11·3	= 0·9	·24	2·26
Oat straw,	7 ,,	× 1·4	× 0·6	× 40·1	= 0·1	·04	2·8
Silage,	30 ,,	× 2·0	× 0·3	× 9·0	= 0·6	·01	2·7
					3·2	1·12	7·76

Then 1·12 of oil × 2½ = 2·8 of starch, which, added to 7·76 starch, = a total of 10·56; then 10·56 of starch ÷ by 3·2 albuminoids, gives an albuminoid ratio of 1 to 3·3.

The seventh week a small supply of fresh herring meal having come to hand, it was determined to use it in the proportion of 4 lbs. of herring meal to 3 lbs. of maize meal, and see how it would compare with the composition which at that time was being used by the rest of the herd. A change in the food given was being made at that time, the cotton cake and wheat being substituted by cummins, saccharine meal, and Paisley meal, the same quantity of bean meal being used as formerly. Cummins are the dried sprouts of barley when malting, saccharine meal I understand to be a bye-product, but cannot say from what, while Paisley meal is maize meal with a portion of its starch abstracted.

Table showing the Weight and Composition of the Food of the Seven Cows fed with 4 lbs. of Herring Meal and 3 lbs. of Maize Meal during the 7th, 8th, and 9th Week of the Experiment.

Daily Ration.	Analysis.				Amount of each Substance used.		
	Weight.	Alb.	Oil.	Starch.	Alb.	Oil.	Starch.
Herring meal,	4 lbs.	×40·0	×18·0	× 0·0	=1·6	·74	0·0
Maize, ,,	3 ,,	× 8·4	× 4·8	×60·6	=0·25	·14	1·81
Draff,	20 ,,	× 4·8	× 1·2	×11·3	=0·9	·24	2·26
Oat straw,	7 ,,	× 1·4	× 0·6	×40·1	=0·1	·04	2·8
Silage,	30 ,,	× 2·0	× 0·3	× 9·0	=0·6	·01	2·7
					3·45	1·26	9·57

$1·26 \times 2\frac{1}{2} = 3·15 + 9·57 = 12·72 \div 3·45 =$ an albuminoid ratio of 1 to 3·7.

Table showing the Weight and Composition of the Food of the Three Cows fed in the Ordinary Way during the 7th, 8th, and 9th Weeks, and the whole ten experimented with during the 10*th,* 11*th, and* 12*th Weeks.*

Daily Ration.	Analysis.				Amount of each Substance used.		
	Weight.	Alb.	Oil.	Starch.	Alb.	Oil.	Starch.
Cummins,	$1\frac{1}{2}$ lb.	×20·8	× 0·9	×43·7	= ·31	·01	0·64
Saccharine meal,	$1\frac{1}{2}$,,	×29·0	×22·0	×13·0	= ·43	·33	0·19
Bean meal,	2 ,,	×23·0	× 1·4	×50·2	= ·46	·04	1·00
Paisley meal,	2 ,,	×16·0	× 8·5	×60·0	= ·32	·17	1·2
Draff,	20 ,,	× 4·8	× 1·2	×11·3	= ·9	·24	2·26
Oat straw,	7 ,,	× 1·4	× 0·6	×40·1	= ·1	·04	2·8
Silage,	30 ,,	× 2·0	× 0·3	× 9·0	= ·6	·1	2·7
					3·12	·93	10·79

$·93 \times 2\frac{1}{2} = 2·32 + 10·79 = 13·11 \div 3·12 =$ an albuminoid ratio of 1 to 4·2.

The seventh week the cows getting herring meal and maize did not make the quantity of milk that was anticipated before trial. This, in part, may be accounted for by the change in food, as none of the cows had to my knowledge ever tasted maize, and they did not show any very great liking for it. Little of it was actually left, but at first they apparently did not relish it. As will be noticed from the table of weekly returns, the average of those getting herring meal and maize was exactly 1 lb. of milk per day less than the others, which is more than is accounted for by any little dislike that was shown to the food, as it was practically speaking all eaten, and ought to have given some return. The principal reason of this fall (heavy fall I may call it) I expect to have been caused by the excessively nitrogenous food previously given. This food being very deficient in starch, the superfluous fat of the body would be utilised to replace it, so that whenever a more starchy ration was given to the animal, it might at once replace this fat before producing extra milk. Whether that be the true reason or not I cannot positively say, but certainly all the other circumstances were favourable for a larger production of milk than happened. I am confirmed in my surmises by the milk production of the next two weeks, as the ninth week as much milk was actually produced as there was the seventh; whereas, judging from those fed in the usual way, there ought to have been a weekly fall of from 2 to 2½ lbs. per day, owing to climatic circumstances.

The eighth week the combination of herring meal and maize meal began to exert itself, and to be seen in the increased flow of milk. It will be noticed that there is a daily increase of ½ lb. of milk over that given by those fed in the usual way. Although this is a considerable increase, not only over last week's production, but over those fed in the ordinary way; still it is little on what was the production a fortnight previous, when with 4 lbs. of herring meal alone daily the production was ½ lb. more. From the beginning to the end of the experiment the natural daily decrease has been about ½ lb. of milk per week, so that, all other things being equal, where 4 lbs. of herring meal during the sixth week produced 23·8 lbs. of milk daily, it should under similar circumstances have produced about 21·8 lbs. the ninth week. This is, in fact, what was produced by those fed on the ordinary food, so that although there is a rise this week over those fed in the usual way, still the production is not greater than one might have looked for. The only explanation I can give is that advanced regarding the falling off during the previous (seventh) week.

The ninth week the rise in milk of those getting herring meal and maize was very perceptible; for, whereas those fed in the ordinary way fell off about the usual, viz., $\frac{3}{10}$ of a lb. instead of ½ lb.; the lot getting herring meal and maize not only fell off none, but actually increased to what they had two weeks ago, or a production of 1·4 lb. of milk per day over those fed in the usual way. This rise clearly shows the advantages of a combination of herring meal and maize over that of herring meal given alone, and also the advantages which are likely to accrue from the use of properly combined foods.

At the end of this week the supply of herring meal was again exhausted, but to see whether the two lots of cows would again return to about the same proportions of milk as each had held at the beginning of the experiment, it was determined to carry on the weighing of each cow's milk for three weeks longer, and in the interval feed all alike.

During the tenth, eleventh, and twelfth weeks, therefore, all the ten cows were fed on 7 lbs. of a mixture of Paisley meal, bean meal, saccharine meal, and cummins, with the usual bulky food. The tenth week those which had received herring meal and maize still showed a daily increase of 1 lb. of milk over those fed in the usual way, which is a reduction of $\frac{1}{2}$ lb. from the increase of last week. It may, however, be here noticed, that whereas those fed in the usual way fell off none during the week, the ones which had previously had herring meal and maize fell almost $\frac{1}{2}$ lb. The following week this lot fell off fully 1 lb., while those fed in the ordinary way all along sank scarcely 1 lb., so that it will be seen that the two lots were gradually approaching each other. The last week those previously fed on herring meal and maize fell off $\frac{1}{2}$ lb., while the other ones had a trifling increase. The lot of seven cows on the average of the week have a production of $\frac{1}{5}$ lb. over the lot of three cows. This increase is, however, all made up on the first half of the week, for on the last three days of it they were actually giving less than the others. At the beginning of the experiment, it will be noticed that the lot of three cows were on an average giving 4 lbs. milk per day more than the average of the seven cows, and during the last few days of the experiment they had returned almost to this identical position—in fact, much nearer to it than I had ever thought it possible to attain.

This test experiment of fish meal, although fairly satisfactory, and in most particulars confirmatory of the results obtained during the previous summer with the same food, should not, however, be taken as furnishing actual proofs of the value of herring meal as food for dairy cows, but only as one of several such proofs, as agricultural experiments with milk cows are so very apt to have the results contorted either one way or the other, by the particular likes or dislikes of the animals and their surroundings, that it is only from a constant repetition of the same results from different animals under different management, that facts thoroughly to be relied on can be obtained.

Whether or not the results obtained in these experiments will be borne out in everyday practice, experience only can solve. My present opinion, however, is that they should at least be equalled if not exceeded, as one becomes better acquainted with it.

The results obtained by these experiments seem to prove that—

1. Herring meal is a useful cattle food.
2. That it would be injudicious to use it largely alone.
3. That the best results are obtained when suitably mixed with very starchy food.
4. That it is fairly palatable, as cows take to it as readily as most *manufactured foods,* linseed and condimental cakes excepted.
5. That it appears to be easily digested.
6. That as far as my experience goes, it has not conveyed any fishy or other unpleasant taste to either the milk or butter.

At the conclusion of the experiment, I made inquiry at a Norwegian firm at what price they would be agreeable to deliver it at Glasgow, to which they replied, quoting £7, 12s. 6d. per ton in bags. At that price, however, taken in comparison with the value of ordinary feeding stuffs at that date, I fear it would be a difficult matter to get the British farmer to adopt it. Neither its appearance nor taste are in any way inviting, and to get a trade in it established here, it will have to be much lowered in price to begin with, after which experience and public opinion will very soon put it at its proper value.

QUARTER-ILL, AND ITS PREVENTION BY INOCULATION.

By WILLIAM WILLIAMS, F.R.S.E. and F.R.C.V.S., Principal of the New Veterinary College, Edinburgh.

QUARTER-ILL, black-leg, strike, symptomatic anthrax, quarter-evil, are a few of the numerous names applied to a specific disease affecting cattle and sheep, and due to the presence of an organism.

Quarter-ill was, until recently, supposed to be an external manifestation of splenic fever (anthrax), that in young cattle anthrax was always thus developed, whereas in older ones the disease was located in the spleen.

This disease is fortunately not nearly so common in Scotland as it is in England, France, and other countries on the Continent; but owing to better drainage of the land it is less common than formerly, even in England.

It occurs much more frequently in young than in old animals, as is well illustrated by the following record by M. Hess of 989 cases:—

374 cases	in animals	aged between	6 and 12 months.
439	,,	,,	1 and 2 years.
83	,,	,,	2 and 3 ,,
65	,,	,,	3 and 4 ,,
10	,,	,,	4 and 5 ,,
18	,,	,,	5 and 6 ,,

Not only is it less frequent in old animals, but it is also less fatal to them. Animals affected under two years old almost invariably die, but animals over that age frequently recover; so much is this so, that many affirm all animals over three years of age to be free from danger of contracting this disease.

But this conclusion, however, must not be implicitly believed in, as the following statements by Hess show there is even danger though the animals are beyond the stated age.

Out of 36,000 animals, from six to twelve months old, 350 died of the disease; of 13,000 animals, from one to three years old, 500 died; and of 135,000 from three to six years of age, 120 died; giving us the following percentages of total mortality:—

Between	6 and 12 months,	·972	per cent. died.
,,	1 and 3 years,	3·845	,, ,,
,,	3 and 6 ,,	·08	,, ,,

The disease is never, or hardly ever, seen in calves under six months old, unless they are fed on a diet which is not an exclusively milk one.

Quarter-ill, like many other diseases, has periods at which it is rife in the country, and other periods when it seems to be dormant.

It is most frequently seen when animals are changed from one pasturage to another, or from one condition of living to another, more particularly when the change is from poor feeding to rich pasturage. The disease is also most prevalent in low-lying pastures, and when there is rain and humid heat, though it may occur on any lands and in all kinds of weather.

Symptoms.—The symptoms of the disease are usually mostly as follows, but occasionally the initiatory ones do not indicate it very clearly, and may readily be taken for those of some other affection, and perhaps one which may be cured by treatment, and so consequently are apt sometimes to mislead even the expert:—Loss of appetite, dulness, listlessness, cessation of rumination, harshness and staring of the coat, elevation of temperature, rigors and local tremblings, coldness of the extremities, then lameness or stiffness when moved, arching of the back, and on examination of the skin a tumour is found forming under it in some part of the body. It may be on the head, neck, shoulders, dewlap, loins, genital organs, or mammary gland, but by far most frequently in either the shoulder or the loins.

M. Hess has observed that the tumour forms more often on the right side of the animal than on the left, but he can give no reasons why this should be so.

The tumour is found in regions which abound in muscular tissue, and where the connective tissue is loose, and seldom in the region of joints and tendons, and where the tissues are firm.

These tumours are ill-defined, and have no limiting membrane. Externally they may not appear of great size, but when carefully examined they are found to extend deeply into the subjacent tissues.

At first hot and painful to the touch, they rapidly become cold, insensitive, and dead in their centres, and when then handled are found to crepitate or crackle, due to the presence of evolved gases under the skin; their peripheries extend and penetrate into the surrounding parts until they attain enormous dimensions.

If incised, they discharge a dark-coloured and fœtid fluid, succeeded by a flow of frothy, citron-coloured serosity.

As the disease progresses the tumour or tumours enlarge, gases are evolved beneath the tissues, the animal evinces great distress, the breathing becomes greatly hurried, the temperature rises to a great height, the pulse beats at 120 to 130 per minute, feebly and intermittently; the expression of the face becomes haggard, tympanitis (hoven) ensues, fæces are passed involuntarily, the animal falls, becomes unable to rise, is attacked by fits, and either dies during one of these or immediately after its cessation.

In the last stages the temperature falls below the normal, and decomposition sets in even before death.

There are, however, cases which do not exhibit the ordinary symptoms to commence with. In some the disease begins as colic, or some digestive derangement; and in others there may be lameness and stiffness, but no appearance of a tumour anywhere. On *post-mortem* examination, the animal is found to be enormously swollen, due to the evolution of gases into the stomachs, intestines, and in the tissues under the skin. Bloody froth is seen issuing from the mouth, nostrils, and anus. On cutting into the carcase, gases of a bad odour escape, and are often accompanied by spurts of dark blood or yellow serosity.

The tumours are found to be black in their centres, and the muscles in their immediate neighbourhood to have the same colour. The further we proceed from the centre of the tumour the lighter the colour becomes, until, instead of being black, it is black and yellow streaked, then pinkish, and then surrounded by a citron-coloured portion.

In some cases the tumour is found in the muscles under the shoulder—in others, in the diaphragm and in many varied situations, but these are rare compared to those found in the loins and withers.

Disposal of Carcase.—It is the practice, in some parts of England, to slaughter cattle affected with the disease, to prepare them for human food by carefully removing the discoloured portions, and sending the rest of the carcase to market. We are opposed to this, and consider that this disease should be dealt with by the authorities, under the "Anthrax Order" of the Contagious Diseases (Animals) Act, as the skinning and dressing the carcase is dangerous to human life.

The blood of an animal affected coagulates readily, and hence is quite different from that of anthrax (splenic fever).

Cause of the Disease.—The cause of this disease is a germ or minute parasite, which when in connective tissue and outside blood-vessels, propagates itself with wonderful activity, and in so doing causes destruction of the tissues in its neighbourhood, the formation of the tumours, and ultimately death from blood-poisoning.

This germ is extremely small, and can only be detected by the aid of a microscope. It measures from $\frac{1}{5000}$ inch to $\frac{1}{2500}$ inch in length, and $\frac{1}{25000}$ inch in breadth. It is found in the tumour, and the exuded fluids contained in and about it, in large numbers, but is scarce in the blood itself; it varies in shape, and often contains a clear spot or spore at one end, sometimes one at each end. It is slightly motile, its movement being from side to side.

If iodine solution be added, the germs stain a violet colour. In glycerine they grow readily, and become motile.

They also stain with fuchsin, more particularly the spores contained in them.

When the virus is introduced into the system of a guinea-pig, it becomes attenuated, and loses its great destructive powers.

Protective Inoculation.—It has recently been demonstrated that when the germs are introduced directly into the blood stream, and not into the connective tissues, immunity to the disease is caused.

To obtain the germs for protective inoculation, the following is the method recommended by Messrs Arloing, Cornevin, and Thomas, and others, and found to be extremely successful:—

From an animal just dead of the disease take the blackest portion of the tumour, cut up into small pieces, mix with distilled water, then triturate in a mortar, squeeze through cloth, and filter through several folds of muslin which has been previously wetted with water, and of this fluid inject from five to ten drops into the jugular vein by means of a hypodermic syringe, taking the very greatest care that none of it escapes into the wound. If the operation be carefully performed, the animal will have immunity conferred upon it.

In many, for two or three days, there is dulness and disinclination to feed, but this soon passes off, leaving no ill effects.

But if the virus escapes into the wound, or if the animal has any bruises upon it, there we may expect to see the tumour of quarter-ill appearing, and death resulting.

Others again, instead of using the virus direct, inoculate a guinea-pig subcutaneously, and cause the formation of a tumour containing germs, which are thus modified in their power, and after mixing with water, triturating, and passing through muslin, use it. Others again have used the desiccated virus prepared by drying in air portions of the diseased tissues. We, however, are of opinion that Cornevin, Arloing, and Thomas' method of using the virulent tissue mixed with water and filtered as above stated, is the best.

Many other methods of preventing this disease have been in use from ancient times, and seemingly with success; setoning, for instance, when performed on young animals not affected with the disease, but having been in contact with affected animals, almost invariably is said to protect the animal for the time being at least. We think that the setoning itself does not protect, but that the dietetic and hygienic alterations which accompany it materially tend to stop its progress, and the credit is thus given to the wrong agent.

Again, the insertion of garlic beneath the skin in different regions, and rowelling, have each its advocates, but their aim is directed to the one main feature, and that is the increasing of the coagulability of the blood, but this is erroneous, as the blood of animals dead of quarter-ill is found to be quite coagulable, and so with this object in view such operations are useless.

We can quite understand the value of such operations in anthrax (splenic fever), which is caused by a different germ, and where the blood is extremely fluid, and loses all power of coagulability.

WEST COAST FISHERIES.

By W. Anderson Smith, Ledaig.

[*Premium—Five Sovereigns.*]

During the past year we have been largely occupied with a continuation of our investigations into the fisheries of the West of Scotland, but we have given more attention to particular districts, supplementary of our last year's expedition under the auspices of the Society, and consequently covered less ground.

More especially have the islands of Mull and Barra been examined, and a few of the facts there collected may prove of public utility.

Lochbuie, in the south of Mull, is readily approachable from Oban in the summer time, and during many seasons there have been herring fisheries of considerable value carried on there. Opening, as the loch does, directly to the Atlantic—to the gales from which it is also more especially exposed—one naturally anticipates occasional visits from fish shoals, and in this the natives are seldom disappointed. But from season to season there is a distinct variation in this regard, and the reason for the absence of the accustomed visits is worthy of close examination. The herring fishery, when prosecuted, is conducted for the most part from Oban as a centre, principally owing to the extremely exposed nature of the coast preventing a herring fleet lying securely in Lochbuie. The herring used formerly to spawn in quantities at the head of the bay, but we could not learn that they have done so of recent years, and the likelihood is that they have been driven out to sea, and forced to spawn in deeper water. During our stay they were not observed in shoals, but were occasionally in numbers "on the feed." This made it all the more interesting, seeing the contents of their stomachs were readily differentiated, and proved to be of the usual nature, viz., the life that for the time being was the most plentiful in the tow-net, and along the outer fringe of the sea-ware. This life included numerous Entomostraca, such as *Cladocera* and *Copepoda*, as well as Schizopoda from the shoreward waters. At these times the tow-nets were always well filled, and the floating life of the sea shown to be abundant. Occasionally, at this time, the nets were filled with strong-smelling floating algæ of a simple character, such as was found to be inimical to fish life in the further north; but we did not find that the presence of this disagreeable growth either decreased the take of Entomostraca, or prevented the capture of herring inshore.

We had here an opportunity of noting a fact that has a special bearing on our investigations elsewhere, and that make it dangerous to generalise on negative evidence. The cod fishing that was being conducted outside, at the mouth of the bay, was a blank, so far as any evidence of the immediate neighbourhood of herring was concerned. Not that there was any absence, either, of a general food supply. Quite the contrary. The fish were well supplied with a general cargo, but herring, in no case within our cognizance, were found amongst it. It is frequently stated that when not captured inshore freely, the herring are in deep water, and consequently when the white fish there captured show no sign of herring, we leap to the natural conclusion that no herring are in the vicinity. This it seems is not a necessary conclusion to come to, for, undoubtedly, when cod-fish were numerous in 60 fathoms near the mouth of the loch, within 3 miles of the head, herring were being captured in quite sufficient numbers to show that they were plentiful on the feed in the neighbourhood. This seems an important fact in view of our former experiences.

The cod-fish were being captured last spring both by the old way of long lines, and the modern Norwegian system of nets sunk to the bottom, and were frequenting the mouth of the loch at this time in multitudes for the purpose of spawning. The waters were accordingly well filled with their ova, as well as with those of many other so-called pelagic fishes, whose eggs float on the surface until incubated. When the nets were drawn the contiguous fishes were quite frequently male and female, showing they had come together for spawning purposes. These could easily be relieved of the ripe ova, and these latter impregnated under water by the milt of the male; but it was invariably the case that only a portion of the ova was ripe at a time, and that the spawning of the cod is a lengthy operation, and not readily concluded—an arrangement to secure its safety against destruction by being all thrown into the water at once, under adverse conditions. There is no doubt that cod-fish throw their ova at the bottom of the sea, even at a depth of 60 fathoms; that these ova immediately come to the surface if impregnated, and that they remain there until incubated, floating about at the mercy of the winds and waves.

We took them at all stages of development, and explained their condition to the fishermen, who were much interested, and as usual much astonished, to find that their beliefs in this direction were not in accordance with the simple facts so readily observable. In the spring, from March to the end of May, was the period in which the sea was richest in floating ova of all kinds, from the cod downwards to the smaller rocklings. Afterwards, with increasing warmth, there was a greater increase in Entomostraca, those voracious little crustaceans that clear the sea of all decaying animal matter, and no doubt also attack such helpless organisms as developing ova, in despite of the tough *zona radiata* that environs them. This is a sufficiently suggestive fact, as pointing to all the Gadidæ as being northern fish, and better adapted for the colder seas. At the same time they must necessarily have water of a sufficiently high temperature to develop the floating ova, and it is just possible that, within a comparatively limited area, the ova of the Gadidæ are successfully developed during the spring months to supply the whole area inhabited by them. Otherwise they must just take it leisurely like the salmon, and extend the time with the decreasing warmth.

The fishing trade of this district has distinctly fallen off, owing perhaps to some extent to general dissatisfaction and land agitation, but also no doubt to the reduced prices for the fish captured. Much might be done, however, at small cost to develop an important industry in this quarter, the whole region to the south-west, by Dhu Heartach, being undoubtedly most abundantly provided for the supply of a fishing industry. A considerable quantity of flat fish are still captured on the spiller lines, and sent during the spring and summer to the Oban market, along with the salmon taken in great numbers off this coast. The flat fish include the sail fluke, which is occasionally taken, and young halibut undeveloped, so far as to have the eyes wide apart, were also found in the tow-net, showing they were still in the position in which they were developed from the floating ova, and had not yet descended to the depths at which the mature fish is taken.

A good deal of systematic work is still before the naturalist ere he can positively claim to know the career from end to end of the commercial fishes. But a great proportion of them have been hatched out, and examined specifically in course of development, so that ere long we trust to be able to declare with certainty to what species each ovum, during any month, may with reasonable certainty be allocated. There is no doubt a danger in generalising from particular cases, and still more in judging from analogy, and it may be necessary to carry the ovum to a certain development ere reasonable certainty can be assured; but the possibilities are there, and from our observations and drawings, we have no doubt that sufficient distinction is observable at an early stage to enable an accurate observer to define the genus, if not the species, from the developing ovum. There is a marked difference in the development of the eye, of the pigment spots, of the colouring matter, or so-called *chromatophores*, and various other points.

Thus, without accepting the view that beam-trawling is not a destructive mode of fishing, we are ready to admit that, so far as the bulk of our commercial fishes are concerned—herring specially excepted—it can do no direct injury to the spawn once that has been deposited in the water, seeing that the ova are not only by presumption, but by actual observation and investigation, proved to be floating freely in the upper waters during their development, although the ground fishes to which they belong may throw them many fathoms deep.

When the waters are rich in Entomostraca—and these go in shoals just as fishes themselves do—the fish taken, such as herring or "saithe" (young *Gadus virens*), are also found to be full of these readily captured multitudes. When these are scarce, then the stomachs of the "insectivorous" fishes are supplied more promiscuously. They then separate and hunt about with much energy, for they may contain the small *Helcions* from the fronds of the tangle, alongside crustacea and mollusca from deeper water and inshore. They are not so well fed when this is the case, nor are they so plentiful: and we may safely conclude that, when herring shoals are large they have ceased to feed, and are preparing for spawning; otherwise they separate to hunt for food, and are not then so close together as properly to constitute shoals, although they may yet remain about a given neighbourhood in the so-called gut-poke condition. The haddock fishing, at one time valuable off the mouth of Lochbuie, has not of late years been prosecuted, but whether through the want of attention of the fishermen, or the absence of this fish, always somewhat erratic on the West of Scotland, we are unable to suggest. Their floating ova was present in quantity, so that they probably only shifted their ground, perhaps from the pressure of the spawning cod-fish. The line fishery was not so harassed by dog-fish as is frequently the case, and we attributed their immunity to the net fishing alongside, these fish having a wholesome dislike to nets. This fact might be made use of in the Outer Hebrides, where nets have not yet taken a prominent place, and yet where dog-fish make great havoc amongst the cod and ling, spoiling for the market those they do not clean to the bones.

The coast on this side of Mull is very rich in most classes of shellfish, and the neighbouring Loch Spelvie could readily supply a great quantity of mussels with very little labour and attention. The mussels of Loch Spelvie are especially good and rich, and its native oyster is also comparable to most in the West of Scotland. "Spout-fish," or *Solen*, are obtainable in fair numbers, and the coast generally is rich in what may be termed the ordinary wealth of the sea. It would be useful to investigate the reasons for the extremely backward state of the native fishing industry in such a good position. Mr Maclaine of Lochbuie is himself an enthusiastic fish-culturist, and willing to give every facility for the prosecution of the fishing trade. He himself has cultivated the Salmonidæ to much advantage, and his net fisheries are the most valuable in the island. It is probable that most of those who are able to prosecute the sea-fishing are of late wholly absorbed in land questions, that can benefit them little in such a district, and under present conditions.

The swift currents of Mull alter the sea-bottom to some extent even at considerable depths, and may in consequence have injured the grounds frequented by certain fishes at certain seasons. But so far as the evidence of last season went, from the quantity of developing ova afloat in the water, of a wide variety of fishes, there must be a very great number of fish procurable off this coast. Even when the cod-boats were each capturing 100 large spawning cod, the upper waters were showing as plentiful a supply of the ova of other smaller fishes.

Quite in keeping with the wealth of Entomostraca in the upper waters, was the remarkable supply of *Amphipoda* in the deeper waters, as a food supply for ground fish. The best mode of taking these is by sinking a fine net with a bait, such as a fish head, and when drawn to the surface after a time, this is sure to be well devoured by a colony of these active crustaceans. The shore species are equally numerous and of large size; the hermit crabs frequent almost every stone on the shore, and penetrate to the deep waters, where common shore species intermingle with the rarer deep-water species. The annelids on this coast at all depths are as rich in development as they are plentiful, so that everywhere fish food is abundant. At the same time, oysters will not thrive in Lochbuie, nor are the mussels of that loch comparable to those of the neighbouring Loch Spelvie.

From a review of the results of our examination, we may conclude that there are here the elements of an important industry, so soon as the fish trade of the country assumes a normally healthy condition. This it shows no sign of doing at present, and consequently the people are not encouraged to make efforts which they are at all times slow to attempt. The skates, taken by the hundredweight off the mouth of Lochbuie, were mostly thrown overboard, as they would not give them room in the boats when fishing for cod; but if there had been any market at all for these wholesome fish, it would pay to make an effort to get them to it. The congers are also well represented around this rocky coast, and their young were numerous in the spring at the mouths of the freshwater streams, and up between tide marks, very distinct in brilliance from the dull-coloured freshwater eel.

It is to some extent here, as elsewhere, a question of facilities of communication. There is as yet no telegraphic communication between Lochbuie and commercial centres. The steamer that is comparatively convenient in the summer time is off except during the tourist season, so that the despatch of fish to market is a tedious or a costly operation—or both. As to the abundance of fish in the waters alongside, if the fishing were properly prosecuted there can be no reasonable doubt during most seasons of the year.

From Mull to Barra there is a great leap in distance, but there is, practically speaking, no proper resting-place between, and the expanse of water across by the Hawes Bank may be looked upon as the Outer Hebridean fishing grounds, separated from those of Mull by the islands of Coll and Tiree. The absence of harbour accommodation, and the exposed situation of these latter islands, prevent their inhabitants from taking advantage of the waters about them. With Barra it is very different. There the harbours are of the very best. Castle Bay can accommodate 700 large fishing boats with ease in the herring season; and in North Bay, on the Sound of Barra, a splendid fleet could be accommodated. The harbours are also secured from all winds by the neighbouring islands closing them in, and being open both to the west and east, the boats can take advantage of the prevailing wind to fish the least turbulent sea. These facilities have had a most beneficial effect in stimulating a great herring fishery, and the generosity and public spirit of the proprietress, Lady Gordon Cathcart, has still further supported the efforts of the curers, by building steamboat piers and hotels on this and the neighbouring islands. But the greatest stimuli to the Barra fisheries and industries has been the establishment, by the Highland Fisheries Company, Limited, of a mail route from Oban amongst these outer islands, and the construction of a telegraph, supported by subsidies from Lady Cathcart and the Scotch Fishery Board. Since the establishment of the mail service, less than two years ago, Castle Bay has begun to assume the appearance of a neat village, and there is every evidence that communication has meant to it civilisation and progress. So far as the herring fishing goes, with the many accompanying steamers during the six weeks of its continuance, the mail route has influenced it mainly in creating a fresh-fish trade with the south. But with other industries it has meant their virtual creation. The cockle trade has reached important dimensions, in spite of the long and costly carriage to the English markets. The lobster trade, with increased opportunities for despatch, has been greatly stimulated, and altogether the immense advantages of being in touch with the great centres is felt throughout the island, and points to what may be done with every prominent island in the West Highlands. The agriculture of Barra is not worth considering in presence of its fisheries, in which the whole population could readily find profitable employment.

The shores of Barra are quite distinct in many respects from those of Mull; and the fauna, with a certain resemblance, is at the same time different. Thus, perhaps, the immediate cause of the variation lies in the fact that, whereas one has to go for miles off Barra ere any considerable depth is obtained, and the immediate vicinity of its shores is comparatively shallow, a depth of 60 fathoms and upwards may be found so soon as the mouth of Lochbuie is reached. This difference is the immediate cause of the difference between the cod of the one place and those of the other. The Lochbuie cod are the light-coloured fish of deep waters, while those of Barra are, properly speaking, only rock cod, that have remained longer in the tangle area, and retain the peculiar rich colour of such fishes. The Barra cod is very delicate in flavour, but the flesh somewhat soft, and we are inclined to look upon them as exceptionally well-grown specimens of young cod-fish, ere these take to the deeper waters for a subsistence. At any rate they have all this appearance, and the salted cod of Barra cannot for a moment compare in size with those of the Hebrides further north. The same may be said of the skate and conger taken in the immediate vicinity. But further out to sea the result will no doubt be different, more especially in the west, as on the Atlantic side the herring are larger and richer, and a body of white fish of proportionate size will no doubt be found preying upon them. Hitherto there has been no outlet for lower class fishes in the Hebrides, such as skate, but with the establishment in Barra of the Normal Company's factory for the utilisation of waste fish products, a new era has opened up for that region, if the native populations will only rise up to the occasion. This extensive establishment, well supplied with the best machinery, has been erected for the purpose of manufacturing fish glues, guanos, and other articles from the lower class fishes, such as skates and dog-fish. These are collected from the islands around, and all the material possible to be obtained under existing circumstances can be utilised at the station. So far, the difficulty has been the giving sufficient inducement to the people to capture and bring in these waste fishes—the Hebridean fisherman not having been sufficiently educated up to the proper appreciation of the value of small sums, and thrift being a science they do not properly understand. In the summer time, during the herring fishery, there will be abundance of herring offal for the manufacture of oils and fish guano; but whether the enterprise of the people will ultimately maintain such an establishment at work throughout the year is a question of supreme importance to the West of Scotland. Its success would no doubt induce an extension of the system, and, let us hope, point the way to a more systematic and energetic prosecution of the western fisheries than the people have yet been induced to conduct.

It is undoubtedly a great advantage to the fishermen of Barra that the sea for many miles around is comparatively shallow, and that the islands are so numerous they can safely calculate upon obtaining shelter under the lea of one or other of them. This extension of what may be called in a sense the tangle area, gives a great space for the propagation of lobsters, with many important results. The lobster fishery is indeed one of the most valuable in these islands, and the one that has been prosecuted with the greatest assiduity. But, owing to the want of organisation and foresight, the people have not been careful of the spawning lobsters, nor attentive to the question of size, with the result that the fishery is declining, and must under such circumstances continue to decline. For the lobster is not properly a pelagic, but really a foreshore crustacean, driven further and further to sea through the persistence of the onslaught upon it. It cannot go an indefinite distance, being an inhabitant of the tangle area, and the fact that the lobster boats of Barra have even now to proceed many miles out to sea in prosecution of the industry, and carry double the usual number of creels, points to a serious over-fishing and underproduction. We have already indicated our belief that berried lobsters should be either kept until the berries have departed as zoæ; or relieved of them, and the berries incubated artificially. This pelagic habit, when in the zoæ and megalop stages, prevents the possibility of their being readily carried further artificially; but they could at least be returned to their native waters with a reasonable chance of supplying the annual catch at the proper time.

Everything that goes to make a prosperous fishing district is to be found in Barra and its small isles,—abundance of bait for lines small or large, good harbourage, good quays, a proprietor willing to grant all facilities, and now both telegraphic and mail communication directly with the mainland. It is consequently in marked contrast with the south of Mull in these latter respects, and although the latter is much nearer Oban geographically, yet the want of facility of access and harbourage, as well as mail and telegraphic communication, prevent its steady development.

Barra is but showing what the other islands of the Hebrides must promptly do, or the inhabitants will rapidly sink still further into penury and hopelessness.

THE BEST MEANS OF DEVELOPING THE CRAB FISHERY OF SCOTLAND.

By W. Anderson Smith, Ledaig.

[*Premium—Five Sovereigns.*]

It is well in the first instance, before seeking to solve this question, to examine into the prior question as to whether there is an important crab fishery to be developed; and next it is advisable to find out whether, and if so why, it is not at present developed. The crab is a frequenter of a rocky coast, in the crannies of which it shelters, going forth in search of prey which it hunts with great energy and ingenuity. Its food is very different from that of the lobster, although they may both be taken in the same pot and with the same bait. For the crab is more especially devoted to fresh food, and does not touch what is tainted; while the lobster, on the contrary, prefers food in a high condition. Again, the great speed of a lobster in the water enables it to capture prey that the crab could not aspire to, its formidable claws being more as a weapon of sexual attack and defence than as a means of a direct livelihood, as in the case of the crab; for the strong nippers of a crab may be frequently found ground down to the utmost, where the food mainly consists of the larger species of dogwhelk (*Fusus*), whose tough shell homes they have been in the habit of crushing. The crab is, therefore, a more dainty feeder than the lobster; and as it is slower in its movements, it does not go so far from its accustomed haunts. At the same time, it is more occasionally a mud dweller, and consequently more independent of sheltering seaweed than the lobster. This enables it to proceed out to deep water in search of prey, and thus we find them come up in the long lines, or the cod nets, from the greatest depths. A given stretch of rocky coast has probably the capacity of carrying a greater stock of good-sized crabs than it will of well-grown lobsters, and at any rate, seeing the lobster fishery has been prosecuted with energy around the Scottish coasts for a lengthened period, while crabs have not formed a remunerative fishery, these latter are still abundant in many districts. Indeed, it might be said that all around the Scottish coasts crabs are sufficiently numerous to enable a satisfactory fishery to be carried on, if only a suitable market could be found that would take up the supply. In various parts of the East Coast the capture of "partans" was quite a remunerative occupation to a few skilled fishermen some thirty years ago. They were especially pursued into the crevices of the laminous rocks, out of which at low springs they were drawn by means of an iron cleek. No matter how many were captured during a tide, by the next springs the best holes were always occupied by well-grown successors. It was evident that a large body of crabs were unprovided with accommodation, and only too ready to take advantage of any that offered through the abstraction of the previous occupier.

Alongside these "partans" or ordinary edible crabs (*Cancer edulis*), were to be found quantities of the common green or shore crab (*Cancer Mœnas*) up to a considerable size. These, though carefully avoided in Scotland, are still quite edible, and readily find consumers in London. When lobster fishing around the coast, there is no doubt a large quantity of edible crabs captured, most of which are again returned to the water, or simply thrown on shore to die. There is not a part of the rocky coast with which we are acquainted that does not at one time or other supply crabs in quantity, but for the most part the best crabs captured in the lobster-creels are of very moderate dimensions, and crab-pots pure and simple are rarely employed in Scotland, nor have we ever met them on the rocky north-west coast where the crabs are probably most numerous. From all over the Outer Hebrides, and throughout the Orkney and Shetland Isles, crabs could be forwarded to market in great numbers. It is not here, as in some cases in connection with the ordinary fisheries, where the abundance of fish is often taken for granted. The supply of crabs is unquestionable, and we have ourselves captured them at all parts of the Scottish coasts, where they were simply regarded as "offal," and usurping the place of the lobster, which was the special game in view.

This being the case, we must next inquire whether the crabs captured on our coasts are comparable to those commonly supplied to the English market. To this it must be answered, that the crabs of many portions of our coast, notably lochs into which an abundant supply of fresh water empties, are very watery, and not worth putting into the pot. As our native populations are not as a rule eaters of crabs—more especially those on the sea coast—they are not even aware of this fact, and we have seen crabs sent off to friends, or market, that would never have left the shore if the fishermen had known a good crab. A few consignments such as this would naturally raise a strong prejudice against Scottish crabs, and such are generally most easily procurable from the western lochs, if not from the eastern foreshore. Our sea-faring population must, in the first place, learn to know what is really a good crab, so that the market be not prejudiced against their consignments; and then care should be given to keeping up the quality to the highest pitch.

Another point necessary for the consigner of crabs to be acquainted with is, the general character of the crabs sent to the London market, so that he be not deceived with the market quotations forwarded so regularly from Billingsgate. Only the other week he might have observed crabs quoted at two shillings, when lobsters were as low as one shilling at even this season of the year—October—when the price is supposed to be rapidly advancing in view of wintry weather. But what do the prices mean? They do not mean that the London consumer is giving half the price for the lobster we are striving to capture, that he pays for the crab we are throwing overboard? The lobster in question is probably moderate in size, and unsatisfactory in condition, while the crabs were such as, in all likelihood never came under the eye of the Scottish lobster fisherman, who alone has frequent opportunities of capturing them. The size of the crabs sent to the London market from Cornwall are such as to throw into paltry insignificance those generally forwarded from Scotland. Not that we have no such crabs on the Scottish coast, but they could never enter a lobster-pot, and are not sought after in crab-pots. The crabs of the Flannan Isles, or about Heiskeir, would probably compare with any in the kingdom, but we cannot always or indeed often get a chance of fishing them, and consequently we are forced to fall on those of moderate dimensions that can squeeze themselves through the rings of a lobster-creel. Of those, an abundance reach the London market, where they are disposed of at very moderate prices, the value of a crab increasing by leaps and bounds as it approaches nearer to an exceptional size. This accounts for the extreme disappointment caused to consigners from Scotland who have sent crabs to the English market, where, after a long and costly railway journey, they have to compete for a third rate place with the native article.

Two questions suggest themselves in this connection. The first has reference to the possibility of procuring a better class of crabs to compete fairly with those of the Cornish coast; the second applies to the apparent want of a demand for our own crabs in our own cities.

With regard to the first, there is no reason to doubt that off our wilder coasts the use of the crab-pot in place of the lobster-creel, or supplementary to it, would procure a much larger class of crab, at present never captured. Indeed, we have seen lobsters taken in the netting of the creel that could never by any possibility have entered the creel itself, and it is impossible to argue that our native crabs are small because, in comparatively sheltered situations and inshore, they have not been captured larger by means of creels that would not take them had they been larger! We are willing to admit that some of the monster 12 lb. crabs from Cornwall may beat anything we can hope to procure; but these themselves are not common, and it is a question if, with suitable apparatus, they could not be matched. One thing is certain, that the use of good-sized crab-pots, in the proper situation, would procure a much larger average of crab than is at present taken as a "bye-product" in the lobster-creels. Consignments of these would also naturally be more likely to yield a return, as weight for weight the larger crab would bring a much greater price in proportion. There is no use, indeed, in forwarding the ordinary crab of our lobster-creels to London; they could not possibly do more at the best than pay the carriage. The second question is more difficult to answer. But it is certain that at one time there was a large demand of a local character for "partans" at a moderate price. The prospect of lobsters at 2s. 6d. each, as we have known them bought from the fishermen in the further north, throws crabs at 2d. or 3d. each out of reckoning; in the same way that ling at 1s. each blinds fishermen to the advantage of capturing coal-fish at 2d. Yet it may be that the pursuit of "partans," even at 2d. each, is worth considering, more especially when the greatly diminished prices for all produce turns the attention of all classes to neglected articles of commerce. Local markets, if carefully and judiciously fostered, ought to take a large proportion of our medium-sized crabs; but there is not enough money in them for most of our fishmongers to bother over them, while the capture of these having gradually fallen into desuetude, the trade is never pressed to dispose of the catch. It would be useful if some of our principal fishmongers were to supply a few crab-pots to the most likely localities, and endeavour to reintroduce a native industry that at one time helped to eke out a subsistence to many a family in our smaller fishing villages.

The development of the Scottish crab fishery is then a matter partly of understanding exactly the position of affairs; partly of knowing how to capture proper sized crabs, how to tell good crabs by weight and appearance, and how to send the proper article to the proper market. The fishermen must not be misled by the Billingsgate rates as published; they must be satisfied with very reasonable returns, endeavour to foster a local trade throughout the minor towns as well as the larger provincial cities, and seek to show the public that, if good crabs of a reasonable size are desired, they will be readily forthcoming at a moderate price. At the same time, by the use of proper pots in the more suitable districts, crabs to compete with the average of Cornwall may be forthcoming; the remaining portion of the English coast can in no sense interfere between us in the highest class crabs.

The crab question partly resolves itself in the west of Scotland into the more general question of the neglect of all minor fisheries in favour of such abundant, and hitherto productive and remunerative, fisheries as the herring, and the cod, and ling. It will have to be taken up, as many other minor industries will be, once the main industries are overstocked or underpaid; and it appears as if the present were a suitable time in which to summarise the necessities of the trade. These we recapitulate—

1. The special capture of crabs of good size.
2. The despatch of the best and largest crabs only to the English market.
3. The stimulation of local and provincial markets, by providing good crabs at a reasonable price and in good condition.

If these suggestions are followed, and too great expectations not indulged in for a time, there is no doubt a future for our crab fishery, which has the special advantage of having almost virgin ground over a great part of the coast to work upon. But no trash need be sent to London, to be swallowed up in carriage, as has hitherto been commonly the case. The enormous fecundity and tenacity of life of the crab, "or partan," will readily keep up the supply.

ANTHRAX AND ANTHRACOID DISEASES.

By William Williams, F.R.S.E. and F.R.C.V.S., Principal of the New Veterinary College, Edinburgh.

Anthrax; charbon; gloss-anthrax; apoplexia—splenetica; carbunculo contagiosa, &c. (L.); charbon; chancre à la langue; mal de sang; sang de rate; typhomiè; fièvre putride, &c. (F.); miltzbrand; miltzbrand-fieber; petechial typhus; pestfieber (C.); carbone; febbre carbonculara, &c. (I.); apoplexy of the spleen; malignant sore throat; known in India as Loodiana disease, and in South Africa as horse sickness; in sheep as splenic apoplexy; in America, splenic fever, Texan fever, trembles, &c.

The term *charbon* is applied by the French veterinarians for the reason that the regions of the body where the disease is localised are coloured black. Anthrax (a burning coal) is now adopted by most writers as a generic term, and applied to what is otherwise known as splenic fever, but it throws no light on the nature of the disease, as others, septic and putrefactive in their nature, present a similar appearance of the blood.

Definition.—The disease consists in a special and primitive alteration in the blood, in which an organism termed the *Bacillus anthracis* is rapidly developed and propagated, and is more special to the herbivora and birds. Inoculation with the blood or tissue of animals which have died from it induces, both in man and other animals, a malignant form of inflammation called "malignant pustule." For this reason anthrax is looked upon, and described, as a truly contagious disease.

Anthrax appears at all seasons, but principally in the spring or during summer and autumn. It occurs either as a sporadic, enzootic, or epizootic disease, attacking animals of any age—the fat, vigorous, plethoric, as well as the lean, feeble, and languid. It is a remarkable fact that wounds, simple in themselves, in cattle subjected to the influence called charbon, although not suffering from it, often become mortal.

History.

Anthrax has a very ancient history, and was known in Asia Minor at the period of the siege of Troy; but, leaving ancient history aside, it may be useful to mention that the seventeenth and eighteenth centuries were remarkable for the devastations committed by various epizootic outbreaks of anthrax. In 1617 it was prevalent and of such a fatal nature in the neighbourhood of Naples, that over 60,000 persons perished through partaking of the flesh of animals which had died of the disease. In 1731 it declared itself in several provinces of France, notably in Auvergne, Bourbonnais, and in Languedoc, where it was studied by Sauvages, and described by him under the term glosso-anthrax (*Nosologia Methodica*, vol. ii. p. 300).

1757, 1763, 1775, 1779, 1789, and 1800.—These years were signalised by a charbonous malady which extended nearly all over France, and affected all the domesticated animals. The disease was studied by Bourgelat, Chabert, Berdin, Huyard, Desplas, Detil, Gordine, Gilbert, and a great number of veterinarians. From 1800 to 1846 many outbreaks of charbonous disease were observed, generally in the hottest months. They were studied by Demoussy, Sansol, Pradal, D'Arboval, Mathieu, and others. During more recent periods, outbreaks have been studied by Roche-Lubin in Avignon; by M. Rey on the heights of the Alps; and in Eure et Loire by the Medical Society of the department; and by MM. Renault and Delafond, who were sent by the French Government, the one to Allier and Nièvre, and the other to Somme, to report on the disease. Within recent years the disease has been profoundly studied by Pasteur, Chauveau, and Koch, and others in France and Germany. In this country, however, little has been done for its elucidation; and though less frequent here than on the Continent, it is, however, quite as fatal in its character.

Observers who have closely watched these affections in this country, where it seldom appears in the horse, almost unanimously conclude that in cattle and sheep they are due to dietetic errors; more particularly to sudden and violent changes in diet, whether that change be from a poor to a highly nutritious, more particularly a nitrogenous diet; from dry and good food to watery, unripe provender; to damaged food of any kind; the influence of undrained lands; defective ventilation and drainage of stables; to food and water contaminated with the morbid products of animals which have died of blood disease. In one remarkable outbreak which came immediately under my notice, the disease appeared amongst sucking calves of the pure Shorthorn breed, and which had never partaken of other food than what they obtained by sucking, the dams remaining healthy. Anthrax is also disseminated through the agency of flies; and Bollinger, who has observed that the disease is often most prevalent when flies are in the greatest abundance, has induced it in rabbits by inoculating them with flies caught on the carcases of animals dead from anthrax. The flies, however, resist the influence of the virus, although bacteridæ are found in them.

Pathology.

The influence of all these causes upon the animal economy, differing widely in their primary stages, induce within the blood certain changes which ultimately tend to grave alterations in its composition, and to its death and decomposition.

First of all we must consider the influence of highly nutritious and nitrogenous fodder when suddenly brought to bear upon the animal body; and veterinarians are generally agreed that the result is the rapid formation of blood, highly charged with albuminous materials, which neither the tissue-nutrition nor the excretory organs are calculated to keep in anything like its normal condition. In consequence of this, grave changes occur, by which its constituents become degraded, and the system eventually empoisoned. If it be remembered that every tissue and organ in the body, by withdrawing from the blood those constituents which are essential to their well-being, serve as excretory organs to the rest of the body, the subject will be more clearly understood. Without this withdrawal from the blood of those constituents by every tissue and organ, it soon becomes unfit for the purposes for which it is intended, and the same condition results when it is so rapidly (and hence imperfectly) formed, that the process of tissue-nutrition cannot possibly eliminate or withdraw from it more than a moiety of its superabundant constituents.

For example, the whole of the body requires within a given time a certain quantity of plasma for all the purposes of nutrition, growth, the formation of fat, and what is eliminated by the excretory organs; and if within that period the quantity of that plasma far exceeds those requirements, it naturally follows that the unused matter must accumulate in the circulation, and there undergo such grave alterations as to become injurious to the animal economy, empoison the blood, modify its power of absorbing and conveying oxygen from the lungs, destroy the integrity of the blood-corpuscles, and convert it into a proper habitat for the development and growth of low organisms, which cause within it a septic or putrefactive action, by which its vitality is ultimately destroyed; in fact, bring about a condition of the blood similar to that which can be produced artificially by the introduction of decomposing animal matter, or by giving it with the food upon which the animal is fed. When blood is so altered, it tends to accumulate in the vessels of the soft structures of the body, such as the areolar tissue, spleen, enteric mucous membrane, and lungs, where it rapidly transudes through the walls of the altered and debilitated blood-vessels, and constitutes the various local manifestations of a septic fever.

In opposition to the view of the spontaneous origin of anthrax, we have the observations of many eminent pathologists, who maintain that the malady is due to the propagation of a now well-known organism, the *Bacillus anthracis*, the history of which is as follows:—

These organisms were first observed by Brauell, and afterwards by Delafond and Gruby, in the blood of animals which had died of anthrax, as peculiar staff-shaped bodies, which Delafond designated *bâtonnets*, and which were believed to be products of putrefaction, and that anthrax was a septicæmia or putrefaction of the blood. These *bâtonnets* were afterwards observed in 1850 by MM. Davaine and Rayer, and some time later Koch studied them, and found the aqueous humour of the ox's eye to be particularly suitable for their nutrition. With a drop of the aqueous humour he mixed the smallest speck of a liquid containing the rods, placed it under the microscope, warmed it suitably, and watched the subsequent action. During the first two hours hardly any change was noticeable, but at the end of that period the rods began to lengthen, and the action was so rapid that at the end of three or four hours they had attained from twenty to thirty times their original length, and at the end of a few additional hours had formed filaments in many cases a hundred times the length of the original rods; and further it was seen that within the transparent rods little dots appeared; these

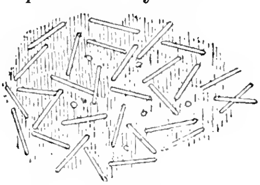


Fig. 1.—Transparent rods.

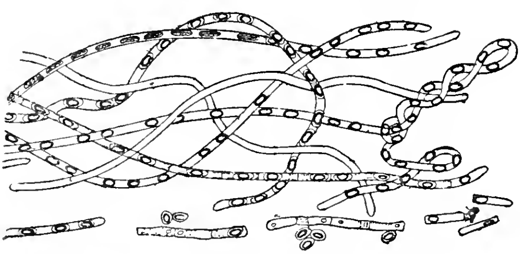


Fig. 2.—Spore-bearing filaments.

Fig. 3.—Spores.

became more and more distinct, until the whole organism was studded with minute ovoid bodies, like peas within their shell. After a time the integument fell to pieces, the place of each rod being taken by a long row of seeds or spores. Koch concluded that these spores, as distinguished from the rods, constituted the contagium of the disease in its most deadly and persistent form.

By inoculating animals with the fresh blood of an animal suffering from splenic fever, he found that they invariably died within twenty to thirty hours after inoculation. By drying the infectious blood containing the rod-like organisms, in which, however, the spores were not developed, he found the contagion to be fugitive, maintaining its power of infection for five weeks at the furthest. He then dried the blood containing the fully-developed spores, and exposed it to a variety of conditions. He permitted the dried blood to assume the form of dust, wetted this dust, allowed it to dry again, placed it for an indefinite period in the midst of putrefying matter, and subjected it to other tests. After keeping this spore-charged blood, which had been treated in this fashion for four years, he inoculated a number of mice with it, and found its action as fatal as that of blood fresh drawn from the veins of an animal suffering from splenic fever, each spore in the millions contained in the diseased blood being sufficient to produce the disease.

The bacilli are not always found in the blood of living animals suffering from the disease; indeed, they generally appear a few hours before death (which seldom takes place in less than twenty hours), and then only singly and in very small numbers. Even after death they cannot always be found in the blood, but always in the spleen. Their number, however, varies with the animal inoculated; in the guinea-pig they are numerous, sometimes exceeding the blood corpuscles; in the rabbit much smaller, and in the mouse often absent altogether. If the disease has been induced by inoculation, they are present, though in variable numbers, in the inoculation carbuncle. Though the rods are not always found in the blood, the spores are said to be invariably present, and some assert that it is their product that destroys life.

The bacilli rods, as found in the blood and spleen, vary in length very considerably, those in the spleen being longer, the shortest rods being in length generally about twice the diameter of a human red corpuscle, the longer ones two or three times the length of the shorter; but when carefully examined, the latter will be seen in a process of division into two or more segments. According to the observations of Koch, it appears that, whatever be the species of animal inoculated with anthrax blood, and no matter how many successive inoculations may be made, the *bacilli* multiply solely by fission, but only so long as the animal is alive; when dead a minute portion of its blood, placed in aqueous humour, and kept at a temperature of 35° to 37° C. (95° F.), the rods, as already stated, lengthen out very considerably. This process of lengthening of the rods into filaments is apparently effected by the temperature. In five hours a rod at a temperature of 32° C. (89°·36 F.) may have increased so as to be from eighty to one hundred times its original length, and in twenty-four hours the filament may be full of spores. If the temperature, however, be kept about 28° C. (82°·24 F.), the spores may not appear till the thirty-sixth or fortieth hour. When the spores have once appeared, all the other changes go on at ordinary temperatures from 12° (53°·36 F.) to 18° C. (64°·24 F.), but not nearly so rapidly, even when the preparation is kept in the sun for a few hours daily, as when artificial heat is applied. On the other hand, a high temperature, 37° to 40° C. (98°·36 to 104° F.), at once checks all developmental changes.

The filaments differ in cultivated specimens very much in their arrangements. Sometimes they form a network—indeed a mycelium—made up of numerous, nearly parallel, unbranched threads, crossing each other at different levels; the threads are sometimes straight, but have generally a wavy outline. This condition may obtain throughout the whole preparation, but generally at some parts the filaments are extremely irregular and much convoluted.

It has been stated by several observers (Koch, Bollinger, Siedamgrotzky, &c.) that the bacilli are always motionless; Dr Cossar Ewart says they are sometimes motile, but this requires confirmation.

Pasteur stated that the spores of bacilli remained toxic after boiling; and after being subjected to a pressure of twelve atmospheres of oxygen, Dr Burdon Sanderson and Dr Cossar Ewart tested the accuracy of this statement, and found that mice inoculated with the boiled and compressed solutions remained quite well.

The experiments of Bert, however, support to some extent the conclusions of Pasteur. In a series of experiments Bert submitted anthrax blood to the action of considerably compressed oxygen, and found the bacilli had disappeared, killed by the oxygen, and yet the blood retained its virulence, for it killed rabbits, guinea-pigs, and dogs inoculated with it; and in another series of experiments Bert took anthrax blood containing bacilli, and added drop by drop of absolute alcohol to it, until a precipitate was formed, and which was dried in vacuum. This dried powder was injected under the skin, and it killed a rabbit, a guinea-pig, and even a dog.

If this alcoholised precipitate be dissolved in water and filtered, the filtrate is still virulent. If alcohol is again added to it, it forms a flocculent matter, which is deposited at the bottom of the vessel. Collected on a filter and dried, this precipitate is still toxic. If would therefore appear that the active or virulent element of anthrax resists absolute alcohol, and that it resists oxygen, and that it is precipitated by alcohol and soluble in water. It behaves itself something like diastase, except that, whatever may be its nature, it can reproduce itself to an indefinite extent; while it is asserted by some authorities that diastase cannot reproduce itself.

Putting aside the conclusions of Colin—that the bacilli are simple transformation of the blood-corpuscles—we are left between two sets of conclusions. Those of Koch and others point to splenic fever being due to a minute organism possessing wonderful powers of resistance and reproduction; Bert's to something independent of the presence or absence of animal or vegetable organisms, and which resists the action of compressed oxygen and absolute alcohol, which would, he asserts, kill everything possessing life: this something he is of opinion is a substance analogous to diastase.

Blood containing bacilli, if dried in very thin layers, by being exposed to the air in a shady place, was found by Koch to lose its virulence and its power of developing elongated fibres after twelve to thirty hours. Thicker layers retained their powers for two or three weeks; and some still thicker for four or five weeks. After a longer time they were never capable of producing the disease.

Koch also found that if the bacilli were deprived of air they soon died.

When rubbed up with the blood or aqueous or vitreous humour of an ox, and placed in a well-closed glass vessel, there quickly ensued an odour of putrefaction; the bacilli disappeared after twenty-four hours without the fibres enlarging, and lost their infective power. That their death was due to the absence of oxygen was shown by placing a drop of blood infected by the bacilli under the microscope. Examined by the micro-spectroscope it gave the bands of oxy-hæmoglobulin; the fibres in this drop increased four or five times in length in three hours, but after that time the oxygen was clearly used up, as the presence of the absorption band of reduced hæmoglobulin proved. From this moment the growth of the bacillar fibres ceased, although true putrefaction had not set in.

When the spores and bacilli are separated from the blood by filtration, the blood is said to be rendered innocuous; and when pregnant animals become affected, or have been inoculated, the blood of the fœtus does not become diseased, and other creatures can be inoculated with it and suffer no harm, the intervening membranes acting the part of a filter. The bacilli also disappear in liquids in the presence of carbonic acid, and the blood soon loses its specific property.

This proves that, to live and grow, the bacilli require to absorb oxygen and give out carbonic acid: hence they are what M. Pasteur terms "aërobic." If the fluid which contains them begins to putrefy they are destroyed, not only by being deprived of oxygen, but by being brought into contact with other organisms, such as the vibrios of putrefaction, in the presence of which, and of all other low forms of organisms, they either do not develop at all, or develop with great difficulty. The vibrios of putrefaction are not aërobic, and cease to move when brought in contact with oxygen; disappear, being transformed into refracting corpuscles, which in a suitable soil reproduce motile vibrios and multiply with extreme rapidity in a putrefying fluid. If an animal be inoculated with it when in this condition, it does not die of anthrax, but of septicæmia, the symptoms of which, when produced in guinea-pigs with the blood of a horse which had been dead of charbon twenty-four hours, and which contained vibrios of putrefaction as well as some bacilli, and with the blood of a cow which had been dead forty-eight hours, and which contained a preponderating quantity of vibrios, were violent inflammation of all the muscles of the abdomen and limbs, and here and there, especially on the ears, bullæ formed containing gas. The blood was diffluent, and on examining these animals immediately after death, M. Pasteur found that the muscles were filled with active vibrios of putrefaction, and in the peritoneal cavity they had undergone extraordinary development; one drop of this serosity taken from an animal still living, affected another animal profoundly, while a drop of blood from the heart had no effect.

Again, dilution of the fluid containing the bacilli with a moderate amount of water has no effect on its virulence, but a large quantity destroys it, and traces of carbolic acid prevent the development of the bacilli.

It has been stated that the bacilli destroy life—(1) by acting as asphyxiants, depriving the blood of its oxygen; and (2) by mechanically obstructing the blood-vessels. Against both these theories must be placed the fact that they are very few in number, indeed often absent altogether in the blood during life.

Anthrax is not transmitted by infection from one animal to another, for animals kept in the closest proximity to diseased ones, and placed under the most favourable conditions for infection through the air, do not become diseased.

Mice and rabbits seem capable of eating food containing bacilli with impunity, and flies can gorge themselves with the infected blood and suffer no harm; but horses, cattle, pigs, dogs, cats, and ferrets succumb after partaking of food and water contaminated with the virus.

The local effects of inoculation of the skin with anthrax blood are as follows:—In twenty-four hours there is redness of the spot, with heat, swelling of the skin and subcutaneous tissue, extending from a third of an inch to an inch in depth.

The swelling increases in forty-eight hours to perhaps two inches, and on the third day, if the animal survive, to several inches; the heat and redness being most intense at the inoculated spot. The process extends in the connective tissue, particularly along the track of the lymphatics. In superficial inoculations bacilli can be seen in every instance in twenty-four hours, at a distance only of about one-fourth of an inch, but their after extension is not proportionate to the extent of the tumefaction, nor does the serum found in the swelling contain many of them until after forty-eight hours, when great quantities will be found in it; when the virus is injected into the subcutaneous tissue death may occur without bacilli being found at the point of injection.

The production of the disease by inoculation, particularly with cultivated spores, is a strong proof in its favour; but, on the other hand, there exists the fact that the disease is often produced by over-feeding, even on food of good quality, unless indeed it can be proved that the spores or bacilli are contained in the food or atmosphere; but at the same time it must not be forgotten that the bacilli are seemingly not present until the disease has made considerable progress, until in fact the animal is at the point of death, when its temperature is considerably diminished; that (according to Dr Cossar Ewart) the development of the bacilli is at once checked by a temperature of from 37° to 40° C. (96°·36 to 104° F., the natural temperature of the ox being about 102° F.); and judging by the results of the experiments of Bert, and having knowledge of a remarkable outbreak amongst calves which had never tasted any food but what milk they sucked, the dams being healthy, one is forced to the conclusion that the disease is due to a virus which renders the blood a fit habitat for this peculiar organism, between the spores of which and the virus there seems to be an almost indestructible affinity.

The process by which a virus is developed may be analogous to what takes place in the conversion of grape sugar into alcohol and carbonic acid.

Here we have, first of all, a solution of an organic compound—sugar—$C_6H_{12}O_6$; and, second, a vegetable organism—the yeast plant—which, when added to the solution of sugar, reproduces itself, grows, develops new generations, and during this generative or reproductive process alters the constitution of the saccharine solution, converting it into alcohol, C_2H_6O, and carbonic acid, CO_2.

The same may be said of the action of microbes on animal fluids—that by reproducing themselves they change the nature of the blood, converting it into a material unfit to maintain life.

Inoculation for the Prevention of Anthrax.

Few investigations, marking as they do an epoch in pathological science, have had more immediate and practical results than these of Pasteur, Toussaint, Chauveau, Koch, Klebs, on anthrax; of Toussaint on fowl cholera; and of Arloing, Cornevin, and Thomas, on symptomatic anthrax, or black quarter. The experiments of Pasteur, now very widely known, are to some extent the outcome of the experiments of Dr Burdon Sanderson, Mr Duguid, and afterwards of Dr Greenfield, conducted at the Brown Institution, London. In 1878 it was discovered by Dr Burdon Sanderson and Mr Duguid that cattle might be inoculated with splenic fever from a guinea-pig, and though such inoculation caused the development of serious symptoms, the animals did not die; and in continuing these experiments it was found that cattle once so inoculated resisted the results of further inoculation,—that, in fact, they could be thus rendered insusceptible to future attacks of splenic fever. Dr Greenfield, in making a series of experiments with the view of obtaining a suitable virus for inoculation, found that the virus modified by transmission through the guinea-pig, and cultivated under particular conditions, gradually lost its activity, and at last became practically inert; and it occurred to him that, by making use of this fact, a virus might be obtained so far modified as to be sufficient to ensure protection, and yet not endanger the life of an animal inoculated with it, and this he found could be done with success.

The priority of this discovery is therefore claimed for England, but the merit of working out its details is undoubtedly due to Pasteur.

Anthrax in the Horse.

Anthrax in the horse rarely occurs in this country, but is prevalent in India, where it is said to attack the elephant as well as other animals, and is there termed "Loodiana Disease," and in Africa the "Horse Sickness."

Symptoms.—I. *Without External Eruption.*—The animal may appear dull, walking with a heavy, feeble step, then fall prostrate in a state of somnolence; if it be standing, the head hangs down, resting on the manger or other solid body. It sometimes stands back in the stall, resting the body on the side, and finally becomes restive, stamps with the feet, looks to the sides and flanks, and shows other signs of colic.

If the disease comes on whilst the animal is at work, added to the above symptoms there is extreme lassitude, great weakness of the lumbar muscles and posterior extremities, with staggering gait. The skin has lost its suppleness, is hot, and slightly crepitates on the back, over the kidneys, and sides; the coat is rough and bristly in some parts; and there are partial or general tremblings of the muscles, and flow of saliva from the mouth. There are sweats, alternating from hot to cold. At the base of the ears and behind the elbows, the veins become augmented in volume. Above all, the lymphatic ganglia of the groin are swollen; and if the horse be entire, the testicles move rapidly up and down. Great excitement now sets in, the animal is irritable and timorous, and afterwards becomes unconscious of all around. The conjunctivæ are yellow or reddish-yellow; and sometimes petechial spots are present on the visible mucous membranes.

The pulse is small and thready; the beatings of the heart are, however, strong, and are accompanied by a metallic tinkle. The respiration is often irregular, and often associated with roaring.

These symptoms may insensibly disappear, or may be succeeded by a critical eruption. At other times, even after the animal has seemed to rally, aggravation of the symptoms takes place. The animal grinds its teeth, has violent colic, rolls about, carrying its head to its flanks; the muscles of the head and neck are agitated by convulsive movements; the eyes are haggard and wandering; the mucous membrane injected, and of a brown or red tinge; the heart beats with extreme violence, very irregularly, and accompanied by a strong metallic sound; the pulse is trembling or double, and very small; the respirations tumultuous and agitated; the nostrils dilated, and clots of yellow serosity and blood escape by the nose; the mouth is filled with a mucous foam; the tongue is tumefied, and of a deep bluish-red colour; tears, sometimes tinged with blood, flow from the sunken and haggard eyes. The belly is sensitive when pressed upon, tympanitic, and the excremental matters are often liquid and mixed with blood clots; the rectum is often everted, appearing as a tumour, folded and livid; the temperature of the skin is lowered; the countenance is particularly anxious, the face shrunken. The muscular force now becomes exhausted; the animal falls to the ground; convulsions come on, more particularly of the neck and extremities; and finally it succumbs, after a few moments of calmness, which, succeeding a paroxysm, always precedes death. The disease may terminate in from six to forty-eight hours after the manifestation of the first symptoms. The ordinary time is from twelve to twenty-four hours, unless external eruption eliminates the morbid material from the body.

In the spring of this year, 1884, a remarkable outbreak of charbonous fever, presenting the salient symptoms of Loodiana disease, occurred in a large stud of cart-horses under the care of Messrs Leather, veterinary surgeons, Liverpool, and which had been, for some time previously, fed on an Indian pea (*Pisum sativum*), called in Liverpool, Indian mutters. *Mutur* is the Hindustani word for the common pea (*Pisum sativum*), but that brought to Liverpool is different from the ordinary pea of this country, and resembles a lentil more than a pea. It is imported into Glasgow from India in large quantities, I believe, mostly as ballast, and has, I am told, not only been given to horses, but ground and mixed with various cakes for cattle, and with many fatal consequences.

However, in the outbreak at Liverpool, it appears that horses commenced to die very suddenly some time after the owners had commenced to use the mutters, and for several weeks after they had discontinued to use them they still died. The symptoms were roaring, hæmorrhage from the nose, great prostration, swelling of the throat, succeeded in many cases by sudden death. Other horses, however, lived a considerable period; but none recovered in which roaring had become pronounced.

I saw them in March, and found two dead on my arrival—one having only been dead a few hours; and from the blood of which I obtained the bacilli shown in the drawing.

On examining the food everything was found to be of the best and cleanest quality; but the Indian mutters were very dirty, dusty, and mixed with the excrement of rats: and from this dust bacilli identical with those found in the blood were cultivated; but in no instance did I succeed in obtaining bacilli from the interior of the grain. From this it may be inferred that the microbes were in the dirt surrounding the grain, but not in the mutters themselves, and that by proper washing and cleaning they might be a safe diet.

This, however, requires further investigation, as animals have died on the Continent presenting similar symptoms to those at Liverpool after being fed on the legumen *Lathyrus sativus*, a bitter legumen, but whether from a vegetable poison contained in the legumen or from bacillar growths has not yet been determined.

Leguminous plants are often provided with small tuberous roots, and in these roots there occur almost invariably, and in great numbers, peculiar rod-like structures which have been identified as bacteria. Woronin, for example, in 1866, examined the root tubers of *Lupinus mutabilus*, and found the rod-like bacteria present in considerable numbers. Eriksson investigated the matter further in 1874, and found in the tubers long tubular structures, which he considered to be the hyphæ of a fungus; and he described the bacteria described by Woronin as nothing but detached parts of the hyphæ.

FIG. 4.—● Blood corpuscles. | Bacilli of various lengths, but about $\frac{1}{20000}$ inch in diameter. These bacilli seem to differ from those of splenic fever, being rather smaller in diameter, and, so far as my observations go, multiply by fission only, not developing spores. This, however, requires confirmation. × 400.

The tubers themselves in which these hyphæ and bacteria occur have been considered by some as diseased outgrowths caused by the pressure of the fungi, but others have regarded them as peculiar modifications of adventitious roots, in which the fungi have taken up their abode. Water culture experiments have been made to determine whether these tuberous growths are caused by the fungus or not, and it was found that plants (red clover being selected) growing in solutions rich in nitrogenous substances developed little or none of the tuberous growths, whereas those growing in solutions containing the least amount of nitrogenous matters developed numerous tubers. Whether these tubers were developed or not, the bacteria were still present. Whether we look upon the tubers as normal outgrowths or pathological phenomena, we are forced to the conclusion, from the history, invasion, and progress of the disease in animals, that the bacteria, whether existent in the plants, or merely contained, as we suppose, in the dust, have some connection with the disease. This, however, as well as the disease induced by eating lupin, prevailing on the Continent, is well worthy of further consideration.

II. *With External Eruptions.*—In the case of charbonous fever, often at its commencement, the first observable signs are tumours on the surface of the body. There tumours serve as a base to all the divisions and subdivisions of charbon, following their form, volume, situation; the degree of virulence of the accompanying fever; the resistance which they oppose to therapeutics; and finally, the physically morbid character which they present. They are thus divided into essential, symptomatic, benign and malign.

Seat and Anatomical Character of the Tumours—Butons (*Buboes*).—They are developed principally in the subcutaneous areolar tissues, in those parts of the body where it is loose and abundant, as well as in the lymphatic glands and muscular tissue.

The development of these tumours is signalised by heat of the skin, standing out of the hairs, and often by slight crepitation in the areolar tissue when the skin is thick. At the beginning they feel as nodosities placed in the areolar tissue. Each nodosity is about the size of a walnut, simple or compound in structure, round or irregular in form, and adhering to a pedicle at its base. They are painful, and the sensibility of the surrounding tissue is increased. When touched by the hand, a local shivering like a subcutaneous beating is felt; this character is special to charbon.

The phenomenon of crepitation arises from the affected tissue evolving gas; this constitutes crepitant and emphysematous charbon, and when emphysema occurs the tissues lose their sensibility, for on plunging a lancet into them the animal does not evince any pain. The liberated gas is fœtid, and a brownish or black fluid escapes through the lancet puncture. This fluid corrodes and depilates the skin.

Engorged Tumours.—These tumours are uniform; the skin by which they are covered is tense, cold to the touch, crepitant, and emphysematous; they exist on the back, sides, and quarters, and may extend and embrace the walls of the abdomen, sheath, or mammary gland, perineum, vulva, or penis, anus; but they generally affect the head, and extend downwards, even to the chest, and as they increase the animal may bleed from the nose, show signs of suffocation, and if not speedily relieved death ensues in a very short time. The swelling of the head is a prominent symptom of the disease as seen in India.

Glosso-Anthrax.—On the surfaces of the mucous membranes, as the tongue, or inside of the lips, when tumours exist, phlyctenæ are sometimes seen, varying in size from that of a nut to a hen's egg, constituting a softened mass filled with a sero-albuminous liquid of a brown or yellow colour, corrosive and acrid, destroying the tissue which surrounds it, and causing the formation of ulcers.

These phlyctenæ ordinarily form some hours before death; they are simple or multiple, of a yellow-grey colour, resting on the surface of the mucous membrane; and their formation coincides with tumefaction of the surrounding tissues. The tongue then swells and hangs out of the mouth, becomes of a bluish or mulberry colour, and when the vesicles on its surface are broken by its movements, ulcers form with a red centre and a black circumference, discharging ichorous liquid mixed with saliva and blood. The swelling may extend to the base of the tongue, to the parotid region, and the animal may die of suffocation.

In animals which have white skins, or in which the eruption takes place in parts of the body void of hair or wool, red, brown, violet, or mulberry spots of bloody effusion are seen. These spots are independent of the tumours and extravasations, and sometimes exist on the surface of the tumours. They are most commonly seen in the pig and sheep.

Enchymoses are seen on the visible mucous membranes. When the fever progresses slowly these spots unite by confluence, and surround, notably in the pig and sheep, the whole body. Some of them become crepitous and emphysematous; others take the form of tumours, passing rapidly to the state of gangrene. In addition to these eruptions; there is often a soreness and swelling of the throat, infiltration of the upper end of the trachea, and a discharge of a lymph-like material from the nostrils.

Charbonous tumours are generally of a black-brown colour. The phlyctenæ are filled with a brown liquid, which is very irritating; it sweats on the surface as drops of cold serosity. The tumours have little tendency to suppuration, and speedily become gangrenous. If these symptoms are added to those furnished by the mucous membranes, no difficulty need be felt in diagnosing charbonous tumours, phlegmonous and gangrenous.

Terminations.—When the tumours resist mortification, they terminate by delitescence, by suppuration, and by metastasis.

1. *Delitescence.*—The morbid products are effused, and constitute tumours, which are reabsorbed and expelled by the excretory organs. Examples of this kind of termination have been observed by veterinarians in Africa.

2. *Suppuration.*—When the tumours progress in a slow manner, indurating gradually, suppuration may be brought about by therapeutic and surgical means. Resolution is slowly induced, and it is not without pain that the necessary suppura-

tion can be provoked. The animals remain poor and unthrifty, and often in the horse glanders and farcy conclude this morbid state.

3. *Metastasis.*—The amelioration of the symptoms which succeed the development of tumours is not often lasting. The products are reabsorbed and carried anew into the circulation. This unhappy crisis is announced by the reappearance of all the symptoms proper to charbonous fever; their succession is so rapid that death may take place in from eight to ten hours.

Symptoms of Anthrax Fever in Horned Cattle, Apoplectic Anthrax, Splenic Apoplexy, Splenic Fever.

The symptoms in the ox are very analogous to those in the horse. The ox suddenly goes off its feed; rumination is suspended; there are rigors and tremblings; partial sweats bedew the body, which is alternately hot and cold. The dorso-lumbar region is excessively tender to pressure, and when it is the seat of the tumour, very acute pain is thus caused; the gait becomes staggering, and the animal rapidly exhausted. A recumbent posture is almost constantly maintained; the animal will now and then attempt to rise, but will rarely succeed in doing so. When standing, the back is arched, the legs stiff and rigid, but the standing posture is not long maintained. The animal looks towards its flank, falls into convulsions, and expels without much effort soft and bloody matter by the anus. The heart beats with violence against the thoracic walls; the pulse is small, rapid, irregular, intermittent, and sometimes double; the conjunctivæ red, injected, and reflect a blackish-red tint; the respiration is panting and plaintive; there is tympanitis of the abdomen; the tongue is bluish-red, and the mouth filled with mucus; blood escapes from the nose; the eyes are sunk in their orbits, and tears flow over the cheeks. The areolar tissue of the back and sides becomes crepitous to the touch, and the animal dies during a convulsive exacerbation, or during the succeeding calmness. In some animals the excitement is so great that it is dangerous to go near them. The rapidity with which the symptoms succeed each other is variable, death taking place in the space of from a few minutes to twenty hours.

In cattle above two years old, particularly milch cows, the local lesions are often confined to great congestion of the spleen, and to a lesser extent of the liver and mucous membrane of the intestinal canal. In other, but rarer instances, the engorgement may be in the lungs, and should the animal survive for some days, decomposition of the extravasated blood is established, as expressed by fœtor of the breath; the decomposed extravasated blood being absorbed into the circulation, causing death by septicæmia. I have also seen this condition in a sucking calf.

In true splenic apoplexy the spleen is often much enlarged, broken down in structure, and its capsule distended with a mass of tar-like blood. If one end of the organ be elevated, it will be seen that the blood will gravitate into the most dependent part, showing that the splenic tissue is disintegrated, and that the blood is more or less fluid.

Death from splenic fever is very sudden; in many instances an animal seen a few hours before apparently in good health is found dead, death having apparently occurred without a struggle. If, however, the disease is not so rapid in its course, it may be noticed that there are various alternations in the symptoms; in some instances an animal will be unwell for several days, suffering from a remittent fever; one day very ill, with rapid, feeble pulse, hurried and painful breathing, red and injected eyes, hot mouth, irregularity of the bowels, and redness of the urine. After continuing for some hours these symptoms may subside, and the animal commence to eat and ruminate. The febrile symptoms, however, often return, and in the end the sufferer too often succumbs.

In another form of anthrax without external tumours, the most prominent sign, in addition to the general disturbance, is the passage from the bowels of quantities of dark-coloured blood; and the disease is then denominated *enteric* or *abdominal charbon*, the *post-mortem* characteristics being congestion of the intestinal mucous membrane, more particularly of the small intestines, which are covered with petechial spots, with incipient ulceration in their centres, extravasation of dark-coloured blood into the canal, and very often extravasations into the sublumbar areolar tissue; the fatty mass surrounding the kidneys being loaded with extravasated blood, in a disintegrated, broken-down, tarry, semi-fluid condition, or covered with petechiæ.

GENERAL SHOW OF THE HIGHLAND AND AGRICULTURAL SOCIETY, HELD AT PERTH IN 1887.

THE sixtieth Show of the Society took place at Perth on the 26th, 27th, 28th, and 29th July. The Society had met at Perth on six previous occasions, namely, in 1829, 1836, 1852, 1861, 1871, and 1879.

At an Emergency Meeting of the Directors held on the 29th June, it was resolved, owing to pleuro-pneumonia, that cattle should be excluded from the Show. In all other respects the arrangements were as nearly as possible the same as at Dumfries in 1886.

The General Meeting of Members was held in the Showyard on the afternoon of Wednesday, and the public banquet took place the same evening. The Earl of Elgin, senior Vice-President, occupied the chair on both occasions, in the unavoidable absence of the Duke of Athole, K.T., the President.

The following remarks regarding the stock are taken from the notes of the Judges:—

Horses.

Stallions and Entire Colts.—Of the stallions foaled before 1st January 1884, a much better lot has been seen at the Society's meetings. The three-year old class was good; the first prize animal was the best animal in all the sections. The two-year olds were also a good class. The yearling colts were all of the best quality, the first prize animal being of extra good quality.

Mares, Fillies, &c.—Mares with foals at foot were a good lot of very superior animals. The first prize was easily taken by "Moss Rose," who is now laden with more trophies of victory than any living Clydesdale. She again also secured very easily the champion prize for the best female exhibited; she combines great size, strength, and substance, with excellent quality. She has this year at foot a very promising foal by Garnet Cross. She was followed by "Crystal," a mare of extra quality, though of less weight than the first. The third and fourth mares were good, but neither of them looked quite in bloom. The other mares exhibited were all good animals. The next section, mares in foal, was the weakest of the female classes; still it contained a number of stylish mares. The first prize animal, "Lady Macbeth," was shown in better bloom than the others, and is a mare of much style of body. The second was a little out of bloom, but she is a nice low-set mare, with good action. The third is the biggest mare of the three, but she is rather wanting in bone. The three-year old fillies were a grand even class. The first prize grey mare may probably yet develop into a very prominent mare. The second, a roan, half-sister to the first, is a compact mare; and the third, fourth, and fifth prizes were taken by most promising fillies. The two-year olds formed a strong class. "Pandora" by Darnley easily secured the first ticket; she is a filly with an unbeaten two-year old record, and she is possessed of great size, substance, and quality. Two heavy fillies by Lord Erskine, of good quality, were second and third, and the fourth and fifth places were taken by daughters of Topgallant. One-year old fillies were a good class, and here "Vanora" proved a clear first. She, and also the second prize filly, are by Darnley; another Darnley filly, which was first at the late Royal Show, was third. The fourth and fifth, by St Lawrence and Lord Erskine, are good animals. The classes for geldings only produced one animal of fair quality. Unfortunately, the prize for mare and descendants only brought out one group, but it was an interesting feature of the Show. It consisted of "Young Darling," with the fifth prize brood mare, the champion stallion "Cairnbrogie Stamp," and a foal by the latter. Much as the stallion was admired when being judged in his own classes, it is probable that his value as a breeder was most enhanced in the opinion of strangers when he was seen alongside of his dam Young Darling. The contest for the best five two-year-olds or one-year olds off one stallion consisted of two lots by Darnley and Lord Erskine. Both groups were excellent, but after much care the six Judges decided in favour of the Darnley group, which consisted of the first prize two-year-old filly, the first and second prize yearling fillies, the second prize two-year old colt, and the fourth prize one-year old. The Lord Erkine's consisted of the first and third prize two-year old colts, the fifth prize year-old colt, and the second and third prize two-year old fillies. The contest was keen and close, but the great quality and uniformity of the three Darnley fillies carried away the award.

Hunters, Roadsters, and Ponies.—The show of hunters, roadsters, and ponies was not up to the average. Although several animals of great merit were shown, these were quite exceptional, and the entries were not large. Considering the fairly liberal prizes offered, it is to be regretted that owners in the district where the Show is held, and members generally, do not support the Society to a greater extent by sending their horses for exhibition.

Sheep.

Blackfaced.—The show of blackfaced sheep was one of surpassing excellence. Never at any time has there been such a large collection of first-class animals of the breed seen at any Show. In some of the sections the competition was so keen, and the quality of the exhibits so nearly matched, that it took a great deal of labour and discrimination on the part of the Judges before they could give their decisions. Nearly all the breeders who have done most to improve this hardy and important breed of sheep had entries, and it must have been very gratifying to them to see the immense improvement which has been wrought by their skill and exertions. Where all the animals were so good, it might not be necessary to make special mention of any individual sheep, but the great excellence, hardy appearance and substance of the aged tup which was awarded the cup, entitles him to more than a passing notice.

If sheep farmers would only breed from animals of his form, there would not be so many complaints of the excessive mortality which we have at present after a severe winter.

Cheviot.—The show of aged tups was not up to the average quality of former exhibitions. The shearling tups were also not up to the average quality of previous years, except the first prize sheep, which was an exceptionally good one, and a very good specimen of the breed. The ewes were a fair class, but scarcely up to former years. Gimmers, or shearling ewes, were good, and quite up to former exhibitions.

Border Leicester.—There was a good average show of this breed. In the section for aged tups there were several absentees. Those ticketed, although somewhat different in type, were good specimens of the breed. The shearling tups were, however, a long way the best exhibition, the first and second prize sheep being of great merit; and many of the unplaced tups showed good breeding in their heads, bone, and wool, but were defective in balance of frame and evenness of flesh. There were only two entries of ewes, but the sheep were superior. Gimmers were a good show, the placed pens being well-formed, true-boned animals.

Long-woolled other than Border Leicester.—There were only two entries under this class, and the animals were under average merit.

Shropshire.—The Judges were agreeably surprised to find the Shropshire sheep so good. The aged tup section contained some very good animals of good Shropshire character. The section for shearling tups, although containing some fine sheep, was deficient in character. The ewe sections were very good, and the first prize shearling pen especially so.

Short-woolled other than Shropshire.—The show of short-woolled sheep other than Shropshire was a small one, and was limited to eight entries of Oxford Downs in the four sections.

Swine.

In the large breed boars and sows were a small class, but very good. The pigs under 8 months were also a small section, but very fair. In black or Berkshire breed boars were a small section, but very good. The sows were a large section, and most select, not an inferior animal amongst them. The small breed boars, sows, and pigs were short in number, but good.

Poultry.

The show of poultry, although larger than in some previous years, was not quite satisfactory to the Judge. The provision of so many classes for varieties that are not kept in great numbers, to the exclusion of those breeds that are more numerous, is to a great extent the cause, while the addition of a few sectional specials also would serve in a great degree to induce entries from across the border. In no part of the United Kingdom can such a display of that grand original variety of the Dorking (the silver greys) be found, and it is cheering to find that, as in this, so all through the Show the most useful and productive varieties were present in the greatest numbers. Some of the most perfect birds it has ever been our lot to see were present in this case, although in some cases birds of the most prepossessing appearance proved crooked-breasted on handling, a defect that points to a weakly or defective constitution, and one to be avoided by breeders. The young stock were quite equal, if not superior to, the old. The coloured Dorkings were also good, but not equal to the silver. Some good Cochin Chinas were on exhibition in old birds, but many, otherwise best, were very much out of feather. The Bramahpootras were very good in all classes. The Scotch Greys were but moderate, while the Hamburgs, Spanish, and Bantams were little better than failures. In the variety class some excellent Plymouth Rocks turned up, this being a breed of the most beneficial kind on a farm at once very hardy, capital layers, and excellent table fowls; we would strongly recommend them. The aquatic section was almost the best in the Show, the Rouen and Aylesbury ducks being especially large and good, though many were deep in moult. The geese were so good that extra prizes were recommended to the consideration of the Council. Turkeys were another capital section, the exhibits being equal to those of any of the best English Shows, and in much greater numbers for a summer Show. The arrangements, protection, feeding, and attention to the exhibits were about perfect, and ought to command the greatest confidence on the part of Exhibitors and Judge.

Butter.

The day was very warm, and every precaution was taken to protect the numerous exhibits of butter from injurious effects. The butter on the ground comprised three classes—fresh, powdered, and cured. Many of the exhibitors had taken advantage of using ice, so that their samples came forward in fine cool and firm condition; but whilst this method has the effect of firming, it cannot be said that it assists in judging, for it causes the flavour of the butter to present rather a negative character. The finest samples of full-cream well-wrought powdered butter were those free of ice or its effects. The cured butter shown was very poor, and dairy farmers in this country have much to learn yet in this respect. All the curing in the world will never make bad butter good, so thus only the purest and healthiest of butter is worth the care and trouble of curing, not with rough salt, but with a strong and pure pickle or very fine salt. In the show-room were also exhibited two Scotch Cheddars, made a year previous at Dumfries Show, and one Cheddar Dunlop. They were in fine order, and reflected credit on those who had kept them.

Working Dairy.

The working dairy was, as formerly, a great attraction at the Show. It was managed as formerly, but on this occasion a dairyman from the Aylesbury Dairy Company was engaged to work the centrifugal separator and to make some of the butter. A Jersey creamer was used, and though a shed in a showyard is not a very suitable place for butter-making, very fair butter was made both from the separated cream and the Jersey creamer, though there was no doubt the butter made from the Jersey cream was the best. The cheese-making was carried on by Mr R. J. Drummond, the instructor in Ayrshire, and was most satisfactorily conducted. As usual, the demand for strawberries and cream and for separated milk was very large.

Implements.

1. *Weighing Machines.*—The Judges reported,—Having examined and tested the cart and cattle weighing machines exhibited by Messrs Henry Pooley and Son, Albion Works, M'Alpine Street, Glasgow, recommend that they be awarded a premium of £10 for the cart and cattle weighing machines No. 1321 and No. 1323, entered for competition. They suggested that the cattle cage for No. 1323 should be increased in length 12 inches, to give sufficient space for cattle. The small size of machine the Judges considered suitable for ordinary farm purposes. The larger machine, No. 1321, might be advantageous on large holdings or where lorries are in use.

2. *Sanitary Appliances.*—The Judges also examined the sanitary appliances exhibited by Messrs Ben. Reid and Co., Aberdeen, for competition. The pump exhibited, No. 525, would be useful where heavy liquid matter has to be removed, it being simple in construction, effective, and cheap, and recommend that a premium of £2 be awarded to them for the pump No. 525.

Bee Husbandry.

The Caledonian Apiarian Society held their fourteenth exhibition of honey, hives, and bees in connection with the Highland and Agricultural Society's Show at Perth. The exhibits were as numerous as on former years, and were of an exceptionally high quality. An attractive feature of the exhibitions was the very fine designs worked by the bees in honeycomb, which called forth the admiration of the visitors. There were several of them appropriate to the jubilee year, such as—"God save our Queen, 1837–1887," crowns, and other devices. There was a very large collection of bee furniture, showing the latest improvements in hives and appliances, which was explained by the members to numerous inquirers. The observatory hives and the manipulating with the bees were as usual sources of much interest and wonder to the visitors.

The Exhibitions consisted of the following entries in the different classes:—

HORSES.

	Stallions.	Entire Colts.	Mares.	Fillies.	Geldings.	Total.
Agricultural horses, . .	11	79	27	57	3	177
Hunters and roadsters, . .	...	...	14	...	21	35
Ponies, ...	4	...	5	...	6	15
Shetland ponies, . . .	5	...	3	...	1	9
Thoroughbred, . . .	1	...	...	...	...	1
Hackney, ...	1	...	...	...	...	1
Norfolk cob, ...	...	...	1	...	...	1
Total, . . .	22	79	50	57	31	239

SHEEP.

	Tups.	Ewes.	Gimmers.	Lambs.	Wethers.	Total.
Blackfaced, ...	87	36	33	51	48	255
Cheviot, ...	41	18	30	18	6	113
Border Leicester, . . .	34	6	24	...	...	64
Long-woolled other than do., .	2	3	...	...	...	5
Shropshire, ...	28	24	24	...	...	76
Short-woolled other than do., .	5	6	3	...	...	14
Half-bred, ...	...	...	...	...	3	3
Total, . . .	197	93	114	69	57	530

Swine.

	Boars.	Sows.	Pigs.	Total.
Large breed,	1	1	...	2
Black or Berkshire breed,	5	9	4	26
Middle White breed,	2	2	6	10
Total,	8	12	10	38

Poultry, 210 entries ; Butter, 72 entries. Implements, 136 stands ; 1509 entries.

The following is a comparative view of the exhibition of stock and implements, the premiums offered, and the receipts (gate money and catalogues) of each of the seven Shows at Perth:—

Year.	Cattle.	Horses.	Sheep.	Swine.	Poultry.	Dairy Produce.	Implements.	Premiums.	Receipts.
1829	192	53	199	13	...	...	14	357	£119
1836	265	46	416	18	...	6	17	479	225
1852	313	135	662	50	186	123	339	900	926
1861	335	155	616	77	360	91	850	1500	1328
1871	376	177	684	71	301	88	1948	1600	2270
1879	383	253	470	56	200	49	2207	2629	3063
1887	...	239	530	38	210	72	1509	2372	1841

SHEEP DISEASES: THEIR CAUSES, NATURE, AND PREVENTION.

By Thomas Walley, M.R.C.V.S., Principal of the Royal (Dick) Veterinary College, Edinburgh.

In considering this subject I shall, as far as is possible, avoid technicalities and shall compress my subject into as limited a space as is compatible with its intelligent consideration.

Beginning then at the foundation, I shall deal with the *physiology of animal life* so far as it has to do with the production and prevention of disease.

The blood is the life, and the source of the blood is the alimentary matter we ingest; and if the food does not contain all the elements—and the proportion of elements too—necessary to the formation of the vital fluid life cannot be maintained.

Recognising this important, this vital fact, I shall, in the first place, endeavour to make plain the nature of this source and supporter of life; and, in the second, how its vitality is to be preserved.

The blood *is not* a *formed*, it is a *formative* tissue; it is not a simple fluid, but a highly complex one, and, like all complex matter, is very susceptible to the action of surrounding influences. It is made up of fluids and solids which bear a definite proportion to each other, and any departure, past moderate limits, from this correlation inevitably produces grave consequences.

I do not wish you to imagine that the blood is every day and every hour the same; the opposite is the fact. Probably it is never the same for even consecutive minutes of time. Now its fluid elements are in excess, then its solids. One hour it contains more saline elements than are absolutely necessary to enable it to perform its function; another it is deficient in such elements. One minute its flesh-forming constituents predominate, the next its respiratory; but all the while a certain and necessary correlation is kept up. Cross the boundary line, and health ceases to be maintained, nutrition becomes impaired, the vital elements of the cell elements of the body gain not their normal stimuli and support, and disease takes the place of health.

I have said that the blood is composed of fluids and solids. It will, perhaps, astonish a few when I say that the proportion of water in 1000 parts of blood is between 800 and 900, but this water, large as the quantity appears to the uninitiated, is absolutely necessary to preserve its normal fluidity and to enable it to circulate freely through the great streams and little rivulets of the system. As well might the farmer attempt to irrigate his pastures with mud, as the heart and arteries to circulate the blood if its volume of water were materially diminished.

Not only is this water necessary for the purpose of facilitating the distribution of the blood. it performs the office of preserving the solubility of the materials necessary for the support of the system—of preserving, in other words, these materials in the condition in which they may be absorbed and assimilated; and in order to render this solution perfect it contains certain chemical substances of an alkaline nature which possess the property in themselves of dissolving, or, more accurately speaking, of holding in solution the albuminous and fibrinous substances (*colloids*) of which the flesh (muscle) is composed. Amongst the other chemical constituents of the blood we have soluble phosphatic salts, *i.e.*, phosphate of lime and magnesia, both absolutely necessary for the building up and nourishing of the bony frame and the nerve and brain tissues. Carbonaceous material, fats (*hydrocarbons*), and starch, sugar, &c., are also important elements of the blood serum, as by them the fatty tissues are supported, and food for respiration and the production of heat by oxidation is supplied.

The so-called solids of the blood consist of little bodies, known as cells or corpuscles; and inasmuch as some of these are colour-less, while others, when in bulk, are of a red colour, they are distinguished respectively as white (leucocytes) and red cells. The former of these are the larger, and they are endowed with the power of motion in a limited degree and of actively altering their shape. The latter are much smaller and are practically devoid of the power of motion; they are believed to be the highest stage in the development of the white cells.

Both these bodies are absolutely necessary in the blood, and to the white cells is now ascribed a function which, until recently, was only suspected, viz., the function of destroying injurious organisms, such as the germs of disease—devouring them, in fact—and of removing dead matter from the tissues; they are the scavengers of the system, and are as voracious as jelly-fish, closing over the object of their attack and digesting it, or all of it that is capable of being digested, and ejecting the remainder into the blood stream. By their agency, too, the solid parts of the blood—even the red cells—are removed from the tissues when that fluid is poured out into them as the result of an injury or in consequence of disease. If, in other words, an individual is unfortunate enough to get a " black eye," these little bodies set to work, and, by breaking up and removing the red cells, upon which the colour of the bruise is dependent, they restore the damaged tissues to their original condition. Moreover, the white cells rush into the breach whenever a wound is inflicted and not only preserve the exposed tissues from the action of injurious organisms but supply all the means by which the breach is filled up.

The red cells have equally as important, and even more important, an office to fulfil. They are the means by which oxygen is carried to the tissues for the purpose of oxygenation or decarbonisation. They are, in other words, the conveyancing media of the gas (oxygen) necessary for the purpose of burning up the excess of hydrocarbons and carbohydrates, thus getting rid to a large extent of effete and injurious material, and of keeping up the animal heat. The actual agent by which their oxygen-conveying function is performed is iron, and it is upon this element also that the cells are mainly dependent for their red colour. Deficiency of iron means deficiency in oxygen, and the blood assumes a dark colour—becomes venous, instead of being a bright red or scarlet colour, as in arterial blood.

The existence of a third corpuscle is now recognised by many physiologists, but to the character and functions of this I need not allude in detail, further than to say that it is believed to be the originator of the other cells; hence it was called by Hayem a *hæmatoblast*, or blood-former.

That the blood is possessed of vitality is shown by its power, on withdrawal from the vessels, of undergoing coagulation—a process brought about not by the existence, as was once supposed, of fibrin as fibrin in the blood, but by the action of a ferment upon two substances pre-existent in that fluid, known as *fibrinogen* and *fibrinoplastin*.

The second problem we have to consider *is the means by which the vitality of the blood is maintained.*

I have already said that the source of the blood is the alimentary matter we ingest or take into our stomach and bowels in the ordinary processes of eating and drinking, and again I repeat that in order for the preservation of the equilibrium in the different constituents of the blood, the ingested matter must contain all the elements, and that too in due proportion, necessary for their supply. In other words, the food must contain a due proportion of flesh-forming matter, of heat producers, of alkaline salts (potash and soda), iron, phosphorus or phosphoric acid, magnesia and lime; with a few other elements of a less important character, such as sulphur. Before considering the effects of improper alimentation in the direction of inducing diseased processes it will be useful to glance briefly at the effects of adverse agencies on the blood itself. Looking at the blood in the light of its vast importance in the animal economy, it would seem at first sight that it ought to be a stable tissue. Nothing, however, is further from the truth than is such a supposition, as even quantitative deficiencies or excesses in its elements are sufficient to induce grave changes, both structurally (histologically) and functionally (physiologically); thus, if water is deficient in quantity the blood becomes thick, its plasticity is increased, and, as a consequence, there is a great tendency to stagnation (congestion). If water is superabundant the colloids are held in an undue state of solution, the colouring matter is dissolved out of the red cells, and the walls of these little bodies may be actually broken up or disintegrated. Not only is this the case, but, owing to the macerating process to which they are subjected, the white cells are injuriously acted upon, and the elements entering into the composition of the walls of the blood-vessels (particularly of the capillaries) become weakened, and their vitality lowered and they allow of the easy escape of serum into the tissues and cavities of the body, and thus we have produced *dropsies* (effusions). It is a well-known fact, too, that an excessive draught of cold water when the system is heated, will, particularly in man, determine an attack of *nettle-rash* solely by its effects on the blood and the glands; and more than this, repletion and congestion of important organs is frequently produced by similar causes.

The colloids (proteids) of the blood are absolutely necessary, not only for the building up of the muscular and other tissues, but for their ordinary repair, as well as for the restoration and repair of tissues destroyed or damaged by disease and injury; and any deficiency therein must be compensated—the compensation taking place at the expense of the tissues. The colloids are rapidly disintegrated or used up in all important diseases, especially fevers, hence the rapid emaciation (wasting) which is associated with and follows disease, and hence the value of giving albumen and fibrin in a readily assimilable form—as eggs and milk—in the treatment of fever.

Excessive using up of the proteid elements means not only emaciation, it means arrested growth, general debility, dropsy and often permanent impairment of the general health; degraded proteids being passed out of the system as useless material by the kidneys and not again made use of.

Great excess in these matters tends to the production of congestions and inflammations—produces, in fact, the so-called inflammatory diathesis, or a tendency to inflammation.

The heat and force producing elements, though existing only in very small proportion in normal blood, are vitally as necessary to the well-being of the system as are the proteids. If they are deficient and cannot be obtained from the food they must be got from the tissues—especially the fat—and if they cannot be obtained at all heat production ceases and life is extinguished.

Fat is the first to become absorbed and burnt up in wasting diseases, but it is followed, or perhaps sometimes preceded, by the consumption of the proteids.

Excess of carbonaceous elements in the form of fat, produces debility and interferes with the vital activity of the cells of the body, as well as predisposes to stagnation. Moreover, if this excess is kept up, the cells of the tissues of important organs become firstly, infiltrated with fat; secondly, actually transformed into fat. Independently of carbonaceous matters being required for respiration and production of heat fat constitutes the basis of muscle, and no animal can thrive or even live if deprived thereof. Such elements frequently save the more important proteids from oxidation or burning.

Of the salts of the blood it cannot be said that one is more important than another. *Chloride of sodium* (common salt) is probably the most necessary for the preservation of health, and its withdrawal, or its absence from the blood is followed by the gravest consequences. Salt (sodium) is required not only for the blood, it is necessary to the formation of the gastric juice and of the bile and for the digestion of albumen; and of the fact of its presence in the blood I cannot give a better proof than that which may be obtained by tasting the perspiration or the tears. Nature cries out for it, as is shown in the wandering of the denizens of the wilderness in search of it, and it is provided for them in the form of "salt licks."

Excess of salt is highly injurious, interfering as it does with the skin glands, and with the blood, inducing important skin diseases—*e.g.*, scurvy in man and eczema in certain animals, particularly in dogs.

That *potash* is necessary is proved by the fact of its forming a constituent part of the material food of animals, viz., vegetables. Deficiency in this salt means impaired tissue nutrition; excess of it means excessive fluidity of the blood, increased activity of the kidneys, by which it is excreted, and dropsies. If the excess persists, defibrination of the blood follows and important forms of skin eruption are produced; the kidneys too become organically deranged.

The phosphates are absolutely necessary for the building up and nourishment of the bones and the teeth; and if they are not supplied in due quantity the former become soft and thus you have produced the various forms of bone-softening, such as *rickets* and a tendency to fractures, as is sometimes seen in pregnant mares. Moreover, the teeth are imperfectly or slowly developed and when developed tend to decay, and thus you have the late dentition (cutting of teeth) common to animals reared on poor lands and the cases of rotten teeth (caries) which are so often seen under similar conditions.

Phosphorus is a constituent of nerve matter, and neither can growth go on nor can the functions of the brain be performed without it; and it must be remembered that animals cannot make up for deficiency in phosphorus in their ordinary food in the same way as man does by eating fish.

But while phosphorus in due proportion is necessary and beneficial not only it, but phosphates also, in my opinion, may become baneful. Physiologically we know that phosphorus possesses the property, if given in excess, of dissolving and breaking up the blood cells, of causing very rapid fatty degeneration of the coats of the blood-vessels and of such important organs as the liver and of degrading the colloids of the blood: as a result of this, we get spontaneous flowing out of the blood (hæmorrhages) into the tissues, and the passing out of albumen and broken-up red cells, with their colouring matter, with the urine. Superphosphate of lime also possesses the same properties, as was well illustrated some years ago in the case of cattle depastured on land near Liverpool which had been recently topdressed with this agent; the case came under the observation of Mr Welsby, F.R.C.V.S., West Derby.

Without iron no animal could exist for one moment, and small though its quantity in proportion to the other elements of the blood it yet performs a most important function, viz., the carrying of oxygen to the tissues; the effects of the withdrawal or non-assimilation of iron are quickly seen in the pale colour (pallor) of the visible mucous membranes,—as of the eye, nose and mouth; and in man, in the blanching of the skin. In all animals the effects of its loss are seen in the excessive rapidity of respiration for the purpose of compensating, by the quantity taken into the lungs, for the small quantity of oxygen which the blood cells are capable of carrying to the tissues.

It is now demonstrated also that iron acts as a stimulant to the liver.

An animal in whose body iron is deficient becomes comparatively bloodless though its carcase may be laden with fat; it is said to be *anæmic*, and if this condition is pushed too far it dies.

Iron may exist in abundance, but by the influence of adverse agencies, such as the action of disease or disease germs, the red cells may be incapable of appropriating it; and thus, in the midst of plenty an animal may die of oxygen starvation. If iron is assimilated in superabundance an opposite extreme is induced, viz., *excess of blood* (hyperæmia), and inflammations may result.

Not only phosphorus, but, as has recently been shown, a salt of potash (the chlorate) has the power of so changing the colouring matter of the blood as to render it useless and to cause it to be passed out by the kidneys, giving to the urine a peculiar but characteristic colour. Carbonic acid renders the blood dark and displaces oxygen. Carbonic oxide heightens the colour but brings about such a change in the condition of the iron as effectually to prevent re-oxidation; hence the primary and secondary effects of exposure to the gases given off in combustion or fires and hence the blood-stained urine we sometimes see passed by animals which have been exposed to the influence of those gases in burning stables and cowsheds.

Having described some of the characters of the blood, I will now consider the influence exerted upon it by the more important organs and functions of the body, viz., by digestion and assimilation, by oxidation and nutrition; by the liver, the bowels, the mesenteric glands, the kidneys, the spleen, the lungs and the skin.

Digestion.—The first act of digestion is performed in the mouth when food is broken up by the teeth and exposed to the action of the *saliva* which secretion converts the starchy matter it contains into sugar by the action of a ferment (ptyalin). The process is most perfect in ruminants. The second act in digestion takes place in the stomach, where the acid secretion—gastric juice (succus gastricus)—dissolves mineral and other matters, while by the action of a second ferment (pepsin) albumen is rendered more soluble and converted into substances known as peptones. The third act in digestion is performed in the small bowels where the food meets with the secretion of the pancreas (sweetbread), the pancreatic juice: and with the secretion of the liver, the bile. The bile also contains a ferment which, to some extent, also converts starch into sugar. It is alkaline, and in a slight degree dissolves and emulsifies fats; it is also supposed to act as a natural purge in the intestines, and to prevent decomposition by acting as an antiseptic.

The pancreatic juice (succus pancreaticus) like the bile is alkaline; it converts starch into sugar to a much greater extent than does the saliva, and as in the gastric juice, so in this, a ferment (trypsin) exists which has the power of converting albumen into peptones, it also splits up and emulsifies fats: both bile and pancreatic juice convert a small quantity of fat into soap.

Into the small bowels a secretion is poured, known as the intestinal juice (succus entericus) which, in a modified degree, assists the other juices mentioned.

In the large bowels, acidity replaces alkalinity and certain constituents of the food are rendered soluble, and probably digested.

Some of the soluble matters of the food are absorbed partly from the stomach, but more largely from the intestines; the more important constituents are mainly taken up from the small intestines by the lacteals and the tributaries of the portal vein.

It is evident, from what has just been stated, that perfect and healthy digestion and the nourishment of the blood and the tissues, depends entirely upon the perfect and healthy action of the important organs to which I have referred.

Fortunately, the salivary glands and the pancreas are rarely, practically I may say never, found diseased in the sheep. The stomach being of very complex arrangement is frequently deranged; and here I should observe that the three first compartments of the stomach of the sheep serve an useful purpose in assisting to break up (comminute) and to soften the food presented to them and thus prepare it for the more important process to which it is subjected in the true digestive stomach—the fourth.

It would be well for animals, as also for ourselves, if we could say the same of the liver as of the salivary glands and the pancreas; unfortunately, there is no gland in the body more subject to functional and organic derangement than this. I say unfortunately, not only on account of its secreting bile but on account also of certain processes which go on in its interior and upon which the support of life depends.

In the liver, many of the constituents of the food—*e.g.*, the carbohydrates (not the fat) and, according to some authorities, the peptones, are converted into a substance known as *glycogen*, a sweet substance somewhat resembling sugar. Glycogen is supposed to be produced by the action of a ferment and to be stored up in the liver until required in the system, when it is reconverted into sugar and discharged into the circulation for the purposes of generating heat and muscular energy. Hence, the liver has been described as a "coal bunker" to the body.

In addition to this function, the liver *destroys the used-up red cells of the blood* and it is from their colouring matter that the colouring matter (pigment) of the bile, and also of the urine, is mainly obtained. Another important function served by the liver is to *prevent* the *entrance* of *injurious substances into the circulation*—to act, in other words, as a guard to the blood. Thus, the very substances upon which life is largely dependent, viz., the peptones, if taken from the intestines and injected directly into the blood would kill, but by passing through the liver they are not only rendered harmless but useful. In the intestines, peculiar poisonous substances (ptomaines) similar to those produced in the decomposition of animal flesh, and from which so many anatomists and others have lost their lives by inoculation in dissecting, are constantly being formed; the liver seizes on these, as it were, and sends them back into the intestines whence they are ultimately got rid of in the dung (fæces). Even that deadly poison with which Indians have for ages poisoned their arrows, known as Curara-Woorara, or the woorali poison, is harmless when swallowed; and this, it is believed, is due to the guardian function of the liver.

One substance of importance is found largely in the liver, and acts as a stimulant to it, viz., *iron*, and when it is given in overdoses, it is believed that the liver returns it to the intestines.

The cells of the liver after a meal contain large quantities of fatty matter, become infiltrated with it in fact, and if feeding on such matters is persisted in fat takes the place of the normal tissue elements and the organ becomes practically a mass of fat —as seen in the liver (pate de foie gras) of Strasburg geese. *Fatty transformation means annihilation of all those important functions to which reference has been made.*

No bile is secreted consequently it is lost for digestive purposes, for stimulating the activity of the intestines and for antiseptic purposes; and it is largely owing to the last fact that purgation takes place in the advanced stages of liver disease—arrest of the secretion of bile leading at the outset to constipation. The opposite condition of softening, *i.e.* fibroid change, takes place from the action of continued irritation as in sheep and cattle by the fluke worm (in rot); and in man, by over-indulgence in spirits, the organ becomes hard, constituting "gin drinker's liver." Moreover, if the liver is not acting poisonous matter is absorbed and produces its deleterious effects on the brain and nervous system generally, as well as upon the blood.

The Kidneys.—These organs, though small as compared with the liver—and especially, I think, small in the sheep as compared with those of other animals—are, nevertheless, of vast importance in relation to health. Unlike the liver, pancreas, &c., *they are not producing organs, i.e.,* nothing that is formed in them is ever sent back and used up in the system, with the exception of water, which, in the case of deficiency of that fluid in the body, and in dry weather, is supposed to be reabsorbed from the kidneys. They are essentially excretory organs, serving to get rid of excess of water, of salts and of waste matter; as also of the poisonous products of cells (leucomaines) which, if left in the blood, would act as poisons. Any interference with or arrest of their function is followed by grave consequences, and no disease is more dreaded by the physician than kidney-disease because he knows full well that it means in the long run death by the action of such deleterious matters as the products of oxidation which are allowed to accumulate in the system. Arrest of the function of the kidneys is to some extent compensated for by increased activity of the skin and the bowels; hence, if by any means the functions of these organs is interfered with the disease of the kidneys is rendered more grave.

To illustrate the rapidity with which certain matters are passed out of the system I may direct attention to the fact, that if one puts his feet into a solution of potash or soda those salts can be detected in a short time in the urine; or if turpentine be rubbed into the skin, even the skin of the hands, it is detected in the urine in a very short time by the odour of the "sweet-scented violet" which it imparts to that fluid.

One important thing I would particularly direct attention to here and that is that whenever the albumen in the blood becomes so degraded, as it too often does, as to be unfit for use it is passed out by the urine, in which it can be detected by glazing or varnishing the skin of the hand when it is allowed to flow over it, or by subjecting it to heat, when it coagulates. Not only the albumen but the colouring matter of the blood, when it is dissolved out of the cells, is passed off in the water; and this is the explanation of the colour of the urine in the disease known as "red water" in cattle, a condition not usually seen in the sheep because in this animal the coloured water of the blood is, curiously enough, thrown into the cavity of the abdomen, causing "bloody dropsy of the belly" (sanguineous ascites).

Under certain circumstances, the kidneys excrete enormous quantities of clear water, constituting *diabetes;* but this is not noticed so much—except by observant shepherds—in the sheep as in the horse. In the latter animal it is frequently caused by mouldy bad foods, by mow-burnt hay and grass, or hay grown with excessive quantities of nitrate of soda. Diabetes, if unchecked, kills by exhaustion.*

The spleen (melt) and the lymphatic glands (kernels) are also of great importance to animals for by them the white cells of the blood are manufactured, and in certain diseases the quantity of white cells becomes so excessive as to far outnumber the red cells constituting "white cell blood" (leucocytosis) and producing emaciation and death. The spleen is influenced injuriously by fever poisons and by the organisms of "anthrax," in which disease it is often the first organ to become affected. The spleen probably serves other purposes than that of manufacturing white cells; as iron, soda, and phosphates, with various extractive matters, are found in tolerable quantity in its ash when it is burned.

The lungs are of the greatest possible importance to life and any interference with their function exercises an injurious influence upon the whole of the system and more particularly on the blood and the brain, as it is through their agency that carbonic acid is got rid of from the blood and oxygen supplied to it; or, in other words, *it is in the lungs that the change from venous to arterial blood takes place.* Watery vapour too is exhaled by the lungs, and probably, to some extent, volatile matters also. Interference with the excretion of carbonic acid by the lungs tends to produce plasticity of the blood and favours congestive processes.

The skin, though last to be considered, is not the least in importance particularly to the sheep.

From this structure, under ordinary circumstances, watery vapour is constantly being exhaled, constituting *insensible perspiration;* and in the event of any derangement of the kidneys it takes on, if allowed to do so, compensatory action and assists in getting rid of the excess of water from the blood. Not only does it give off water, but it also, under certain conditions, absorbs water; that it possesses this function is shown by the fact that if an animal is placed in a bath and retained there for a time, it gains in weight.

Warmth favours the evaporation of moisture, cold retards or arrests it; and this is a matter of great importance to the sheep because when its fleece, as so often happens, is saturated with water and the weather is cold the skin cannot perspire; on the contrary water is absorbed and this is often aggravated by the watery nature of the food, and by inactivity, from disease, of the kidneys, and dropsy results.

The facts just noted account for a further fact, viz., that while

* During the last winter the author has frequently detected degeneration of the kidneys in the carcasses of sheep which had suffered from *water braxy*. He pointed out this condition in similar cases many years ago.

the sheep can withstand the effects of almost any degree of cold it is most injuriously affected by *cold and wet combined*; and this is especially true of lambs.

The perspiratory function of the skin is not the only function of importance that it performs. It is a *breathing* or *respiratory* organ also, though its powers in this direction are limited; nevertheless, if the skin is covered with some impermeable material, such as varnish, or, as is frequently done in the case of affiliation of lambs, with a lamb skin, the animal dies. It was at one time thought that death in these cases was due to suffocation; now, however, it is believed to be due to poisoning, as the temperature lowers materially, such a proceeding would certainly arrest the excretory function of the skin most effectually.

That oxygen is taken in and carbonic acid given off by the skin has been shown by direct experiment.

The *excretory function of the skin* is of the highest importance. The sweat usually contains common salt, ammonia and fatty acids in varying though small proportions; but it is further known that under some conditions other materials are excreted, such as waste products and even colouring matter, and in some instances certain constituents of the blood also. In disease of the kidneys matters usually passed off by these organs have been found in the sweat.

In all animals a certain quantity of fatty (sebaceous) matter, known as *yolk* in the sheep, is secreted by the skin, but in no animal is the amount so great as in the sheep, and it is early noticed that in an unhealthy animal the fleece becomes dry and harsh instead of greasy.

Arrest of this secretion is of most importance in the case of animals exposed to cold and wet, for it leaves the skin at the mercy of these influences and allows of the ready absorption of the latter. Yolk contains a large percentage of potash which is obtained from the soil and removed in the wool.

Having considered the influence of the action of the different organs of the body in the production of disease, or rather I should say in the preservation of health, I will next look at the influence of foods and for brevity's sake will group these foods —1st, into those of a succulent character, *i.e.*, containing large proportions of water; 2nd, into those rich in heat-producing material; and 3rd, into those rich in flesh-forming substances.

(1) *Succulent Foods.*—It follows, as certain as light follows darkness, that in proportion as watery elements increase nutritive elements decrease, and in no class of food is this so strikingly shown as in turnips which contain about 90 parts of water to 10 of nutritive matter. The same applies to grass which has been rushed by excess of moisture, artificial stimuli and warmth.

Now, if these foods are not supplemented by others of a nutritive character disastrous results must and do follow; the class of diseases produced being those in which lowered vitality and debility with dropsies—such as water braxy, shell sickness, vanquish or trembles—are marked. The lowering influences of such foods are aggravated by low temperature and exposure to cold winds, particularly east or north-east winds, but of the latter more anon. Excessive quantities of turnips are most injurious when artificial manures, especially salines, have been too generously used and there has been long-continued wet weather. Moisture within, moisture without, moisture above, below and around, will tell its tale; will dilute and impoverish the blood and macerate and soften the tissues; will disintegrate the cell elements and render them incapable of performing the functions of organic life; moreover, it will affect the blood cells and the walls of the blood-vessels injuriously.

While swedes are more nutritious than white turnips they too may be overdone; and owing to the quantity of sugar they contain they produce fatty changes in the liver and as a result thereof deficiency in blood supply, especially of red blood, with a tendency to throwing out of fluids of an albuminous character into the tissues, constituting "turnip braxy."

I have seen sheep (especially lambing ewes) that have been fed *ad libitum* on swedes, without any complementary food, die in dozens, their carcasses laden with fat but not a teacupful of blood in the veins of any one of them; and in the case of breeding ewes, I have seen the recently born lambs the subjects of internal dropsies. I have again seen ewes fed in the same way, on swedes which have been forced with artificial manure, especially phosphatic manure, die in dozens from *milk fever* (so called in some districts) while their lambs have succumbed to *joint-ill;* and some years ago, Mr Robertson, late of Kelso (the late Professor Robertson), assured me that he had, by way of experiment, produced these diseases at will.

Foods rich in carbohydrates and fatty matters are, in excess, extremely injurious bringing about, as they do, the changes already noticed in the liver; and if sugar is superabundant diarrhœa or scour. Moreover the blood becomes over-laden with their products and highly plastic from imperfect oxidation, and congestion is the result.

Foods rich in flesh-forming material (*proteids*) are, in too great quantity, also highly injurious tending, as they do, to an undue accumulation of albumen and fibrinous elements in the blood, thus taxing the cells to their utmost to appropriate the nutritive matter offered to them and so overpowering them, as it were, as to prevent their normal function: in this way imperfectly formed tissue is produced and the result is the advent of congestive and inflammatory conditions (so called *inflammation*) and also extravasations of blood into the tissues, producing one form of so-called *red braxy*.

Milk may be briefly alluded to here seeing that it contains a relatively large amount of proteid matter as well as fat. It is a well-known fact that milk contains all the elements necessary to the nourishment of the animal body and it is, practically, the only food of which this can be said. If, however, milk is deficient in nutrient materials and in salts, owing to some inherent defect in the blood of the animal that produces it, we cannot expect that the consumers of it can either retain their health or grow; and, as a matter of fact, nearly every disease from which young animals, whether lambs or otherwise, suffer, is due to impoverished or to excessively rich milk. Moreover, milk is most certainly a conveyancer of disease-producing germs and other injurious matters from the mother to the offspring, as is seen in anthrax (though this is denied by some) and in the case of vegetable and animal poisons. In the artificial rearing of young animals, skim milk, mixed with lime water, may be substituted for sweet if the latter is found to be too strong.

Innutritious food is injurious in a twofold sense—1st, animals require to take in an excessive quantity in order to obtain a sufficient amount of nutritive matter and thus the digestive organs become overtaxed and weakened, and indigestion results; 2nd, the tissues of the body do not gain sufficient nutrition and weakness and debility follow, a matter of the last importance in pregnant ewes as they cannot, under such circumstances, provide sufficient nourishment for two lives, or it may be for three or four.

Dirty foods, i.e., dirty turnips and fouled or sanded grass, are injurious, as the dirt or sand collects in the pouches of the stomachs and in the blind gut (cæcum), mechanically interferes with their action, and produces irritation and inflammation, and even ulceration.

Frosted food should always be avoided if possible and sheep should not be put on frosted turnips until the day is well advanced; it is particularly harmful in pregnant ewes.

Decomposing and decaying foods are the most injurious of all; and it passes my comprehension how an enlightened man can in the early spring, when his crop of swedes has exceeded the wants of his flocks and herds, take the half or wholly rotten roots and scatter them thickly on the pastures for his sheep to eat. They may manage to pick out "tit bits" here and there, but in doing so they swallow also a large proportion of decomposing matter, than which nothing is more likely to set up septic inflammation of the true stomach and bowels, and produce diarrhœa and even *blood poisoning*.

Mouldy foods may be placed in the same category with the foregoing, and by the light of our greater knowledge of the action of fungi in the system we are warranted in attributing many of the diseases marked by a depraved condition of the blood to their influence.

Most certainly many moulds are active agents in the production of inflammation of the mucous membrane of the bowels, and they probably also in some instances cause abortion.

With impure foods we may class *impure water*—a prolific source of morbid conditions marked by depravity of the blood, and by diarrhœa and dysentery.

Indirect Predisposing and Exciting Causes of Disease.

Having glanced over direct, we may now with profit consider those indirect influences which act as predisposing or exciting causes to the development of disease, and one of the most important of these is *the management of the land and of feeding.* Seeing that the growth of animals and vegetables moves in a circle, and that both derive their nourishment primarily from the earth, it follows that the earth must contain, in order for their vigorous growth, all the elements they require and that those elements must bear, as I have already remarked in reference to the blood, a certain definite proportion to each other.

Now it is quite clear that if the stockowner year by year takes from the land the important constituents of all organic growth by putting animals thereon and allowing them to devour the vegetable products and then devouring the animals himself or selling them for some one else to devour, the land must ultimately become impoverished: he cannot eat his cake, and have it too.

It may be held that much of the material taken from the land is returned again to it in the shape of urine and dung, but, allowing that this is so, what about the yearly deficit produced by the removal of immense quantities of material in the shape of mutton, blood, horn, skin, wool, &c.? Then it may be said that the air and the rain supply vegetables with nitrogen and carbon. Granted, again, that this is so, what proportion of soluble matter, especially on hillsides, is washed out of the soil by rain?

The heather may be burned but by doing so much of its nutrient matter is dissipated in the form of gas which is largely carried away by the wind and benefits the neighbouring fields; or, if in close proximity to the sea, the fishes mayhap. Certainly the ash of heather contains a small quantity of potash and other salts which are thus restored to the grass, that is all however—no nitrogen, no carbon. It would, I know, be simply absurd on my part to tell the stockowner, as I have heard of some people doing, to restore to his hill pastures that which he annually takes out of them in the form of manures. As a rule he has not the means to do so, and if he had, the task of manuring a thousand acres of hill would be a Herculean one indeed; but the farmer may give the poor impoverished land, or the best patches of it, something in the shape of lime to supply materials for the bones of the animals grazing on it, and salt to supply soda to the serum of their blood; and if he cannot dress all the patches in one year he can dress them in rotation: I do not say dress the whole area of the hill pastures on a farm. There are hundreds of acres on which, by virtue of the absence of a matrix in the form of soil, manurial agents would be absolutely thrown away, but it is a poor hill on which there are not a few fertile spots—a few oases in the desert—and these are often the life of animals depastured on them. I will even go farther and say that some few of such spots may be worth the expense of a little bone and a few pounds of good grass seeds. I have known a few hills, where it has been practicable, converted into a mine of wealth to sheep farmers by breaking them up and re-seeding; and it must be borne in mind that the good effect of improvements is not confined to the areas on which they are carried out but that it extends around the borders of those areas by virtue of the improved manure (dung) from the sheep themselves.

Assuming, moreover, that circumstances will not allow of the carrying out of these plans, cattle can be depastured on some of the hills or parts thereof and a supply of artificial foods or dried natural foods be given to them; or, the same thing can be done with sheep instead of always taking them to the lowlands. I have known barren hills converted into fertile ones by this means; and, more, I have known diseases, such as "louping-ill" and "braxy," disappear from spots they loved to haunt, if I may use such an expression; and only a short time ago Mr Fletcher Menzies related to me, when conversing with him on this subject, a very instructive instance of the conversion of a death-dealing hill into a healthy pasture in this way. I will also ask and ask if there is anything to prevent the farmer from adding some of the necessary elements of the animal body to the artificial and dry foods in the shape of salt, magnesia (as Epsom salts); potash (as kainite or sulphate); and iron—as green vitriol? Two of these agents—salt and iron—not only destroy the germs of disease but the embryos of parasites also, while the others stimulate the digestive organs and kidneys to healthy action. All are cheap; and even if animals did not utilise all they took in they would return it to the soil in the urine and fæces. Iron is not likely to be conveyed to hills in any form, seeing that there are no roads or streets over them and consequently no tires of wheels or horse-shoes to be worn away; neither is there any old iron lying about to rust.

I do not wish it to be concluded from what I have just said that I am an advocate for heavy manuring—far from it. I could relate dozens of instances of the injurious effects of such a system but will only quote one or two. I have already directed attention to the effects of over-manuring swedes and turnips, and, as a striking illustration of my argument, I may point out that the application of large quantities of nitrate of soda to pasture land is a frequent cause of diabetes and weed in horses feeding on the grass or clover grown thereon, even when these are made into hay; and in my own practice I have frequently told my clients that their horses were fed on such grass or hay (though I knew nothing at the time of the district from which it had been brought) and subsequent inquiry has proved the correctness of my conclusions.

Neither animals nor vegetables can be said to be in a really healthy state if they are over-forced. Wheat grown on a dung-hill frequently fails to attain maturity. Turnips grown with excess of stimulants, especially nitrates, decay or decompose early. Near Edinburgh lately, turnips grown with manure were sold at £14, those with nitrates at £8 per acre, the dairy-men averring that the latter do not keep. Mutton grown on ling and heather is sweeter and more satisfying than is the mutton of trough or manger-fed sheep.

I am quite aware that I may be told—and I have been so told—that I am labouring under a mistake; that plants will not take up excessive quantities of salts. If this were so, why do we see diabetes and weed when nitrate of soda is used in excess? and how is it that when sheep and cattle are fed on turnips and grass grown with a liberal supply of superphosphates or even of lime, the quantity of lime salts passed off by the urine is so great that concretions are formed in the bladder of the sheep which block up the worm-like appendage at the end of the penis and, if not removed, cause death by retention of urine? In bullocks, the lime salts form concretions round the hairs at the end of the sheath which often imprison the urine and cause death by mortification of the sheath and surrounding tissues, or by blood-poisoning. Professor Johnstone analysed turnips grown with guano and farm-yard manure respectively, and found that the ash of the former contained 19·39 per cent. of phosphoric acid, as against 7·73 per cent. in that of the latter.

Now, as excess of manure is injurious so its judicious application may be highly beneficial. Thus I have known diseases, such as "red-water" "braxy" and "anthrax" entirely disappear from pastures in which they had become, as it were, indigenous, by the application of lime, phosphates, or salt.

For all practical purposes, the best manures for the farmer are organic manures, if they can be got in sufficient quantity and *if put on the land before undergoing decomposition.* A man may delight in watching his labourers cut through the manure heap as they would through a mass of butter, but it must be remembered that such material has lost much of its most valuable constituents; its gases have been dissipated in the form of stench and its salts washed out by rain.

I will give one practical illustration of the difference between natural and artificial manures on sheep. During his lifetime my father never purchased, to my knowledge, an ounce of artificial manure other than Peruvian guano and occasionally lime and salt, and no man ever profited more by his sheep; but after his death the modern bailiff went in largely for artificials in the proper acceptation of the term and, figuratively speaking, the land became covered with the carcasses of sheep which had been "struck," *i.e.*, that died from *black leg* or similar affections.

In reference to supplementary foods, putting aside hay, I think there is nothing better than oats—crushed in preference—bran, crushed linseed and ground malt; and in reference to the latter it must be borne in mind that, independently of its nutrient properties, it assists very largely the digestive processes and its dust contains a fair percentage of potash. Of late half-malted barley has grown in the favour of some feeders, and particular attention has been recently directed to its value by Mr J. Shaw, of Walkington Towers Farm, Beverley, in the *Leeds Mercury*:—

"Since the malt duty was removed every farmer can make malt for himself, free from all restrictions, and the cost to him of making it is a nominal one.

"Formerly, very much was thought of malt as a feed for all stock, and it is especially good for cows, as they will upon it, with bran and other food, produce plenty of rich sweet milk all the winter through. Sheep, beasts, and horses all thrive and fatten upon a mixture of it and other foods, but of late years it has not been much used, as its cost has been higher than other feeders.

"Malt is termed green when the roots and stem of the barley, from which it is made, are sufficiently grown for it to be put upon the kiln to be dried. It is also at this stage of its growth that it is of the most value as a feeder, it being found that the green malt gives better feeding results than dried malt, and, as I will show later on, every farmer can easily make this sort of malt himself almost without any manufacturing cost.

"As I have already said, the general use of green malt has been curtailed by its comparative expensiveness, but this objection does not exist at the present. There is no better barley for making this malt from than that imported from Russia, being less liable to mould; and, singular to say, this sort of barley has never before been so plentiful nor so cheap as it is at the present time—in fact, it can be got at the chief ports at 6d. per stone, or £4 per ton, which is below the price of hay, undecorticated cotton cakes, and bran—in fact, feeding barley is at present more than $1\frac{1}{4}$d. to $1\frac{1}{2}$d. per stone, or £1 per ton, cheaper than maize, and is not very much higher in price than straw is in some parts of the country.

"No doubt this unprecedented cheapness of feeding barley will cause it to be used largely in its unconverted state, either unground or ground into meal, along with turnips and other food, but I prefer it when converted into green malt, and for the benefit of those farmers who are inclined to follow my example in this respect, I may say that the process of conversion is as follows:—

"The barley must first be steeped overhead in water (allowing it room to swell) about forty-eight hours, and this can be done in any tank or large tub or casks which may be available (the latter can also be bought of any cooper for a few shillings each), into which a large plug-hole should be made at the side, as near the bottom as possible, and over the inside of the plug-hole should be fixed some perforated zinc (which can be got at any ironmonger's), so that when the plug is taken out, the water may be drained off through the zinc and plug-hole, and the barley left behind. It is a good plan to let the perforated zinc enclose a larger space than is occupied by the plug-hole, so as to let the water drain to it more quickly.

"When the barley has been steeped forty-eight hours, and the water drawn off, place it thickly upon a floor, say 2 feet thick, and let it remain there until some warmth is developed; it must then be thinned down to, say, 6 inches, and must be daily turned over until it strikes out its roots. As soon as these have grown a little, and show signs of withering, they should be sprinkled with a watering can, and the turning continued until the acrospire—or what would be the stalk if the barley were planted—has forced its way well up to the back of the barley under the skin. When this is accomplished, the barley has been converted into green malt, and is at the stage of manufacture which is of most value to the farmer for feeding purposes. The whole operation from first wetting till ready for use will occupy from ten to twelve days.

"As regards the floor for growing the barley upon, a concrete one is the best, but either brick or wood will do; only, in the latter case, more moisture will have to be added whilst the barley is upon it. A wooden floor may also be cheaply covered with galvanised iron sheets, and is then even better than a concrete floor.

"It follows that the quantity steeped or wetted every forty-eight hours should be calculated according to what is required for two days' consumption; and any farmer who may wish for further information respecting the process can, no doubt, obtain it from his nearest neighbouring maltster.

"Mr W. J. Harris, of High Hampton, Devon, has lately contributed a long article to the newspapers (of which a copy appeared in the *Mark Lane Express* of August 22), giving calculations showing that the deficiency in this year's crops of oats, hay, turnips, and straw amounts to 14,600,000 tons, and this estimate is also concurred in by other authorities. Mr Harris further calculates that this deficiency can be made up by using 12,000,000 qrs. of feeding barley, and it is certainly fortunate for us that this article is at present cheaper than all other feeding corn, and that it can be bought at as low a price as hay ard undecorticated cotton-seed cakes.

"In case a good fall of rain should now cause a sharp growth of succulent grass, it will be found advantageous to give dry barley to stock to prevent scour."

In recommending the above materials I do not wish it to be assumed that I underrate the value of other feeding stuffs, far from it: all are good in their proper place and in proper quantities. Maize, for instance, is rich in heat producing; beans, peas and wheat, in flesh-forming matters; and the three latter contain a tolerable quantity of potash also; and I cannot comprehend why sheep farmers do not cultivate, more than they now do, such crops as thousand-headed and other cabbage which could be readily conveyed to the poorer lands, or in the case of the thousand-headed cabbage eaten off in rotation. I must, however, deprecate the *injudicious allowance* of such materials to sheep, and, above all things, I abhor undecorticated cotton cake. I will here give one instance, out of many which have come under my observation, of the astounding ignorance which prevails in reference to the admixture and allowance of feeding stuffs. In the spring of this year I was consulted, by letter, about the death of a large number of sheep in Lincolnshire. After describing the symptoms presented by the animals, my correspondent went on to say, "The food of the sheep is as follows:—Waterloo cake, cotton cake, oats, maize, swedes (cut up). They run on grass land, which is a dry layer, and *have as much of the above food as they can eat;* I may say they are pushed, and are very fat," and well they might be, and no wonder that on making the *post-mortem* examination my correspondent found "the bladder distended with urine and inflamed, and containing calcareous matter in its interior; the lungs congested and the kidneys flabby and degenerated."

The deductions I would draw from the foregoing observations for the guidance of the stockowner are—1st, That he cannot over-force sheep without suffering the penalty in the shape of a large percentage of deaths, and in great waste of material; 2nd, That all sudden changes of management are injurious in the extreme. Judicious changing of food and pasturage should always be practised and, where it can be done, the resources of his own holding should be supplemented by the farmer from the superabundance of his neighbours; *sheep require change more frequently than do other animals.* I have already referred to my father's management of his sheep. No man prepared more sheep for the butcher, in proportion to the size of his farm, than he; but they were scattered in lots all over the country side and frequently changed and when put on to fresh turnips they were limited as to quantity, particularly at the outset, and here I may remark that in turnip-feeding there is often more food wasted and fouled than is made use of; 3rd, I would say to the stockowner, *let your feeding be as natural as possible; don't waste your substance in buying everybody's celebrated compositions but purchase the raw materials and make your own mixtures, then you know what you are giving to your sheep, and you are not "paying through the nose" by purchasing stuff which in many instances is not worth the price paid for it by* 20 *or* 30 *per cent.*

In-breeding is a predisposing cause to disease, at least in a relative point of view or outside certain limits, and those limits are regulated by the vigour or otherwise of the animals engaged. Where the male and female are alike vigorous and structurally perfect the evil effects of in-breeding may be postponed; but even here, if it is carried too far, defects will crop up and they will increase rather than diminish in each succeeding generation. A diffusion of fresh blood is a good thing in more senses than one, and he who neglects Nature's demands in this respect must be prepared to pay the penalty. A plan adopted by Mr Fletcher Menzies is, I think, an exceedingly simple and good one. It is based on the well-known fact that sheep depastured on large tracts of land do not wander very far a-field, but confine themselves to comparatively limited areas; and consists in shifting the rams to fresh tracts every two or three years thus, given three rams placed at three different points one year, they are so interchanged in location each succeeding year that at the end of the third year each section of the flock has been served by a different ram.

Exhaustion of Males.—In no case should a ram be asked to do more than he is capable of doing in this respect, for if he is overtaxed the breeder must be prepared for the consequences in the shape of uncertain crops and weakly lambs.

Exposure to cold and wet is both a predisposing and exciting cause of disease; and of all the different kinds of cold, that dependent upon east winds is the most depressing to animals, and the most inimical to the growth of vegetables: of the east wind it may be said, that

> Desiccate itself,
> It shrivels up and dries the membranes,
> Drives back the stream of blood
> And blanches hand and cheek
> Of all who are exposed
> Unto its baneful power.
> Extended is its influence
> E'en to vegetation. The young
> Green shoots in one short night
> Are withered, crisped and browned,
> Till not a semblance lives
> Of their identity.

Yes, this is one of the banes of the flockmaster and the most disheartening of foes to the shepherd who has in the early spring been watching the growth of the young grass in some specially favoured spot and has been calculating what a nice bite he will shortly have for his lambs and ewes; but, too often in one short night his hopes are dissipated, and in place of seeing his lambs thriving he picks them up cramped and stiffened, and in a few days is mortified by seeing them die from louping-ill, swung-back (paralysis), joint-ill, or so called navel-ill.

Cold and wet are especially injurious to parturient sheep and newly-born lambs; and, if possible, lambing ewes should always be placed in dry situations; or, if practicable, housed either by night or by day, or both, according to circumstances: and I would particularly impress the fact upon all breeders, that if the system of an animal is depressed by debilitating and lowering influences it only requires that some existing cause such as this shall come into operation to call a latent disease into existence: it is "the last straw that breaks the camel's back." Low forms of inflammation and congestion of the lungs, bronchitis especially, are induced by cold and wet in all animals whose systems are debilitated or whose blood is poor.

Parturition is a prolific predisposing and exciting cause of disease as at this period of an animal's life there is a stage of great excitement followed by a corresponding degree of depression; but, in addition, there is a large quantity of waste matter to be got rid of from the womb, and the system has to regain its original state; and all this at the expense of the constitution.

There are many agencies of an adverse character against which an animal would successfully do battle under ordinary circumstances that overcome the vital energy when depressed by the lowering influences of parturition; especially is the system incapable of fighting against the effects of putrefactive (septic) organisms or their products, and the former lodging in the unhealthy fluids in the womb—which form a favourable pabulum for their growth—easily gain access to the circulation through tissues weakened by being supplied with impure or impoverished blood; the result is blood poisoning (septicæmia), septic inflammation of the womb, of the bowels, or of the udder and death not only of the mother but of the lamb; the latter giving evidence also of septic inflammation of the umbilical vessels (navel-ill), and putrefactive diseases of the joints, much of which may be prevented by tying the cord at birth and by applying an antiseptic thereto.

Not only during the rutting season, but onwards through the period of lamb-bearing, at the time of parturition and in the subsequent nursing, is great care in management demanded and a sufficiency of nourishing food required in order to prevent loss and disappointment.

Excitement is up to a certain point good for all animals, but there are few in which it may with greater ease be pushed to excess than in the sheep; it is especially to be guarded against in the case of in-lamb ewes, as it is frequently an exciting cause to the development of latent disease and often causes premature birth.

Fatigue, clipping, and *exposure* to *cold wind* (a *chill*) induce congestion of the lungs.

Age.—Young animals are peculiarly predisposed to diseases depending upon rapid tissue changes for their production; and old animals to diseases of a debilitating or asthenic character, hence the large percentage of deaths in the old "crocks" at lambing time.*

To summarise the remarks I have so far made I may say that all diseases which have their origin in an altered state of the blood—and such form the vast majority of the diseases from which sheep suffer—may be arranged under four heads.

1. Those marked by *deficiency in the quantity of blood,*

* While it is impossible that I can deal at length with every individual disease of this class, I may briefly refer to joint-ill, navel-ill, and lambing or milk fever.

Joint-ill, except as a purely sporadic affection, is always due to a combination of two sets of causes—first, to a depraved or impoverished condition of the blood of the mother (nearly always in my experience brought about by injudicious management) and in consequence of which the milk contracts deleterious properties; second, to the combined effects of cold and wet. In some cases the actual cause is inflammation of the umbilical vein, as a result of which abscesses form in the liver and suppurative inflammation of the joints (pyæmia) follows. Judging from the clinical characters and course of the disease we are warranted in the conclusion that the actual cause is a micro-organism—a micrococcus probably.

Navel-ill or *navel-pocking* is the result, in the first place, of a depraved condition of the mother's system; and, in the second place, to the action of septic germs on the clot of blood which is always formed in the umbilical vein of newly-born animals. If the system is healthy no injurious influence is exerted by septic organisms; if the contrary, the altered blood acts as a splendid pabulum for their development—septic (or sometimes erysipelatous) inflammation is set up, the products of which become absorbed and set up putrefactive inflammation of the joints, particularly those of the hind limbs; but in some cases the inflammatory action extends along the cellular tissue to the fore legs in a forward direction, and to the abdomen, thighs and hind legs in a backward direction, the involved parts quickly becoming of a black or purple hue from mortification. Both in joint-ill and in navel-ill the condition of the blood of the mother should be improved and the navel-string of the lamb should be tied with a silk or cotton ligature and thoroughly dressed with some antiseptic lotion or liniment immediately after birth.

Lambing Fever.—Septic or erysipelatous inflammation of the womb (metritis) has its origin also, in the vast majority of instances, in a depraved condition of the blood. In some instances the affection is undoubtedly due to the local access of septic germs by the contaminated skin of the hand of the shepherd, by wounds, or by retention and subsequent decomposition of the after-birth. But, while I make this acknowledgment, I cannot too strongly express the opinion that in most cases the disease is primarily of systemic origin, and this is proved by the fact that its progress can generally be arrested by the adoption of judicious alterative treatment, by the fact that when the disease is prevalent amongst ewes, their lambs are the subjects of joint-ill and navel-ill, and by the further fact that the udder is frequently the seat of septic or erysipelatous inflammation; and, after death, by the existence of effusions and extravasations into the various tissues of the body.

Notwithstanding that I hold this opinion, I must insist upon the necessity of the application of some antiseptic lubricating agent to the hands and arms of shepherds engaged in delivering ewes as also to the passage (vagina) of the ewes after delivery, *i.e.*, when artificial aid is required, or the ewes are unhealthy.

or of certain important elements thereof, and especially diminution of its red cells (*anæmia*), in which debility is the marked feature, and in which blood medicines (phosphates, iron, and cod-liver oil) are required.

2. Those marked by *excess of the normal elements of the blood*, either of its fat-forming or flesh-producing materials, or both (*hyperæmia*), and in which congestion, inflammation and hæmorrhage are apt to occur in one or more of the important organs of the body, as the liver, lungs, and intestines; and in which some exciting cause, such as cold, is alone required to determine an attack: in these, depletives (as bleeding with laxative and saline alteratives) are required.

3. *Impoverishment and degradation of the blood* (*spanæmia*), the degraded matter being passed out by the glands of the bowels, producing *diarrhœa* or *dysentery;* or by the kidneys, producing *albuminous or bloody urine or diabetes;* in which *dropsies* are of frequent occurrence (as in *water-braxy*), and in which blood medicines, restoratives and alteratives, are required.

4. *A depraved condition of the blood*, usually due to the action of putrefactive germs producing blood poisoning (*toxicæmia*); marked by rapid effusions of water and blood into the system and rapid putrefaction, as in *stinking ill* or *red braxy;* and in which medicines are of little use, though antiseptics and stimulants may be given.

In addition to blood diseases proper we have also to notice those due to parasites.

Disease-producing (pathogenic) *parasites* form two classes, viz., *vegetable and animal parasites.*

Vegetable parasites are again subdivided into two important classes—(1) *Mould fungi* (hyphomycetes and blastomycetes); (2) *fission or cleft fungi* (schizomycetes); and in reference to these fungi the remarkable fact may be noticed that they are identical in form (morphologically) with the fungi by whose agency the various processes of decomposition of organic matter in the soil are carried on; the former class requiring a liberal supply of oxygen, are found on the surface, the latter in the deeper strata of the soil.

Those fungi which are engaged in such beneficent processes as the breaking up of organic matters for the use of vegetables are, so far as we know, *innocent* in character or non-pathogenic; but grave doubts have been entertained by many as to their innocency under all circumstances; indeed, some pathologists insist that innocent organisms do sometimes contract destructive properties and it would be difficult to prove otherwise: if there is any truth in the theory of evolution as applied to the higher there is no reason why the theory should not apply equally to the lower organisms.

The ordinary *eruptive diseases* are aphtha, eczema of the lips, and so-called carbuncle of the lip and the coronets.

Of *aphtha* or *thrush* we have two forms, viz., a benign and a malignant—the former attacking lambs usually, the latter also being seen in ewes, and when so occurring being propagated from the ewes to the lambs by the medium of the milk.

Mild aphtha is attributed to a fungus designated the "oidium albicans." The malignant form is also probably due to a fungus. The former is characterised by a whitish furred eruption in the mouth, with a little fever and diarrhœa, and runs its course quickly without producing any material injury to the system. The latter is accompanied by malignant eruptions in the mouth and on the lips, bleeding ulceration, and often great destruction, with eruptions about the body, diarrhœa or dysentery, and even putrefactive fever, and the formation of abscesses about the head and in the lungs (pyæmia).

These diseases are often looked upon as contagious in character; the truth is, probably in most cases, that they are all produced by the same cause, *i.e.*, originating outside the body.

Eczema of the lips (eczema labialis) is usually attributed to the irritation of fine particles of gravel or sand, aggravated by long-continued wet; but while recognising this as a cause, I am of opinion that in some instances it is due to indigestion or to stomach irritation, and probably to the irritating action of pollen-grain. Of itself, eczema is a mild affection. It occurs in the form of crops of small bladders (vesicles) in the lips, accompanied by some local inflammation and slight fever. If it is neglected, or the cause allowed to remain in operation, serious results may and do ensue. The lips become enormously swollen, misshapen and tender, and the skin chapped and ulcerated; small abscesses form along the sides of the face, and in the long run suppuration of the glands of the neck takes place: the lungs also become the seat of abscesses, which produce death and render the carcass not only useless but dangerous if consumed by man.

Whenever eczema makes its appearance the pasture should be changed, a little laxative and alterative medicine administered and some protective agent, such as carbolised lard, smeared over the lips of the affected animals.

Carbuncle is not of such frequent occurrence as eczema but it is common in lambs, especially during the autumn months, in certain districts. It is commonly known as "hair and hoof" and "orf"; and while the lesion is not strictly of a carbuncular character I have retained the term on account of its use being warranted by custom.

The actual nature of the disease has not yet been explained; but, judging from its characters, I am of opinion that it is due either to a depraved condition of the blood as the result of injudicious management, to irritation of the stomach and bowels, to a microscopic parasite acting locally, or to some parasitic product, such as ergot, acting systemically.

Like eczema it is ordinarily of a mild character, but if neglected it may lead to deep-seated and destructive inflammation of the involved organs; ultimately producing death by exhaustion or by blood poisoning.

The disease makes its appearance at the outset as a painful circumscribed swelling on the coronet or lip, or both. In due course ulceration of the skin results and an angry-looking sore, associated with considerable thickening of the surrounding tissues, is formed. If properly treated this sore quickly heals, but if irritated by dirt or other material it takes on unhealthy action, spreads to surrounding tissues, and becomes very intractable.

The measures recommended in reference to eczema should be also adopted in dealing with this affection.

Of the extraordinary diseases believed to be due to fission or cleft fungi, we have two forms, viz., those which are *non-contagious* and those which are *contagious*. The former are mainly the class of disease marked by putrefaction and blood poisoning (septicæmia), and which have already been largely alluded to. Contagious diseases proper, peculiar to sheep in this country, are fortunately few. So far as we know, they are largely exempt from consumption (tuberculosis), from glanders and from pleuro-pneumonia; they are, however, highly susceptible, though only secondarily, to foot-and-mouth disease, to malignant catarrh, to dysentery and to anthrax.

Malignant catarrh is often very destructive to hill sheep, especially in bad seasons, and it is very intractable. Beginning, apparently, as a simple cold, it is quickly followed by destructive inflammation of the lining of the nostrils and ulceration which is again succeeded by abscesses in the glands of the face and throat, and in the lungs; and, if the animal lives long enough, by emaciation and diarrhœa. The particular form of fungi or germs to which it is due have not yet been recognised, but that it is fungoid in origin is almost a certainty, and it is probable that the fungus belongs to the spherical form of bacteria—that it is a micrococcus.

Dysentery appears usually amongst sheep in hot summer weather with excess of moisture, and on rank pastures or on overstocked and consequently befouled pastures; and in droughty summers on lands upon which there are stagnant pools of water with rank growth of grass around their borders. Even in the dysentery of man the exact nature of the disease has not been determined but it is generally thought that it is due to a fungus. Shepherds entertain such strong views as to its contagious character as, in many instances, to lead them to smear tar on the noses of their sheep; they had better smear it on the skin under their tails, or remove them from the contaminated pastures and apply a top-dressing of lime or salt.

Anthrax—so called from a "live coal" owing to the dark colour of the local lesions—is the most deadly of all this class of diseases and does not confine its ravages to one particular kind of animal but distributes its favours impartially. So-called "red braxy" is often nothing more nor less than anthrax. The labours of biologists have made us intimately acquainted with the nature of this disease and its literature is simply enormous. Moreover, it is the disease the discovery of the character of which has led to such important results in reference to other germ disorders.

It is due to a minute staff-like organism, termed from its shape a *bacillus*, and belonging to the class of fission fungi. It is, on the whole, the largest of this class of fungi found in animals and in the blood streams and tissues multiplies only by fission, but when cultivated in proper media, or, what is of more importance to farmers, when it gains access to suitable soils, it multiplies rapidly by spores which by various agencies find their way on to vegetables grown on such soils and into drinking-water, and produce the disease in other animals that may take in the contaminated food or water. These organisms, and particularly their spores, are possessed of wonderful vitality and retain their destructive properties for a very considerable period in the earth; hence the necessity of thoroughly destroying every part of the carcass, the blood and the internal organs of animals which have suffered from the disease. It is propagable to the human subject and is known under various designations in many parts of the world. There is reason too to believe that it may be disseminated by artificial manures, and sometimes even by artificial foods, as it often appears in situations where it has never before been seen.

Black-leg is a disease somewhat allied to it but the organism that produces it is of rather a different character and it is much less virulent.

Sheep-pox is a disease probably unknown to most of the present generation of breeders and I sincerely hope it will long remain so. With the precautions at present taken by the Privy Council authorities there is little probability of its being introduced into this country, as it is purely an exotic disease.

Pleuro-pneumonia is peculiar to the ox, and no person has as yet succeeded in transmitting it to any other animal, though statements have recently been made by certain parties to the effect that sheep suffer from contagious lung disease. In a very wide experience, I have never yet met with any outbreak of lung disease in sheep the characters and cause of which warranted me in attributing to it, even in the slightest degree, contagious properties. I have been able to trace all such cases as have come under my notice to purely local causes—to, in fact, improper management in the way of feeding associated with exposure to cold and wet and to rapid alternations of temperature.

In many instances the foundation for lung disease is laid at birth, the lungs, owing to the lowering influence of cold or cold and wet, never being properly inflated. Lung disease of this class is more prevalent in some districts than others and particularly in exposed localities; and this fact points to the necessity of providing sheep, when possible, with artificial shelter in bad weather.

The animal parasites of most importance to breeders of sheep are those associated with rot, with sturdy and with hoose. Tape-worms and round worms in the intestines are also sometimes the cause of great losses.

Rot is due to a flat worm known as the fluke (*Distoma hepaticum* or *Fasciola hepaticum*), which inhabits the bile ducts of the liver and there sets up extensive inflammation from which result various organic changes, such as hardening and softening, leading in the end to annihilation of its function and, as a result, emaciation, anæmia, dropsy, diarrhœa, and death from exhaustion: in cold nights following warm days numbers die from congestion of the lungs as the result of chill.

A few of the more important features only of the worm and its life history can be here alluded to.

The worm itself is bisexual (hermaphrodite) and is propagated by eggs which are passed out with the bile and the dung in countless thousands and lodge upon the grass or other places. If the eggs fall on to dry soil, no harm results; if, on the contrary, they fall on wet places the disease is propagated to other sheep.

The egg is oval in shape, has a lid (operculum) at one extremity and contains an embryo which, when fully matured, is provided with delicate hair-like processes known as cilia. The lid of the egg-shell, partly by the agency of moisture, partly by the movement of the contained embryo, is lifted and allows of the escape of the latter when it at once begins to move actively about in search of a host in the form of a particular snail (the *Limnus truncatulus*), whose body it penetrates by the aid of a boring apparatus and there becomes encysted and during its residence therein it undergoes a series of wonderful changes in form, passing through several generations, until a tadpole like creature is produced, which after gaining its liberty encysts itself at the lower parts of the blades of grasses from whence sheep pick it up in the process of grazing; ultimately it finds its way into the liver.

Sheep are more susceptible to rot than are other animals, simply because they bite closer—a hog-mouthed sheep escapes; but cattle, and very many of them too, and occasionally in wet seasons colts also, suffer from the ravages of the fluke.

Rot is never seen on dry lands nor on salt marshes, and even rotting grounds are safe after a frost.

The lessons to be learned in reference to rot are—1st, that it cannot occur on dry lands, because there are no snails there—hence the value of draining; 2nd, that salt is a preventative, because it kills snails as also the embryos of the worm; 3rd, that rotten sheep should be at once slaughtered, their excrements mixed with lime or salt and the liver and intestines carefully destroyed. Its existence can be detected early by the victims thriving very rapidly and by the membrane of the eye contracting a yellow tinge (jaundice).

Sturdy is due to the presence of a bladder worm in the brain and is so called because the animal is stupid, a synonymous term in Norfolk being *dunt;* and if the victim turns round to one side it is known as *turn-sick*, *gid*, &c.; while, owing to peculiarities of gait, affected sheep are often spoken of as "sailors," "trotters" and "swervers."

The bladder worm, or hydatid, is the immature form of one of the tape-worms of the dog (the *Tænia cœnurus*); it is known as the *many-headed hydatid* (*Cœnurus cerebralis*) and sheep become the victims of it by taking into their stomachs, in the ordinary act of grazing, the eggs (containing embryos) of the tape-worm.

The embryo ultimately finds its way to the brain either by the circulation or by boring, and sometimes it gains access to the spinal cord in the neck and produces the condition known as "*thorter-ill*."

From the fact that in some districts a very large number of cases of sturdy are seen I have been led to form the opinion that there must be some other host of the particular tape-worm than the dog, and of all animals the fox is the most likely.

The treatment of sturdy is often very successful, both by simple tapping and by extraction of the bladder-worm, but it is simple madness to allow a sheep to pine away with the disease, as many do, until it is useless; better by half kill it as soon as it shows symptoms of the disease and make the best of it.

As to the prevention of sturdy, the first and most important thing to do is to carefully destroy the brains of affected sheep instead, as is often done, throwing the "bleb" to the dog to eat; and secondly, to keep dogs as free from tape-worm as possible.

Hoose is due to a round worm (the *Strongylus filarius*) which when mature resembles a piece of white thread and the female of which is about $1\frac{1}{2}$ to 2 inches long. It inhabits the windpipe and bronchial tubes but its embryos gain access to the deeper parts of the lungs and there set up much irritation and patchy inflammation.

In the lungs of thousands of sheep, not only native but American also, killed in our slaughter-houses numerous small nodules of a yellowish colour and about the size of a millet seed are seen; these have often been mistaken for tubercle (consumption) but the microscope reveals the embryonic parasites in their interior.

The development of the worm is not understood; one thing however is certain viz., that salt spread over the contaminated pastures is a sure preventive; drainage also is useful but sheep should not, if it can be avoided, be put on infected fields.

The lungs too of affected sheep should be destroyed instead, as is often the case, being sold or used as food for people or for cats. Cooking certainly kills the parasites if it is effectually carried out.

Many sheep suffering from hoose die from debility induced by diarrhœa; others die from suffocation and many from congestion of the lungs, if exposed to a chill.

Another round worm, the twisted strongyle (*Strongylus contortus*), is often the cause of great loss amongst sheep. It is a small worm like a piece of red thread and is found clinging, by the aid of barbs, to the membrane of the fourth stomach, there causing inflammation, diarrhœa, emaciation and death.

It is most seen on old pasture land where there is plenty of fog for cover and this fact points to the necessity of removing the fog from such pastures by burning or by chain-harrows. Top-dressing with lime or salt should also be practised.

The only tape-worm of importance found in the sheep is the *Tænia expansa*, but it is questionable if it does much harm and I have seldom found it unassociated with other parasites.

In conclusion, I would say that no man can be a successful sheep farmer unless he has some knowledge of the structure of the animals he deals with (histology) or of the functions of the different organs of its body (physiology); like the machinist, he must not only make himself acquainted with the wheels and pistons and cranks of his machine, he must know its every fibre; and even as machines are easily deranged so sheep are "kittle cattle"; no more delicate animal breathes.

In addition to the above, the farmer must have a knowledge of the chemistry as well as of the practice of agriculture and if disease makes its appearance amongst his flocks he should at once seek the aid of some one better versed in these matters than himself.

CHEMICAL DEPARTMENT.

REPORTS by Dr A. P. AITKEN, Chemist of the Society.

ANALYTICAL ASSOCIATIONS.

The first grant given by the Society in aid of the expense of analyses made for members of local analytical associations by their respective chemists, was in 1881, when the sum of £54, 10s. was paid for 221 analyses. There were many more analyses recorded that year, but they had reference to substances bought entirely without a guarantee, and therefore disqualified from obtaining the Society's grant. On looking over the kind of guarantees that were in vogue, and regarded as satisfactory eight years ago, it is surprising to find how many of them were so deficient as to be of little or no use, and how many were actually misleading in their terms, and therefore worse than useless. But taking the guarantees as they were, good and bad alike, it is still more surprising to find that out of the whole analyses recorded, not so much as three-fourths were sufficiently up to their guarantees to satisfy the present requirement of the Chemical Committee, so that, had these returns been made last year, it would have been found necessary to publish in the *Transactions* the details of about sixty deficient manures and feeding stuffs.

Deficient Manures in 1887.

The number of analyses for which the Society has given grants this year is 182. The guarantees of all these purchases are expressed in set terms, which are clear and unmistakable; the quality of the material supplied is in the great majority of cases above, instead of below, the guarantees; and out of the whole number there are only two which are so deficient from their guarantees as to require that, in accordance with the Society's regulations, the details should be published.

It is evident that a great amount of education has been going on to account for this extraordinary change. Farmers are finding out that the way to purchase manures safely and economically is to do so in accordance with the rules and instructions published in the memoranda of the Chemical Department of the Society. Manure merchants have also been taught to give greater attention to the quality of the goods they sell, and manufacturers are putting their raw material and their products under more rigid control. Considering the variety of the raw materials they have to deal with, and the difficulty frequently experienced in their manufacture, it says a great deal for the care and attention bestowed by manufacturers, that out of so many manures supplied to all parts of the country, there should be only two which fall below their guarantees so far as to require the Chemical Committee to make special mention of them. The following are the two substances referred to :—

	Associations.	Manure.	Guarantee.	Analysis.	Price.	Value.
					£ s.	£ s.
1	Carse of Gowrie,	Turnip manure.	Soluble phosphate, 23·50 Insoluble ditto, . 2·00 Ammonia, . . 1·75	16·12 7·20 1·93	5 10	3 9
2	Lanark,	Superphosphate.	Soluble phosphate, 25·00 Insoluble ditto, ...	20·47 8·00	2 5	2 1

No. 1 was a sample of turnip manure supplied by Messrs Prentice Brothers, Stowmarket. It was found to contain nearly one-third less soluble phosphate than was guaranteed, and it was sold at a price much in excess of its value. They explain the deficiency in the following letter to the secretaries of the association and the Society :—

Stowmarket, 31*st December* 1887.

Alex. Anderson, Esq., Berryhill, Dundee.

Dear Sir,—Mr Andrew A. Dudgeon has handed us your letter of the 26th ult. for our reply.

We do not think you seriously mean to make a note in the Highland Society's *Transactions* of the matter referred to in your letter !

There was a discrepancy in the analysis of the turnip manure, owing to a serious mistake made at our stores from which the manure was sent, but the whole transaction has been satisfactorily cleared up with Mr Powrie, *and he has accepted an allowance* which we have made him, owing to the short analysis.

The manure sent him was inadvertently dispatched from a heap of old stock of turnip manure which was lying in the stores, and which had been damp, and thus had slightly deteriorated in quality. We had in the store the turnip manure which was sent there *this season*, and the analysis of *this heap comes fully up to our guarantee, and this is the manure which should have been sent Mr Powrie.*

You will therefore see that we have not sent out manures from our factory under guarantee, but owing to a mistake made by our storekeeper the old stock was sent instead of the new.

The matter has been amicably settled with Mr Powrie, and we think you will see it is hardly fair to us that your Society should publish it. We trust you will see it in this light.—We are, yours faithfully,

PRENTICE BROS.

F. N. Menzies, Esq.,
Secretary H. & A. Society, Edinburgh. *Stowmarket*, 24*th Feb.* 1888.

Dear Sir,—We have had a communication from the Carse of Gowrie Analytical Society, referring to an analysis of a manure said to have been drawn from manure of ours, delivered by an agent to a Mr Powrie, farmer. I went and investigated the matter last June, as I happened to be in Scotland at the time, but I was abroad in Mauritius and Egypt when we were asked for an explanation, so I fear the matter has been left in a wrong position, as our reply during my absence did not point to the real facts.

I was told recently by our Dundee agent, Mr A. Dudgeon, who sold manure to Mr Powrie, that the analysis would be published in this year's *Transactions;* but I think you will hardly think it fair to do so under the circumstances.

On investigating the matter last June, I found that two members of the said local society called at Mr Powrie's without invitation, and, seeing some manures, asked his permission to take samples. Mr Powrie consented. I do not think the samples were taken on that occasion, but in meantime Mr Powrie saw our agent, Mr Dudgeon, and told him that he was getting the manure tested, but did not explain that he should be present or fix any date—in fact, the intimation was a hurried, offhand affair. So the sample was drawn, and I ascertained that not even Mr Powrie, the purchaser, was present, and, worse than all, the samples, of which I understand two were taken, were not sealed, for I asked for the duplicate sample; but finding it was not sealed, and as there was no satisfactory proof of it being our manure, I declined to take any steps with it.

Now, I hardly think the Highland and Agricultural Society will countenance analysis conducted in this loose and irregular fashion, much less publish the result. We cannot claim to be infallible, but we know that not an ounce of manure leaves the works here which is not fully up to the guarantee.

I hope you will kindly have this matter inquired into, and save my firm from very grievous loss.—Yours truly, ROBERT BELL.

No. 2 was a superphosphate sold by Mr R. G. Murray, Spittal, Biggar. It is simply a case of a superphosphate insufficiently dissolved. The seller explains that it was bought by him from the manufacturers, who forwarded it direct from their stores, and that he sold it under the identical guarantee that he had received from the manufacturers without having even seen the manure. In these circumstances, he considers that, if there is blame attachable to any one, it should be to the manufacturers, and not to himself, who acted only as an intermediary in the transaction. This is not the view entertained by the Chemical Committee. They are clearly of opinion that the seller of a manure is directly responsible to the purchaser for the quality of the stuff he sells, whatever be the medium through which he supplies it, and that it is his duty to ascertain that it is up to the quality he guarantees. A purchaser buys a manure relying upon the respectability and responsibility of the seller, and it does not concern him to know from what source the seller obtains his supplies.

Feeding Stuffs.

It is a notable feature of the returns made by the associations last season, that they contain very few analyses of feeding stuffs—only 12 out of 182—and all these are samples of linseed cakes sold under an analytical guarantee. It would be interesting to know what proportion these twelve linseed cakes bear to the total number of feeding stuffs analysed for the associations;

probably only a small fraction. Unless feeding stuffs are sold under an analysis, the Chemical Committee do not now give grants for them, and therefore associations do not report them. In some years grants were given for analyses of feeding stuffs. whose only guarantee was that they were *pure* or *genuine*, or something of that sort; but it was found that cakes and meals guaranteed in that way varied enormously in their composition, and that the commercial standards of purity were of a very fluctuating kind, so that buyers who were content with such guarantees had no security that they were getting value for their money. Owing to the fact that the Society does not give grants for feeding stuffs bought without an analytical guarantee, the record of such purchases does not come so frequently under the notice of the Chemical Committee as it did in former years. There is no reason to believe, however, that any material change in the character of the feeding stuffs supplied has occurred during the last few years, and one has only to refer to former reports regarding the feeding stuffs supplied to the associations to be assured that much loss is incurred in the purchase of these materials. Such loss is not liable to be so great as that which may occur through the purchase of inferior manures, for the effect which the fodder has upon the progress of the stock consuming it affords a practical means of estimating its value, and any deficiency in a feeding stuff is much more easily and rapidly remedied than is possible in the case of inferior manures. When an inferior manure has been applied it affects the whole produce of the crop for that season, but a feeder can alter the quality of his fodder from week to week; and if he finds that his stock are not progressing according to his anticipation, he can increase the quantity or alter the dietary, so as to attain the effect he desires. But such increase of quantity is attended with expense, which may seriously diminish his profits. It is no uncommon thing to find two samples of cake selling at the same price, and yet the one containing 20 per cent. more nutriment than the other. The merchant who sells them may know as little about their composition as the farmer who buys them, and he may derive as little profit from the one as from the other. He may have bought them from the maker, or imported them under a guarantee of purity or under a brand, and may know nothing about their composition. Having received no guarantee, he gives none. It is evident that there is need of education regarding the value of feeding stuffs, and that farmers are not so well skilled in their purchase as they are in the purchase of manures.

There are few good farmers who have not a fair knowledge of the quality of the manures they require for their various purposes, and they can tell perhaps what are the proportions of phosphates, potash, and ammonia, and the forms of those substances best suited for their land and their crops; but there are not so many who can tell what are the proportions of albumen, oil, and carbohydrates contained in their fodder, or what are the proportions required so as to produce the best results at the cheapest rate. That is a knowledge that can be only slowly acquired, but the first step to its acquirement is to know what are the proportions of these ingredients contained in the feeding stuffs they buy. The inducement to acquire such knowledge is much greater in the case of feeding stuffs than in that of manures, for the effects are far more under control. It is one of the disadvantages of manuring that what may suit one season does not suit another, and the best calculations are liable to be upset by various climatic conditions. But in the case of feeding stuffs a farmer can weigh to a pound the quantity of fodder consumed by his cattle and the amount of live weight produced from it, and if he only knows accurately the constituents of the fodder he is weighing he will be able to regulate the dietaries of his stock in a perfectly intelligent and definite manner. If the specific effects produced by the constituents of fodders were better known, there would be more freedom of action on the part of feeders, and a greater variety of feeding stuffs would be brought into use than is at present the case. No better illustration of that could be found than what is afforded by the nature of the feeding stuffs recorded by the associations this year. They were all linseed cakes. That substance has got a name and reputation which makes it the favourite, apart from all other considerations; but there are many feeding cakes and meals in the market which might be profitably used as concentrated fodders were farmers only familiar with them. They do not know how to value them according to the proportions of the nutritive constituents they contain, and they therefore prefer to adhere to the time-honoured use of linseed cake. It may be that there is no better feeding stuff than linseed cake, but that is a matter which cannot be proved until other substances are used alongside of it, and compared with it in an intelligent manner.

The Valuation of Feeding Stuffs.

In order to supply much-needed information on this subject, a short description of the various kinds of feeding stuffs has this year been included in the memoranda of the Chemical Department, and will be found on p. 38 of Appendix B. In addition to that, the following list of the more important feeding stuffs in common use, along with their composition, and their average price during the last three months, has this year been inserted in the Society's valuation scheme (see Appendix B, p. 44). One reason why farmers do not look sharply after the composition of their feeding stuffs is that they have no standards with which to compare them, so that they are not able to tell from the analyses whether their purchases compare well or ill with the average quality of such feeding stuffs in the market. It is hoped that the following list, in which the average composition of a few of the most common feeding stuffs is described, will go far to remove that difficulty:—

Feeding Stuffs.					Units.		
	Guarantee.			Price per Ton.	Ratio of Alb., Oil, and CH = as 5:5:1.		
	Album.	Oil.	Carbo-hydrates.		Alb.	Oil.	CH.
Linseed cake, . .	28	10	35	£7 7 6	3/4	3/4	8d.
Decorticated cotton cake, . .	40	14	20	6 10 0	2/3	2/3	5d.
Undecorticated cotton cake, . .	24	7	25	4 15 0	2/8	2/8	6d.
Hemp cake, . .	30	7	17	4 15 0	2/4	2/4	6d.
Rape cake, . .	32	10	27	5 15 0	2/3	2/3	5d.
Rice meal, . .	12	12	46	4 12 0	2/8	2/8	7d.
Locust bean meal, .	6	2	70	5 15 0	5/	5/	1/
Rye meal, . .	13·5	3	63	4 14 0	3/3	3/3	8d.
Indian corn, .	10	5	68	6 0 0	4/2	4/2	10d.
Paisley meal, .	15	9	60	4 12 6	2/3	2/3	6d.
Linseed (whole), .	20	35	14	10 17 6	3/9	3/9	9d.
Linseed oil, . .	...	...	...	20 0 0	...	4/	...
Molasses, . .	...	...	...	6 5 0	...	...	...

An attempt has been made to frame a scale of units applicable to the valuable constituents of feeding stuffs, by which the market prices of these substances may be estimated as soon as their chemical composition is known.

The principle upon which the units are determined requires a little explanation. It is assumed that the carbohydrates in a cake or meal—viz., such substances as starch, sugar, and mucilage—have only one-fifth the value of albumen or oil, so that the ratio of albumen, oil, and carbohydrates is put down as 5 : 5 : 1. Whether that is a fair ratio for valuing the ingredients of a concentrated fodder is a question on which there may be considerable difference of opinion. There is no one definite ratio which alone is the right one, but the relative values put upon the ingredients of feeding stuffs may vary according to a variety of circumstances. In the first place, there is their nutritive effects, which of course will vary according to the kind and condition of the animals consuming it and other conditions; and in the second place, there is the relative price of the ingredients when bought separately, or the relative prices of feeding stuffs in which one or other of the ingredients greatly predominate. When the rough fodder, which forms the great bulk of an animal's food, is rich in carbohydrates, the kind of concentrated fodder which a farmer wants is one rich in albumen; when it is deficient in oil he wants a bye-fodder rich in that ingredient, and the scarcity of an ingredient in rough fodder enhances its value in bye-fodders. The rough fodder of cattle is usually rich in carbohydrates and poor in albumen and oil. Considerations such as these influence one in fixing a fair ratio for the value of the albuminoids, oil, and carbohydrates in feeding stuffs, and the ratio of 5 : 5 : 1, which has been for some time in use on the Continent, seems a reasonable one for that purpose.

A comparison of the units got in that way will show what are the relative prices paid for the constituents of the various feeding stuffs. It will be seen that linseed cake, which is the favourite feeding stuff, is rather a dear one. The valuable ingredients contained in it cost half as much again as those in decorticated cotton cake, rape cake, and Paisley meal. Owing to the abundance of carbohydrates in Indian corn and locust bean meal, the unit values of the albumen and oil in these substances compare very unfavourably with those in the other kinds of concentrated fodder. It may be that these substances are made to compare rather unfairly with the others, and that the carbohydrates, which are the principal ingredients in these fodders, are somewhat undervalued. The relative feeding value, as well as the manurial value of the various kinds of feeding stuffs, are matters which must be decided by experiment; and it would be of great benefit to agriculture if a series of experiments were carried out on various farms to provide data which would lead to accurate views on that subject.

The mere making of an experiment, and keeping an accurate record of it, is in itself an interesting and valuable exercise; but when any line of investigation is simultaneously adopted by a number of experimenters the united records of such observations supply a body of fact which would do much to promote the progress of agricultural science. If a number of comparative experiments were made with a series of bye-fodders on various classes of stock and in various parts of the country, and if accurate notes were kept of the progress of the stock under the different systems of feeding, we would have no difficulty in classifying such substances as are contained in the above table, and in valuing their ingredients, and we should soon acquire a sound knowledge of the circumstances most appropriate for the use of each.

Experiment Clubs.

With the view of advancing agricultural knowledge in this way, and also with the view of bringing the Chemical Department into more intimate relation with the wants of agriculture in the various districts of the country, the Society is desirous that a number of local *experiment clubs* should be organised to carry out experiments useful to the locality; that these experiments should be undertaken by the different members of a club, each at his own farm; and that they should be under the supervision of a local committee of members appointed for the purpose. In the event of such clubs being formed the Chemical Department will assist the members of the club in every way they can. The Chemist will visit the locality, and co-operate with the members in arranging the experiment in such a manner as to secure useful and trustworthy results. All chemical analyses in connection with the experiments, and approved of by the committee, will be undertaken by the Society's chemist. The Society will also assist in defraying any extra expense incurred in superintending the experiments, and will provide printed instructions for carrying them on, and all necessary schedules for registering the results.

As regards the nature of the experiments which might profitably be taken up by such clubs, the committee have no desire to dictate. They would prefer that each club should decide for itself what is the kind of experiment the members would like to try. These might be experiments in manuring for special crops, or for special purposes; the improvement of land or of pasture; the laying down of pasture; the management of grass and other crops on stock farms; the preservation of crops in different ways; or they might be feeding experiments, such as have been already referred to; or the cultivation of new crops; or the utilisation or economising of waste substances; or any kind of experiment whatever in which the resources of the Chemical Department and its operations can be of service to the members.

COMPOSITION OF FEEDING STUFFS ANALYSED IN 1887.

Linseed Cakes.—The great majority of oil cakes analysed for members of the Society were called linseed cakes, and the following was their composition:—

No.	Albuminoids (N × 6·25).	Oil.	Carbo-hydrates.	Woody Fibre.	Moisture.	Ash.
1	23·40	12·10	30·42	10·30	15·45	8·25
2	23·26	11·35	37·19	9·10	12·60	6·50
3	22·15	11·75	37·15	9·00	14·30	5·65
4	23·93	10·00	38·37	8·10	14·20	5·40
5	22·59	12·25	34·86	9·15	15·20	5·95
6	26·35	7·40	36·85	9·25	12·30	7·85
7	24·72	9·40	35·88	9·00	14·75	6·25
8	23·85	9·45	35·50	9·95	12·20	9·05
9	20·90	12·20	34·65	10·25	13·50	8·50
10	27·47	8·57	37·12	8·57	10·35	7·92
11	25·92	11·63	34·67	8·83	12·65	6·30
12	23·17	14·45	37·81	7·32	11·40	5·85
13	35·13	7·66	36·04	5·57	10·40	5·20
14	22·47	14·00	36·61	7·35	12·72	6·85

It has been noticed that during the last three years there was a great falling off in the amount of oil contained in linseed cakes. The improved crushing machinery recently introduced enabled the oil-crusher to extract the oil more thoroughly than he had previously been able to do. The result was the production of a very hard cake, poor in oil but rich in albuminoids. Feeders complained that the linseed cake so made was not so good feeding material as the old-fashioned kind, and the deterioration was attributed to the want of oil. That the want of oil had much to do with it there need be no doubt, but the hardness of the cake was sufficient to account for much of its inferiority as a feeding stuff. It has been noticed that, even when such cakes are crushed before being presented to cattle, they are only imperfectly masticated; so that there are many little lumps of cake that pass through the alimentary tract protected by their mucilaginous coat, and escape digestion altogether. Some specimens of hard-pressed cake which came under my observation were of such stony hardness that it seemed inevitable that they must either be refused by cattle, or, if eaten, remain in great measure undigested by them. Such cakes are not given to cattle without considerable risk of injury to their health, and farmers should be cautioned against their use. They cannot be economically consumed by cattle until they are ground to meal. These cakes are rich in albuminoid matter, though they are poor in oil; and it has been the practice of some crushers for some years back to grind them, and after mixing the meal with other substances, such as locust bean meal or maize meal, and perhaps adding a small proportion of some condimental flavouring material, to manufacture what are called *compound cakes* or *improved cakes*.

The improvement in the softness and texture, and also in the palatability of the cake, is undoubted, but such mixed cakes are still more deficient in oil than the hard-pressed cake which formed the basis of their manufacture. Regarding the feeding value of compound cakes in comparison with other concentrated fodders, some experiments are wanted, and we have much to learn on that matter. Considering the great variety of oil seeds that are now available, such as palm kernel and candle nut, containing as much as 50 and 60 per cent. of oil, there should be no difficulty in manufacturing compound cakes of standard composition; but whether such compounds would be as economical feeding stuffs as linseed cake is a question that must be decided by experiment.

There is always a certain amount of risk in dealing with such mixed substances, for they are apt to be very inferior mixtures. The buyer does not see so well what he is buying, and he has to depend very much upon the honesty and accuracy of the manufacturer, or else to have his purchases put under strict microscopic and analytical examination. Nevertheless, it must be pointed out that there is no security against buying inferior material in the purchase of what is called linseed cake. Even what is called *pure linseed cake* may, and frequently does, contain a considerable proportion of other matters which require microscopic examination for their detection, and seeing is not believing with linseed cakes any more than with bone meal. The microscope gives most reliable information regarding the kind of impurities contained in cakes, but it cannot be trusted to give any sure gauge of their quantity. For that purpose chemical analysis must be had recourse to.

If we apply the test of chemical analysis to the "linseed cakes" whose composition is given in the above table, we see that most of them are mixtures.

Their average composition is $24\frac{1}{2}$ per cent. of albuminoids and $10\frac{3}{4}$ per cent. of oil; but that is not the composition of genuine linseed cake. There is a fair amount of oil, and if we may regard them as representing the average supply, it would seem that either the deficiency of oil that was complained of is now being guarded against by manufacturers, or that farmers have been careful to see that the cakes they bought were not deficient in that constituent. There are only three samples that are much deficient in oil, viz., Nos. 6, 8, and 13. No. 8 is a genuine hard-pressed linseed cake, but the other two are not genuine. No. 6

does not contain enough albuminoid matter to be genuine, and No. 13 contains too much. We can tell that by referring to the composition of linseed itself.

The average samples of linseed supplied in the market contain 20 per cent. of albuminoid matter and 36 per cent. of oil. The composition of the seed fluctuates somewhat according to the district it comes from, and according to the conditions of its growth; but if the linseed is pure, these fluctuations are not very great. When oil is extracted from the seed the residual cake is richer in albuminoid matter in proportion as the amount of oil extracted is greater. Taking 20 per cent. of albuminoids and 30 per cent. of oil as our basis, we can easily calculate how much albuminoid matter a cake should contain when we know how much oil is left in it. The following table expresses the amount of albuminoid matter which corresponds to certain percentages of oil in an average sample of commercially pure linseed cake:—

When Linseed Cake contains of Oil,	It should contain of Albuminoids about
7 per cent.	29 per cent.
8 "	$28\frac{3}{4}$ "
9 "	$28\frac{1}{2}$ "
10 "	28 "
11 "	$27\frac{3}{4}$ "
12 "	$27\frac{1}{2}$ "
13 "	27 "
14 "	$26\frac{3}{4}$ "

If we apply this test to the analyses given above, we find that almost all the so-called linseed cakes are deficient in albuminoid matter. It is evident, therefore, that they are either made from impure linseed, or that some other substance has been added in the process of manufacture.

If the analyses given above may be accepted as representing the average character of the linseed cakes in the market, it is not so much the want of oil that denotes them as the want of albuminoids. So far as my experience goes, there are very few pure linseed cakes in the market, and microscopic examination shows that this is not so much due to the crushing of impure linseed as to the addition of other substances, chiefly locust bean meal. The effect of adding locust bean meal to linseed cakes is to diminish the proportion of albuminoids and oil, and to increase the proportion of carbohydrates. The reduction of the proportion of albuminoids diminishes the concentration of the fodder, but it is not without its compensation, for the carbohydrates added consist largely of sugar, which is easily digested, and the meal adds flavour and palatability to the cake. It must not be forgotten, however, that the object in view in using feeding cakes is to increase the proportion of albuminoids and oil in the dietary of stock, and not to increase the carbohydrates, which already form the predominant constituent of the rough fodder, such as turnips and straw, which constitutes the bulk of their food.

As regards deficiency of oil, it would appear that it is not so much in the so-called linseed cakes that it is felt now-a-days as in some other cakes less commonly employed for feeding. The following list shows the composition of some of those analysed for members during the past year:—

	Albuminoids.	Oil.	Carbohydrates.	Woody Fibre.	Water.	Ash.
Sesame cake, .	40·95	7·50	24·15	4·2	12·05	11·15
Niger " .	36·35	5·60	23·75	17·15	8·65	8·50
Cotton " .	20·51	6·00	38·00	16·99	11·60	6·90
" " .	20·77	5·65	33·03	20·00	15·70	4·85
Compound cake	20·67	8·05	43·86	7·62	12·35	7·45
" "	22·62	6·56	39·98	8·54	14·10	8·20

Poor as the last four cakes are in oil and in albuminoids, they are not to be despised as bye-fodders. They are very well adapted for young stock and lean cattle, and are capable of being fed to them with greater economy and safety than more concentrated feeding cakes, for the risk of waste, and even of injury, increases with the concentration. The advantage or otherwise of using compound cakes depends in the first place upon the composition of the cakes, and next upon the kind of stock that are eating them, the stage of progress they are in, and the character of the rough fodder that the cakes are intended to supplement. It is not a subject on which one may dogmatise, but it is rather one for experiment, and it would be of great advantage if careful comparative experiments were made by feeders and the results duly recorded.

STACK SILAGE MADE FROM BRACKENS.

During the past year several samples of silage made from the common bracken have been analysed in the laboratory.

A sample sent by Sir James Stewart Richardson of Pitfour, Bart., had the following composition:—

Moisture, ...	73·59
Solids, ...	26·41
	100·00

Solids dried at 212° F.—	
Albumen,	12·34
Non-albuminoid nitrogen × 6·25,	4·84
Carbohydrates, &c.,	45·62
Oil (ether extract),	4·20
Woody fibre,	23·70
Ash,	9·30
	100·00

The chief characteristic of this silage is the large amount of albumen it contains. In this respect it is not excelled by any samples of silage that have come under my notice. The silage that most nearly resembles it is that made from mixed ryegrass and clover. It cannot fail to excite surprise that such a substance as bracken, which has hitherto been regarded as a useless and troublesome weed, difficult to eradicate and injurious to pasture, should be found to have the composition of the choicest cultivated fodder.

Although the analysis of bracken resembles that of clover hay, it may reasonably be doubted whether it is as nutritive a fodder. The relative digestibility of the two fodders can be satisfactorily tested only by means of feeding experiments, which I hope will be carried out next winter. I am informed that the stock to which this silage was offered ate it readily and throve on it.

The experience of Mr Robert Stewart, Culgruff, who made a stack of bracken silage last autumn, is confirmatory of the value of the fodder. His stock ate it with much relish, and consumed the whole of it. Unfortunately, it was all eaten some time before I applied for a sample, so that I cannot give an analysis of it. It would probably not differ much from the composition of the Pitfour silage, for another sample sent by Mr Calder, Halterburn, resembled it very closely. The following is the analysis of that sample:—

Moisture,	72·75
Solids,	27·25
	100·00
Solids dried at 212° F.—	
Albumen,	12·85
Non-albuminoid nitrogen × 6·25,	0·89
Carbohydrates, &c.,	53·11
Oil (ether extract),	3·00
Woody fibre,	23·10
Ash,	7·05
	100·00

In external appearance this sample closely resembled the Pitfour sample. It was of a dark brown colour approaching to black, and had been subjected to a high temperature in the stack, viz., 140° F., but it differed from the Pitfour sample in one important particular; it was interpenetrated with mould, which appeared as little specks all through the mass. Mr Calder reports that his cattle refused to eat it, and there can be no doubt that the cause of that repugnance was the presence of mould, which had apparently attacked the silage long after it had been successfully made.

The making of bracken silage may require more than usual care, and it is fortunate that the first attempts have not all been failures. Mr Stewart, Culgruff, adopted a method which was entirely successful, and it has the advantage of being very simple. It is not exactly a stack which he makes, but a plum-pudding shaped mass which he treads down with horses. He describes it thus:—In making bracken silage "my experience is that a plum-pudding shaped mass is better than a stack, as there is not the least waste. The base of the mass must be large enough to allow a couple of horses to walk round and round—about the size of an ordinary horse-power circle. The outside of the horse track will be found not to be well pressed. I simply use a hay knife to cut off this part, and I strew it on the top of the mass. Of course, I choose a place where stones are abundant, and where one side is higher than the other, so that the horses may go easily on and off. Horses are not a necessity, but they tramp it better than men, and make the mass much firmer. So long as the stuff is evenly spread, and plenty of weight put on the top, it will keep. I heap up earth all round, and then the stones begin. If a farmer puts up only ten tons, he should make a plum-pudding heap, and after covering the bracken with rough straw or rushes or even old bags, he should cover it over with twelve inches of earth." There is one important point to be attended to in making bracken silage, and the whole success of the operation depends on it—the ferns should be cut while young and juicy, before the curl has gone off the leaf. If the plant is allowed to grow, and spread out to its full extent, the leaf is hard and leathery, and the stem is much too dense to make into silage. A sample of bracken silage sent me was of this kind, and it never heated in the stack, but turned out a kind of bracken hay.

I made an analysis of it, so as to compare it with the samples given above, and find its composition to be as follows:—

Moisture, ...	53·54
Solids, ...	46·46
	100·00

Solids dried at 212° F.—	
Albumen,	8·51
Non-albuminoid nitrogen × 6·25,	2·79
Carbohydrates, &c.,	50·17
Oil (ether extract),	2·35
Woody fibre,	28·30
Ash,	7·88
	100·00

It will be seen that the result of leaving the bracken growing so long is to diminish the amount of albumen and to increase the amount of woody fibre. The carbohydrates are also increased, but the quantity of the albuminoids and carbohydrates is not of so much importance as their quality: their digestibility and the practical test of feeding is required to settle the value of bracken and bracken silage as a fodder. There is a very natural antipathy to cutting a plant before it has attained its full size. It seems an extravagant practice, but that is a sentiment that must be got over. The indulgence of that sentiment spoils the feeding quality of a large proportion of the hay that is annually cut in this country, and if it does so in the case of a tender crop like ryegrass, it will do so to a far greater extent in the case of a hard crop like bracken. It is probable, however, that even fully-grown bracken might make good silage if cut fine with a chaff-cutter; and it may even be found that bracken hay, if finely chaffed and fed with pulped turnips, or steamed, so as to be easily masticated, might be found to be a very nutritious diet.

Grass Silage.—The following is the composition of three samples silage from the silos at Portmore:—

No. 1 is sweet silage, from Whinny Knowe field at Harcus.
No. 2 is somewhat sour, from Denhead field, Earlypier.
No. 3 is sour silage, from Borland Meadow.

	1.	2.	3.
Moisture,	52·40	70·94	78·57
Solids,	47·60	29·06	21·43
	100·00	100·00	100·00
Solids dried at 212° F.—			
Albumen,	4·87	4·65	4·76
Non-albuminoid nitrogen × 6·25,	1·78	1·55	2·33
*Carbohydrates, &c.,	57·11	56·05	51·85
Oil (ether extract),	5·63	5·92	6·08
Woody fibre,	24·31	25·52	26·09
Ash,	6·30	6·31	8·89
	100·00	100·00	100·00
*Containing sugar,	5·08	0·32	trace.

As compared with bracken silage, these samples are low in albumen, but they are higher in carbohydrates and oily matters. Whether the excess of these two constituents would be sufficient to make up for the deficit in albumen it would require direct experiments to prove. It seems probable that the bracken hay would prove the superior fodder.

EXPERIMENTAL STATIONS.

PUMPHERSTON BARLEY CROP, 1887—UNEXHAUSTED FERTILITY DERIVED FROM THE APPLICATION OF LIGHT MANURES.

For the second time in succession a crop has been grown on Pumpherston station without manure, in order to show the relative amounts of residue left by the various manures applied to the plots during two rotations of four years each. The crop grown without manure in 1886 was turnips, an account of which is given in the previous volume of the *Transactions*, p. 237, and in 1887 it was barley. The falling off in the turnip crop was very great, and, judging from the weight of the crop, there seemed to be a very small amount of plant food left as a residue from the liberal manurings given in former years. The apparent rapidity of the exhaustion was so great that it did not seem as if there would be sufficient traces of former manures left to materially affect the growth of the barley crop. It will be seen, however, that the exhaustion has not been so rapid as the results of the turnip crop led us to believe. It is evident, from the figures contained in Table II., that the barley crop has been able to make much better use of the manurial residues than the turnips grown in the former year. The differences in the amount of crop on the various plots is even more marked than formerly, and it is certain that, if the season had not been quite so dry, the differences would have been still more conspicuous. The results obtained with these two crops serve to illustrate very well the chief defect of light manures when they are exclusively relied upon for the growth of crops, especially on soils that are a little stiff in their texture. They tend to consolidate the soil, or at least they do nothing to open it up in the way in which dung and other heavy manures do; and thus the roots of the young crop are retarded in their growth at the stage when they are few and tender, and they therefore lose time at the very season when it is most important that they should rapidly establish their roots, so as to take full advantage of the warm growing weather when it arrives. The season of 1886 was very favourable for the growth of turnips on land fairly well supplied with moisture, as land is that has had dung ploughed into it; but on light dry land the crop was deficient and blanky. The drought which occurred in July of that year told pretty severely on the crop in many places, and very much retarded the crop on the unmanured soil of the Pumpherston station. The consequence was, that the roots of the crop did not get a sufficient hold of the soil to enable them to make good use of the residual manures contained in it, and the crop was, therefore, not a favourable one for enabling us to form a fair estimate of unexhausted fertility.

The season of 1887 was remarkable for its dryness, and on that account produced a shorter growth of straw than has occurred for many years. As might be expected, the drought was very keenly felt on the unmanured land of the Pumpherston station; and once again we are prevented from duly estimating the relative amounts of unexhausted fertility derived from the various manures applied in former years. Nevertheless, we are in a better position to do so than we were during the former year, for barley is a strongly rooting crop, and the rainfall in April was favourable to the germinating of the seed. But for that latter fact the crop would have been a failure. The quality of the barley grown in 1887 has seldom been surpassed, and the quantity of grain per acre was not much, if at all, below average. It was only the straw that was very deficient. The record of the rainfall during the growing season at Pumpherston supplies some useful information on this point. It was as follows:—

	April.	May.	June.	July.	August.
1st week, . .	...	...	·38	·43	·51
2nd week, . .	...	·17	·21	·54	·43
3rd week, . .	...	·94	...	·26	...
4th week, . .	1·21	·43	...	1·63	...
Inches, .	1·21	1·54	·59	2·86	·94

The total rainfall from the time of sowing till the harvest was thus 7·14 inches. This may be considered a normal rainfall for that period of the year, but its distribution was quite abnormal.

The crop was sown on 9th April in fine dry weather, and for a fortnight thereafter no rain fell. Fortunately, however, there was a copious rainfall on the last week of the month, which enabled the seed to germinate. A fortnight of drought succeeded, whereby a great amount of moisture evaporated from the bare ground, and the growth of the braird was somewhat retarded. The rainfall during the third and fourth weeks of May and the first week of June may be said to have saved the crop, but a fortnight of drought which succeeded checked the growth of the straw. The showers during the first part of July could not do much more than refresh the growing plant, and the high temperature and unusual amount of sunshine caused the ear to fill and mature, and brought on an unusually early harvest. The wet weather during the last week of July came too late to increase the straw, but the prevalence of sunshine and shower was beneficial in increasing the growth and weight of grain, so that, despite the shortness of straw, the amount of grain per acre was little if at all diminished, and its quality was exceptionally fine. Had the rainfall in June and July been interchanged, there would have been a growth of barley, both as regards grain and straw, that would have left nothing to be desired, and we should have been far better able to judge of the amount of unexhausted manures lying in the soil of the Pumpherston station. Owing to the unfavourable distribution of the rainfall during the growing season the unmanured crop suffered more than crops grown under normal circumstances.

The barley was sown out with a carefully selected mixture of grass and clover seeds intended for permanent pasture, and so far as the grasses are concerned it is a fortunate circumstance that the barley crop was a short one, for they have thereby had a better opportunity of making use of the manurial matter in the soil. The appearance of the various plots on the station after the removal of the barley crop was more striking than that presented by any former crops grown upon the station. It was originally intended to apply various manures to the grass as soon as the barley was harvested, but the great differences of growth upon the various plots showed that much additional information on the subject of unexhausted fertility would be derived from the grass crop, and it was therefore resolved to leave the station unmanured for another season. Owing to the diversity of seeds sown, and to the long time during which the roots of the various plants are enabled to grow and take possession of the soil and subsoil, there is no crop so suitable as grass for yielding information regarding the residual fertility derived from the application of manures in former years.

The crop of barley in 1887 is shown on Table II. It will be seen that although it was short it was of excellent quality. There was no barley weighing less than 54½ lbs. per bushel, and some of it weighed as much as 57 lbs. It is seldom that common barley weighs so heavily, and I am informed that no barley raised on that land in former years attained so great a weight as 57 lbs. per bushel. As has been shown in former years, the kind of manuring has some influence in increasing the weight per bushel. A deficiency of phosphatic manure, and also a deficiency of potash, produced a light kind of grain, and as might be expected a superabundance of soluble nitrogenous manure had the same effect. The plots manured with soluble phosphates produced always a heavier grain than those with insoluble phosphates, the average increase in weight being about one pound per bushel. Now that the manures have been discontinued for two years, it might be expected that the differences observed in former years would no longer be noticeable, but such is not the case; they are still very well marked. If we take, for example, the first ten plots on which the various phosphatic manures are contrasted, and if we compare the weight of the bushel of barley grown on them in the years 1879, 1883, and 1887, we have the following results:—

Plots.	Manures.	Undissolved.			Dissolved.		
		1879.	1883.	1887.	1879.	1883.	1887.
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
1 & 2	Bone ash, . . .	$53\frac{3}{4}$	$54\frac{1}{2}$	55	$53\frac{1}{2}$	$54\frac{1}{2}$	56
3 & 4	Ground coprolites, .	$51\frac{3}{4}$	54	55	$53\frac{1}{2}$	$54\frac{1}{2}$	$56\frac{1}{2}$
5 & 6	Bone meal, . . .	$52\frac{1}{4}$	$54\frac{1}{2}$	55	$53\frac{3}{4}$	55	56
7 & 8	Phosphatic guano, .	52	$52\frac{1}{2}$	54	$56\frac{3}{4}$	54	56
9 & 10	Ground mineral phos.,	52	$51\frac{1}{2}$	54	53	53	56
	Average,	$52\frac{1}{3}$	$53\frac{3}{5}$	$54\frac{4}{5}$	$53\frac{1}{2}$	$54\frac{1}{5}$	56

The quality of the grain has improved in each successive crop of barley, owing to improvement on the land and perhaps to the increase of sunshine; but the superiority of the grain grown on the plots that received dissolved phosphates must be due to the more active form of the manure, or, in other words, the deficiency of available phosphatic material on the plots to which undissolved phosphates were applied lowered the quality of the grain. We must, therefore, conclude that the plots manured with soluble phosphate in former years have still in them a greater amount of phosphate in an available form.

The plots which have produced the heaviest grain, viz., 57 lbs. per bushel last year, are plots 14, 29, and 30, and these are plots which formerly received their nitrogenous manure in the form of *sulphate of ammonia*, while most of the other plots got nitrate of soda as their nitrogenous constituent. There is another plot, No. 38, which produced grain at 57 lbs. per bushel. It has all along been manured in the same way as plot No. 7, with this difference, that it received, in addition, 4 cwt. per acre of supersulphate of lime. This plot has always been one of the best on the station, and it maintains the position to which it steadily advanced.

Another noteworthy characteristic of the barley grown at Pumpherston in 1887 is the exceedingly small proportion of light grain. It does not average so much as 1 per cent. of the total produce. In former years the proportion of light grain was four or five times greater, but that is a circumstance not so much affected by manuring as by the character of the weather during the growing season. A wet summer and a late harvest are the conditions which are favourable to the production of light grain, for they cause an aftergrowth of poor, thin plants that have no time to fill and ripen.

The important thing to look to in endeavouring to form some estimate of the relative fertility of the various crops is the total yield of grain. It will be seen from Table II. that the crop was, over all, a small one; but it must be remembered that the soil is a very poor one to work upon, and under ordinary farming conditions it could not be expected to produce more than about 40 bushels per acre on an average of seasons. Last year the plots which had in former years received a full manuring produced about 27 bushels of barley per acre, or scarcely three-fourths of a crop. Considering the dryness of the summer, the deficiency of straw, and the fact that the crop was unmanured, and that an unmanured crop of turnips had been entirely removed from the land the previous year, it is somewhat remarkable that the produce of grain was so considerable.

In order to gain a clear idea of the relative amounts of remanent fertility on the various plots, it is necessary to compare the results, not only among themselves, but with the results obtained when the station was under barley in former years, and for that purpose diagram V. will be of much assistance. The vertical lines of the chart represent the various plots of the station, and they are numbered along the top and bottom. The horizontal lines represent pounds of grain per acre, and each line represents 100 lbs. more than the one below it. The plots are arranged on the chart in the following manner:—From No. 1 along to No. 35 all the plots received in former years complete manures containing the three constituents, phosphoric acid, potash, and nitrogen in exactly the same amount. From the next three plots one or other of these ingredients was omitted, from the next three plots two of these constituents were omitted, and from the last plot manures have for ten years been entirely withheld.

The first thing that strikes one in comparing the three lines indicating the amounts of produce on the different plots is that the crop of 1879 and 1887 are not very different in total amount, and that they are both far inferior to that of 1883. The crop of 1879 had been manured, and so had the previous turnip crop, which was the first experimental crop grown at the station.

The different produce of the various plots was due to their different manuring, and it will be seen that, with some notable exceptions, the ups and downs of the lines indicating the amount of crop in the three different years have a pretty constant relation to each other. The plots had begun to tell their tale in 1879, and in 1883 they had the same tale to tell, but in an exaggerated degree. Now that the manures have been discontinued, the plots have gone back very much to where they were on the second year of the experiments. Plots 1, 2, 3, and 4 bear the same relation to each other as they did eight years before, but they are decidedly lower in fertility. Eight years ago these plots were above average, but since then they have lost ground, and they are seen to have been below average, both in 1883 and 1887. Plot 1 is made to show better than it ought, because it is the plot next the hedge, which used to shelter sheep from the west wind in former years, and the additional fertility conveyed to it on that account persists after twelve years. Plots 5, 6, 7, 8, and 9 are very much in the position they were in 1879, only that they have improved relatively to the first four plots. The *bone meal* plot (5), although it is somewhat better than at first, is not so good as one might have expected. It had been improving, and in 1883 was on a level with plot 4, but since then it seems to have lost ground. That may be more apparent than real, however, for 1883 was a wet year, and therefore favourable to the activity of bone meal and other insoluble phosphates. The *dissolved bone* plot (6) is now one of the best plots on the station. It is evident that dissolved bones, if it be really pure dissolved bones, as the manure on this plot was, is an excellent kind of manure for maintaining fertility. After it comes dissolved *phosphatic guano* (8), which has always been a good manure. The *nitrate of soda* plot (13) is exactly in the same position as it was eight years ago, but the *sulphate of ammonia* one (14) has improved a little. One of the most remarkable things on the station is the greatly improved position of the *horn dust* plot (15). In 1879 it was one of the poorest on the station, and in 1883 it was the poorest of the fully manured plots. The nitrogenous manure, which seemed to have been applied to it in vain in former years, has been lying dormant in the soil, and is now dissolving and contributing to the growth of crops. This plot, it will be seen, has improved more than any other on the station, and it is probable that next year, or the year following, it will surpass all the rest, for owing to the smallness of the crops hitherto grown upon it, there has not been the same amount of exhaustion going on on it as on the others. The plot which received its nitrogenous manure in the form of *dried blood* (16) has all along been a good plot, and now it is the best on the station. These two plots show the great value of insoluble but finely ground nitrogenous manures as fertilisers of the soil, and although the usual object in employing light manures is to increase the quantity of the crop to which they are immediately applied, yet there are occasions, such as in laying down land to pasture, when such slowly acting substances as horn dust and dried blood would be of the greatest advantage.

Sulphate of potash (19) has always been superior to *muriate of potash* (20), and it continues to maintain its position. Of the next three plots, 28, 29, and 30, there is little to record, further than that a superphosphate, with 10 per cent. soluble phosphate, does not leave behind so much for the good of the next two crops as those more thoroughly dissolved. Plot 35, which received its nitrogenous manure in the slowly-acting form of *rape dust*, and used to be below average, is now well above average, and improving its lead. There is evidently a considerable residue of it in the soil yet.

We now come to the seven plots at the end of the diagram. During the two rotations these plots were deficiently manured, as described in Table II.; but in 1886 they got one manuring with the ingredients that had hitherto been denied them. This was done to see what residual amount of the ingredients applied year after year were still in the soil, but prevented from coming into operation for want of the special substances in which they were deficient. Had this been the last experimental crop the complementary manuring would have been repeated, but, in anticipation of the grass experiments, all manures were withheld last year. That one manuring in 1886 has no doubt dulled the sharpness of the indications due to deficient manuring, but the partial manuring still tells its story very plainly. Plot 11—*no phosphates*—shows that phosphoric acid is the one ingredient that can least be spared from a manure. That this plot should be better in 1887 than in 1879 is doubtless due to the one dose of phosphates applied to it the former year. But for the complementary manures applied in 1886, all these deficiently manured plots would have been on a somewhat lower level. Plot 12, which received *bone ash alone*, is better than plot 18, which received *nitrate of soda alone*. The continuous dosing with nitrate of soda alone, year after year, has reduced that plot to a low level of fertility. Despite the one dose of phosphate and potash it received in 1886, it is not showing any marked sign of recuperation, and it seems probable that, but for that interference with the original plan of manuring, it would have borne the lowest crop on the station in 1887. Plot 22, which was all along manured with *potash salts alone*, suffered positive injury from the treatment; but now that the manure is being withheld, it is rapidly recovering. Plot 27, which has from the beginning been *entirely unmanured*, is now the poorest plot on the station; and the fact that it is not so deficient as it was in 1883 must be ascribed to the abundant sunshine of 1887, which, as has been shown, favoured the production of well-ripened heavy grain.

A general view of the produce of 1887 upon land unmanured for two years shows, despite the drought—

1. That a very considerable quantity of the light manures applied in former years still exists in the soil after two crops have been removed.

2. That, as regards phosphatic manures, the most effective residue is left in those plots to which soluble phosphates were applied.

3. That the most effective residue is found in the plot to which dissolved bones was applied.

4. That, as regards nitrogenous manures, the residue left by sulphate of ammonia is greater than that left by nitrate of soda.

5. That the insoluble nitrogenous manures have left a larger residue than the soluble ones.

6. That dried blood has left a more effective residue for the barley crop than other nitrogenous manures.

7. That, as regards potash manures, the sulphate has left a larger residue than the chloride.

8. That the exclusive use of nitrate of soda reduces the soil to a low state of fertility, from which it does not easily recover.

9. That the exclusive use of potash manures still more rapidly injures the fertility of the soil, but that, with the discontinuance of the manure, the soil recovers somewhat rapidly.

10. That by the application of light manures heavy crops can be grown, but that, in order to secure the continuance of high fertility, they must be applied annually, of a kind and quantity appropriate to the crop.

HARELAW BARLEY CROP, 1887.

In 1886 a crop of potatoes was grown on Harelaw station, and in order to observe the effects of various manures upon the crop, and at the same time to obtain some information on the subject of unexhausted fertility, each plot was cut in two, and manures applied to the one half, while the other was left unmanured. The results are reported in last year's *Transactions*, where a summary of the most noticeable facts is given on pp. 225–6. The crop last year was barley, and the experiments were conducted on the same lines; the unmanured half of each plot was again left unmanured as a basis of comparison, and so that the unexhausted fertility after the removal of two crops might be observed.

Before proceeding to examine in detail the after effects of the various manures, it is necessary to observe that this station was cropped without manure in 1879 and in 1880, the crops removed being respectively barley and ryegrass, so that the steady manuring of the field may be said to have begun in 1881, when a crop of oats was grown succeeded by turnips and barley. Again, in 1884, a crop of oats was grown without manures, but in 1885 manures were applied, and another crop of oats removed. In 1886 and 1887, as mentioned above, there were removed from one half of the station a crop of potatoes and a crop of barley that had not been manured. In looking for the unexhausted residues we have, therefore, to keep in view that the manures we are looking for were applied only in the years 1881, 1882, 1883, and 1885. The reason for withholding manures in 1884 was that the field was in too high condition to show the effects of light manures in a marked manner. Considering that the field is a fertile one, and that the manures were applied so many years ago, any considerable residue is not to be expected. Nevertheless, as will be seen from the results contained in Table III., the traces of former manuring are distinctly visible. It is impossible to say what proportion of the residual fertility is due to recent and what to more remote manuring. The estimation of residual fertility was no part of the original experiments, and they were not specially arranged to yield information on that subject.

A clear and rapid view of the comparative fertility of the various plots may be had from a glance at diagram VI., on which the produce of the manured and unmanured half of each plot is compared. We shall first consider the crop upon the unmanured half.

Unmanured Section.

The unbroken line on the diagram indicates the produce of this section.

As regards the phosphate plots, it will be seen that plot 3 (*ground coprolites*) shows an unexpected superiority, and in this respect it stands in marked contrast to the corresponding plot at Pumpherston. In former years it had not shown any superiority, but was always inferior to plot 4, and in the previous year the residue on that plot did very little for the potato crop. From notes taken during repeated visits while the crop was growing, there was no appearance of any superiority until towards the time of ripening. It was somewhat later of ripening, and it was considered that the soil at that part of the field was a little damper than average. In such a dry early season as 1887 that would give it a great advantage. The same remark applies to plots 12 and 13, which are near the boundary of the field, and in close proximity to a ditch which was filled up a good many years ago when the march there was being rectified. In other respects the appearance of these plots, and plots 7, 8, 9, and 10 resemble the corresponding plots at Pumpherston. The differences are of course not so marked for reasons already explained, and for the further most important reason that the extreme drought and earliness of the harvest did not give a good opportunity for residual fertility showing itself.

Among the nitrogenous manures the *horn dust* plot (15) and the *dried blood* plot (16) are, as at Pumpherston, the best, but the rapecake dust (35) has not done so much for the plot as at Pumpherston.

Of the two potash manures the sulphate (19) has left a little more residue than the muriate (20), but its superiority is not so decided as at the other station. The former year, when potatoes were grown on these plots, the residue left by the muriate was far more effective than that left by the sulphate, the crop on the former being about half as much again. It is, therefore, to be expected, though it does not necessarily follow, that the muriate plot would thus be in a more exhausted condition. Plot 21, which has never had any potash manures applied to it, produced little more than half as much potatoes as the other plots of this group, and we therefore find, as we should expect, that there is a larger manurial residue left in it for the barley crop. Apart from that circumstance, however, it has been observed at both stations that the want of potash is not much felt by the barley crop, while the plot which had a double dose of muriate of potash (34) suffered much from the application, and the plot which had nothing but potash salts applied to it (22) produced in former years at Harelaw one of the worst crops of barley, and at Pumpherston the very worst on the station, on both occasions when barley was grown.

There is little to be noted regarding the after effects of the different guanos. The greatest residue has been left by Peruvian guano (23) on both stations, and during the former years it bore larger crops than the others of the series; but it will be seen that the guano plots as a whole have produced rather poor crops.

The superphosphate plots 28, 29, and 30 are a distinct experiment; they were not entirely unmanured. The half plots that should have been unmanured had one substance applied to them, viz., nitrate of soda in equal quantity with the manured half. The result of that application is the production of a very great increase of barley, and the increase is greater according as the superphosphate was the more soluble.

The very small crop grown on plot 31 requires some explanation. The great deficiency there is not attributable to the manurial treatment. It was noticed, in observations made during the growing season, that a large patch of the plot lost its braird, probably on account of injury done to the soil during the removal of the potato crop. It was difficult to make an allowance for the injury, and perhaps it would have been better if the plot had been omitted from the report.

Taken as a whole, the crop grown on the unmanured parts of the station is chiefly of use in showing that the effects of light manures, applied several years before, are still visible after the removal of an oat crop and a potato crop; but as the residues picked up by the potato crop were greater in amount and different in kind from those removed by the barley crop, only a very partial view of the nature and amount of unexhausted fertility can be had by confining our attention to the results of the barley crop we are now considering. It is evident from these experiments that, in order to get a fair measure of unexhausted fertility, a variety of crops, having different manurial wants, must be grown on the land, and that, to give satisfactory information on the subject, a whole rotation of crops would require to be reaped after the manuring had been discontinued. On referring to the report of the potato crop grown without manures the former year, it is found that many of the plots which have shown larger residues for the barley are precisely those which had on the previous year grown a very poor potato crop, so that when the residues picked up by the potato crop and the barley crop are added together, the total amount of residual fertility given up by the plots that received a full manuring are almost exactly on a level.

We may now pass from this subject with the remark that the object of leaving half of each plot unmanured on this station was not only to gain some information regarding unexhausted manures, but also, and more particularly, that the unmanured half of each plot might serve as a standard by which to measure the effects of the manures applied to the other half.

Manured Section.

It will be seen at a glance that the dotted curve on chart VI., representing the crop grown with the use of manures, presents a marked contrast to the one we have just been examining.

The deep depressions in the curve at 17, 22, 27, 7, and 10 indicate plots which have received no nitrogenous manures, and they show plainly that the one constituent that chiefly affected the growth of barley at Harelaw was nitrogen. On no former occasion has the want of nitrogen had so powerful an effect in diminishing the crop. Most of the other plots had nitrate of soda applied to them as the nitrogenous constitutent of their manure, and this circumstance brings to the front the importance of soluble nitrogenous manures for the growth of cereals, especially during seasons of drought. Had 1887 been a moderately wet season these great differences would not have been observed. In our uncertain climate it is a difficult matter to anticipate the rainfall; but we have in this record abundant evidence that in the event of a dry season there is no more powerful aid at the command of a farmer than nitrate of soda in enabling him to force away a cereal crop, and give its roots an opportunity of penetrating to a depth where the ground water is capable of supplying the moisture requisite for the proper growth of the crop.

Among the phosphate plots there are three—plots 4, 5, and 6—that have disappointed my expectations. They do not resemble the corresponding plots at Pumpherston, but show a very marked deficiency. During the early part of the season the *dissolved bones* plot (6) gave better promise than any plot on the station, and plot 4 was not very far behind it; but all these plots evidently suffered much from drought, for they were checked in their growth as the season advanced, and they ripened very early.

As regards the nitrogenous manures, the results at Harelaw are very like those at Pumpherston. The *nitrate of soda* and *sulphate of ammonia* have done equally well, but the most noticeable results are those obtained on plots 15 and 16, which had their nitrogenous manure supplied respectively in the form of *horn dust* and *dried blood*. It will be seen that, despite the very dry season, they are on a par with the nitrate of soda and sulphate of ammonia plots. This is a circumstance which is well worthy of attention. It has been shown in former years that these two manures do not decompose quickly enough in the soil to supply the wants of a cereal crop, and that they produced their best effects during wet seasons; nevertheless, we are presented with the fact that during the dry summer of 1887 these two slowly-acting nitrogenous manures have been as effective, or even more effective, than nitrate of soda and sulphate of ammonia. It seems probable, therefore, that the quantities of these substances applied in April 1887 had a subordinate part in making the barley crop of that year, and that the residues of them applied in former years, but especially in 1886, have helped to produce so satisfactory a result. The large amount of organic matter contained in these two nitrogenous manures has doubtless contributed to the result in improving the condition of the soil, so as to enable it to withstand better the effect of drought. *Rape-dust* has also supplied nitrogenous food to the crop, though not in so marked a manner, for it is not so easily dissolved or rotted in the soil.

As regards the potash manures, plots 19 and 20, there is little to record. Both plots have done well, but it does not seem as if they owed their position to the presence of potash in the soil, for plot 21, which for ten years had received no potash manures at all, has done just about as well. The good results obtained on these plots must therefore be referred to the superphosphate, but especially to the nitrate of soda applied to each. Plot 22, which got potash salts alone, produced the second worst crop on the station—very little better than that borne by plot 27, which had been continually cropped without any manure.

There is a circumstance regarding the effect of potash manures upon barley which deserves attention, though it is not apparent on the chart, viz., the colour of the barley grain grown with potash manures was distinctly darker than that which received no potash. The grain on plot 21, that has never had potash salts applied to it, is of a brighter colour, and altogether of a more handsome appearance, such as to give it a preference in the eye of a brewer. It would, therefore, seem to be advantageous to apply no potash manures to barley that is grown for malting.

The guanos have not done well with the barley crop, and, strange to say, the Peruvian guano is the worst. It gave the best result when applied to potatoes the year before, so that a smaller residue of that guano would be left for the barley. The fish guano and Ichaboe guano contain their nitrogen in a less soluble state than Peruvian guano, and on that account they should not have been found so beneficial to the barley. It is quite evident that the increase of grain on these plots, as in the case of plots 15 and 16, cannot be due to the superior efficiency of the manures immediately applied to them, but rather to the residual nitrogenous matter afforded by the manures of former years. As a class, the guanos are not well adapted for application to cereals during a dry season, on account of the insoluble condition of the greater proportion of their nitrogenous matter, and the very poor appearance of these plots last year must be ascribed to that peculiarity.

The superphosphate plots, 28, 29, and 30 are a distinct experiment. They had no superphosphate put on them for the barley crop. The only manure applied was nitrate of soda, which was spread in equal quantity over both halves of these plots. The object in view in doing this was to get some information regarding the amounts of unexhausted superphosphate applied in the one case the year before, and in the other case two years before. The result is very instructive. In the case of plot 28, there is not very much of the superphosphate that has come to the surface; but as the manure contained only one-third of its phosphate in the soluble form, the deficiency on that plot must be ascribed to the coarser condition of the phosphatic residues remaining in it. As regards the other two plots, the results on the two halves are very near to each other. There is not a difference of as much as two bushels per acre between the half that was manured with superphosphate in 1886 and that manured in 1885, showing that a considerable residue of the phosphate applied two years before was still in the ground, and available even for the short-lived wants of a cereal crop.

Plots 31 to 34 were once more utilised to show the effects of double doses of nitrogen and potash. The plot to which a double dose of nitrate of soda was applied gave the largest crop on the station. Sulphate of ammonia, when applied in double quantity (plot 32), has not done quite so well. It is a slower manure than nitrate of soda, and not so well adapted for application during a season of drought. Had the season been a wet one, the probability is that the crop on both these plots would have been too heavy to stand. The double dose of sulphate of potash (33) has had no marked effect upon the crop, but the double dose of muriate (34) has diminished the crop very considerably.

Plots 7, 8, 9, and 10 are one-year-old duplicates of the five-year-old plots 27, 11, 21, and 17 respectively. Plot 7 was left unmanured for the barley crop, and has produced a very small crop, but still it is fully five bushels per acre better than the half from which manures have been withheld for two years, and nearly ten bushels per acre better than plot 27, that had not been manured for more than five years. Plot 8 had no phosphate put on it for the barley crop, but only nitrate of soda and potash salts. The result is the production of a full crop, showing that the barley did not feel the want of phosphates. Plot 9 had nitrate of soda and phosphates, but no potash salts, applied to the barley. The result is a full crop, showing that the barley did not feel the want of potash. Plot 10 had phosphates and potash salts applied to it, but no nitrate of soda, and the result is the same as if no manure had been applied at all. It is the nitrate of soda that has exerted the greatest influence over the whole station, and practically it has rescued the crop from failure. The value of nitrate of soda, applied with the seed during a season of drought, is the most prominent fact exhibited by the barley crop at Harelaw.

We may therefore sum up the results obtained on the Harelaw station as follows:—

Unmanured Section.

1. On one half of the station no manures had been applied for two years, and in the meantime a crop of oats and a crop of potatoes had been removed from the land: nevertheless, the

traces of former manuring were distinctly visible upon the barley crop of 1887.

2. The plots which produced the best crop of potatoes in 1886 had a smaller manurial residue left for the barley crop of 1887.

3. The want of potash was most felt by the potato crop in 1886, but it was not felt by the barley crop of 1887.

4. The chief want felt by the barley crop was the want of nitrogen.

5. Plots manured in former years with slowly-acting nitrogenous substances were above average in their produce of barley.

Manured Section.

6. The plots which had nitrate of soda applied to them produced full crops, and even the plot that had had nothing but nitrate of soda applied to it produced a fair crop.

7. Sulphate of ammonia did not succeed so well as nitrate of soda, and proved itself a less suitable manure than nitrate of soda when applied to a cereal crop in a season of drought.

8. Insoluble nitrogenous manures also produced a very good crop, due in great measure to the accumulated effect of the residues lying over from former years.

9. Potassic manures were of very subordinate importance to the barley crop, and muriate of potash had a depressing effect.

10. Barley grown without the direct application of potash manures is lighter in colour and of a more handsome appearance than that to which they have been applied.

11. Phosphates, unless accompanied with nitrogenous manures, have produced very little effect upon the crop, and there was very little difference in the effect of soluble and insoluble phosphates.

12. In the dry season of 1887 the plots manured with guanos did not produce so good crops as in former wet seasons.

13. Drought is the great enemy we have to contend with in relying too exclusively on light manures for the production of crops. Hence the great value of dung and bulky manures containing much organic matter, for these have the effect of improving the texture and composition of the soil, so that it is better able to retain moisture, and to act as a solvent of light manures. This remark, however, does not apply to nitrate of soda, which in dry seasons is most valuable in forcing away the young plant, and enabling its roots to penetrate into the deeper and moister layers of the soil.

[TABLE I.

TABLE I.—*Manures applied to the Manured Half of the Barley Crop at Harelaw Experimental Station*, 1887. *Each half plot being one-eighth acre. The dose* = 6 *lbs. ammonia*, 15 *lbs. phosphoric acid, and* 8 *lbs. potash.*

No. of Plot.	Bone Ash, 64 %.	Bone Ash, dissolved, 34 %.	Ground Phosphate, 59 %.	Phosphate, dissolved, 31 %.	Bone Meal, 4·25 % am., 48 % phos.	Bone Meal, dissolved, 3 % am., 29½ phos.	Horn Dust, 17½ % am.	Dried Blood, 15¼ % am.	Peruvian Guano, 7½ % am., 33 % phos., 2½ % pot.	Fish Guano, 11 % am., 28 phos.	Ichaboe Guano, 11½ % am., 15·5 % phos.	Nitrate of Soda, 96 %.	Sulphate of Ammonia, 24 %.	Sulphate of Potash, 40 %.	Muriate of Potash, 93 %.	Rape Dust, 5 % am.	Supersulphate.	Basic Slag Phosphate.	Dissolved Peruvian Guano.	Kainit.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
1.	51	.	.	.	.	.	.	.	.	.	.	32	.	19	7	.	.	.	.	.
2.	.	97	.	.	.	.	.	.	.	.	.	32	.	19	7	.	.	.	.	.
3.	.	.	56	.	.	.	.	.	.	.	.	32	.	19	7	.	.	.	.	.
4.	.	.	.	106	.	.	.	.	.	.	.	32	.	19	7	.	.	.	.	.
5.	.	.	.	.	68	.	.	.	.	.	.	17	.	19	7	.	.	.	.	.
6.	.	.	.	.	.	112	.	.	.	.	.	14	.	19	7	.	.	.	.	.
7.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8.	.	.	.	.	.	.	.	.	.	.	.	32	.	19	7	.	.	.	.	.
9.	.	.	56	.	.	.	.	.	.	.	.	32	.	.	.	.	.	.	.	.
10.	.	.	.	106	.	.	.	.	.	.	.	.	.	19	7	.	.	.	.	.
11.	.	.	.	.	.	.	.	.	.	.	.	32	.	19	7	.	.	.	.	.
12.	51	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
13.	.	.	.	106	.	.	.	.	.	.	.	32	.	19	7	.	.	.	.	.
14.	.	.	.	106	.	.	.	.	.	.	.	.	25	19	7	.	.	.	.	.
15.	.	.	.	106	.	.	34	.	.	.	.	.	.	19	7	.	.	.	.	.
16.	.	.	.	106	.	.	.	40	.	.	.	.	.	19	7	.	.	.	.	.
17.	.	.	.	106	.	.	.	.	.	.	.	.	.	19	7	.	.	.	.	.
18.	.	.	.	.	.	.	.	.	.	.	.	32	.	.	.	.	.	.	.	.
19.	.	.	.	106	.	.	.	.	.	.	.	32	.	38	.	.	.	.	.	.
20.	.	.	.	106	.	.	.	.	.	.	.	32	.	.	14	.	.	.	.	.
21.	.	.	.	106	.	.	.	.	.	.	.	32	.	.	.	.	.	.	.	.
22.	.	.	.	.	.	.	.	.	.	.	.	.	.	19	7	.	.	.	.	.
23.	.	.	10	.	.	.	.	.	80	.	.	.	.	28	.	.	.	.	.	.
24.	.	.	.	56	.	.	.	.	.	55	.	.	.	38	.	.	.	.	.	.
25.	.	.	28	28	.	.	.	.	.	.	53	.	.	35	.	.	.	.	.	.
26.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	7	.	.	.	100	.
27.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
28.	.	.	.	.	.	.	.	.	.	.	.	32	.	.	.	.	.	.	.	.
29.	.	.	.	.	.	.	.	.	.	.	.	32	.	.	.	.	.	.	.	.
30.	.	.	.	.	.	.	.	.	.	.	.	32	.	.	.	.	.	.	.	.
31.	.	.	.	106	.	.	.	.	.	.	.	64	.	19	7	.	.	.	.	.
32.	.	.	.	106	.	.	.	.	.	.	.	.	50	19	7	.	.	.	.	.
33.	.	.	.	106	.	.	.	.	.	.	.	32	.	76	.	.	.	.	.	.
34.	.	.	.	106	.	.	.	.	.	.	.	32	.	.	28	.	.	.	.	.
35.	.	.	.	106	.	.	.	.	.	.	.	.	.	19	7	120	.	.	.	.
36.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	112	56	.
38.	.	.	56	.	.	.	.	.	.	.	.	32	.	19	7	.	112	.	.	.

TABLE II.—BARLEY CROP (PUMPHERSTON, 1887).—*Unmanured for two years.*

No. of Plot.	Kind of Manures applied in 1878, 1879, 1881, 1882, 1883, 1884, and 1885.		Dressed Grain per Acre.	Weight per Bushel.	Light Grain per Acre.	Total Grain per Acre.	Straw per Acre.
			Bushels.	lbs.	lbs.	lbs.	Stones.
	Phosphatic Manures.						
1	Bone ash,	With nitrate of soda and potash salts,	24·8	55	8	1372	64
2	Do. dissolved,		22·6	56	6	1270	52
3	Ground coprolites,		21·2	55	8	1176	60
4	Do. dissolved,		25·6	56½	12	1455	84
5	Bone meal,		23·2	55	8	1292	68
6	Do. dissolved,		31·5	56	10	1774	100
7	Phosphatic guano,		23·4	54	10	1274	64
8	Do. do. dissolved,		28·6	56	12	1612	80
9	Ground mineral phosphate,		22·7	55	8	1256	68
10	Do. do. dissolved,		23	56	10	1292	88
11	No phosphates,		24	56½	10	1366	68
12	Bone ash alone, ...		26	55	12	1442	64
	Nitrogenous Manures.						
13	Nitrate of soda,	With super-phosphate and potash salts.	26·6	55	12	1476	88
14	Sulphate of ammonia,		27·2	57	10	1562	72
15	Horn dust (Shoddy, 1878),		28·9	55½	8	1608	76
16	Dried blood,		33·1	54½	12	1815	104
17	No nitrogen,		27·9	55	10	1592	68
18	Nitrate of soda alone, ...		23·9	55	10	1322	48
	Potassic Manures.						
19	Sulphate of potash,	With nitrate of soda and super-phosphate,	31·4	56	16	1754	88
20	Muriate of potash,		25·1	55½	16	1411	56
21	No potash,		28·4	55	8	1568	84
22	Potash salts alone, ...		23	56	24	1314	52
	Guanos.						
23	Peruvian guano, ...		32·8	55½	12	1832	92
24	Fish guano, ...		25·6	56	24	1456	64
25	Ichaboe guano, ...		26	55	16	1448	56
27	Unmanured continuously, ...		20	54	18	1098	52
	Superphosphates.						
28	10°/. Soluble phosphate,	With sulphate of ammonia and potash salts,	25·8	55	16	1434	90
29	25°/. do. do.,		29·7	57	14	1706	92
30	40°/. do. do.,		29·3	57	12	1680	76
35	Rape and cotton cake dust with superphosphate and potash, ...		27·8	56	16	1572	96
38	Same as plot 7 with supersulphate of lime,		29·2	57	16	1672	104
39	Once manured like plot 8 (1886), . .		23·7	56	15	1343	68

TABLE III.—BARLEY CROP (HARELAW, 1887).—*Unmanured for two years.*

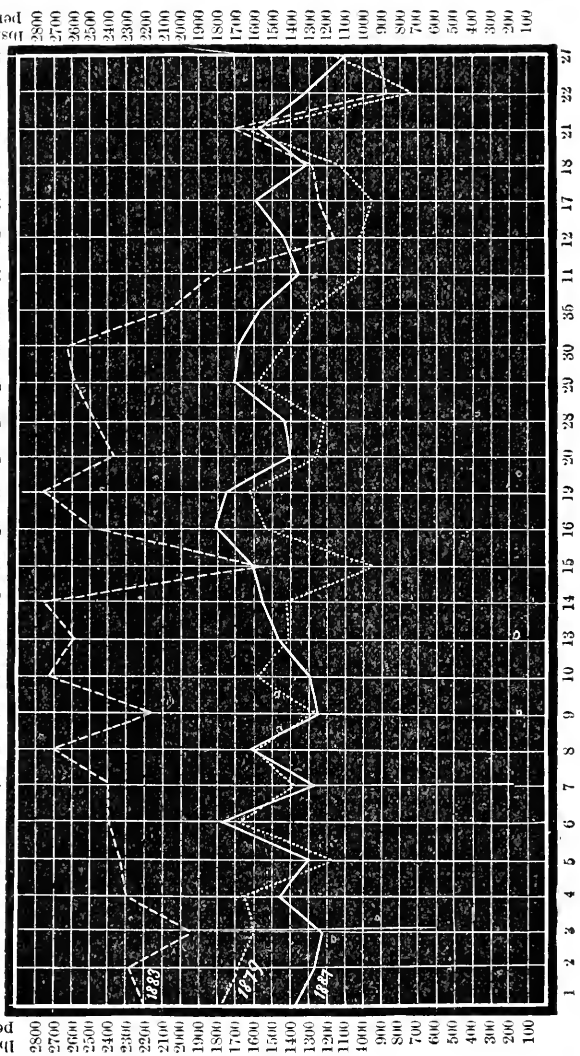
No. of Plot.	Manures applied in former years, 1881-2-3-5.	Dressed Grain. Bushels per Acre.	Dressed Grain. Weight per Bushel.	Light Grain per Acre.	Total Grain per Acre.
	Phosphatic Manures.		lbs.	lbs.	lbs.
1	Bone ash, with nitrate of soda and potash salts, ...	44·4	56¼	64	2562
2	Do. dissolved, do. do. . . .	45·6	56½	80	2532
3	Ground coprolites, do. do. . . .	46·6	57	64	2720
4	Do. dissolved, do. do. . . .	43·8	56½	80	2556
5	Bone meal, do. do. . . .	40·7	57¼	80	2410
6	Do. dissolved, do. do. . . .	43·5	56½	96	2556
7	Phosphatic guano, do. do. . . .	40·1	56½	40	2508
8	Do. dissolved, do. do. . . .	41·3	57	72	2424
9	Ground mineral phosphate, do. do. . . .	39·9	56¾	72	2328
10	Do. dissolved, do. do. . . .	39·5	57¼	64	2320
11	(No phosphate), do. do. . . .	38·8	56¾	56	2280
12	Bone ash (alone), ...	47	57	72	2752
	Nitrogenous Manures.				
13	Nitrate of soda, with superphosphate and potash salts, . .	44·6	57	72	2616
14	Sulphate of ammonia, do. do. . .	42·9	57¼	48	2506
15	Horn dust, do. do. . .	44	57	72	2576
16	Dried blood, do. do. . .	44·5	57¼	64	2610
17	(No nitrogen), do. do. . .	42·7	56¾	72	2494
18	Nitrate of soda (alone), ...	42·4	56½	64	2460
	Potassic Manures.				
19	Sulphate of potash, with superphosphate and nitrate of soda, .	43·4	56½	64	2516
20	Muriate of potash, do. do. .	42·2	56¼	64	2450
21	(No potash), do. do. .	47·1	57	72	2792
22	Mixed sulphate and muriate, ...	45·5	56½	56	2628
	Guanos.				
23	Peruvian, ...	42·7	56½	48	2460
24	Fish, ...	41·7	56¼	56	2384
25	Ichaboe, ...	40·3	57¼	48	2335
26	Imitation, ...	41·5	57	56	2424
27	Unmanured continuously, ...	39·4	57	40	2288
	Superphosphates.				
28	10 % soluble phosphate, with nitrate of soda and potash salts,	46·4*	56¾	112	2848
29	25 % do. do. do.	50 *	57½	240	3112
30	40 % do. do. do.	52·7*	56¾	240	3231
31	Same as plot 1, ...	32·2	57	40	1875
32	Do. 2, ...	36·2	56½	40	2086
33	Do. 14, ...	36·2	57	56	2119
34	Do. 20, ...	39·4	57	56	2304
35	Rape cake dust, with superphosphate and potash salts, . .	40·4	57¼	72	2388
36	Manured in 1884 and 1885, ...	38·8	56½	80	2272
38	Same as plot 7, but with 8 cwt. per acre supersulphate, . .	37·1	56¼	56	2144

Nitrate of soda alone applied in 1887.

TABLE IV.—BARLEY CROP (*Manured*), HARELAW, 1887.

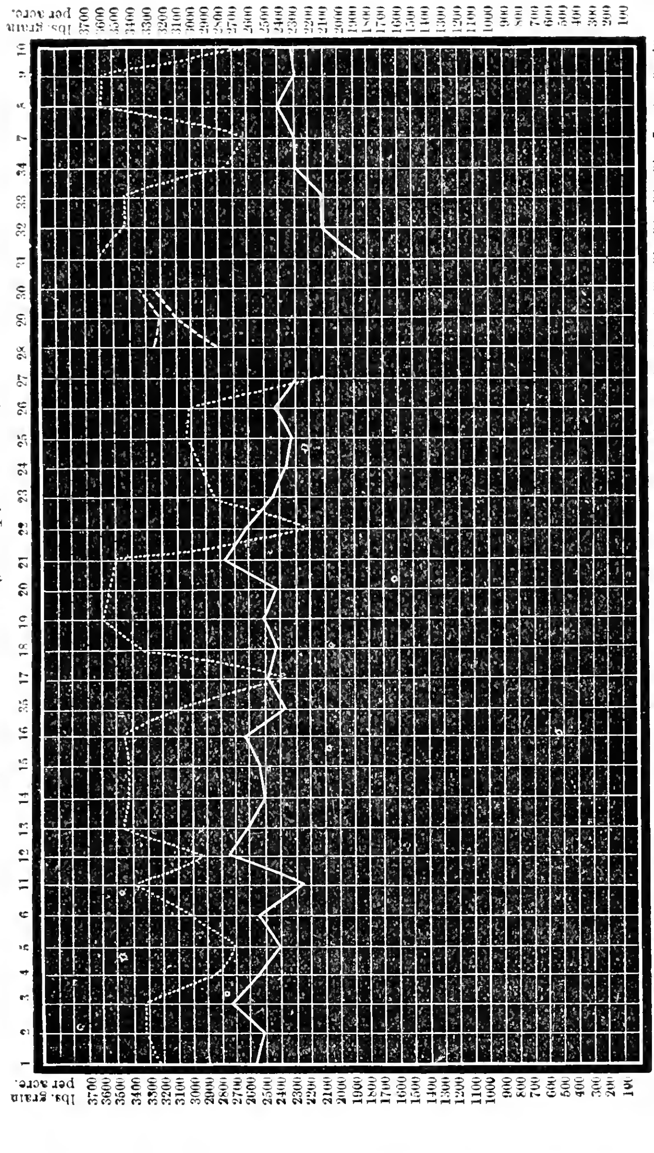
No. of Plot.	Manure applied 1881-2-3-5-6.	Manures applied 1887.	Dressed Grain. Bush. per Acre.	Dressed Grain. Wght. per Bush.	Light Grain.	Total Grain per Acre.
	Phosphatic Manures.					
1	Bone ash, nit. of soda, potash salts,	Same as 1886.	53·3	57½	136	3232
2	Do., dissolved, do. do.	Do.	55·2	57	152	3328
3	Ground coprolites, do. do.	Do.	54·8	57½	160	3312
4	Do., dissolved, do. do.	Do.	47·8	56½	152	2852
5	Bone meal, do. do.	Do.	45·2	57	128	2704
6	Do., dissolved, do. do.	Do.	50	57	144	2992
7	Phosphatic guano, do. do.	(Unmanured), like plot 27.	45	57	80	2640
8	Do., dissolved, do. do.	(No phosphate), do. 11.	58·2	57½	136	3500
9	Ground mineral phos., do. do.	(No potash), do. 21.	59·1	57	128	3496
10	Do., dissolved, do. do.	(No nitrate), do. 17.	44·3	58	64	2632
11	(No phosphates), do. do.	Same as 1886.	56·3	57½	128	3388
12	Bone ash (alone), do. do.	Do.	51	57	56	2960
	Nitrogenous Manures.					
13	Nitrate of soda, superphos. and pot. salts,	Do.	58·4	57¾	96	3466
14	Sulph. of ammonia, do. do.	Do.	57·1	58	128	3440
15	Horn dust, do. do.	Do.	57·5	58	104	3440
16	Dried blood, do. do.	Do.	58·3	57½	112	3468
17	(No nitrogen), do. do.	Do.	40·4	57½	64	2388
18	Nitrate of soda (alone), do. do.	Do.	56	56½	184	3848
	Potassic Manures.					
19	Sulph. of potash, superphos., nit. of soda,	Do.	60·8	57	136	3600
20	Muriate of potash, do. do.	Do.	60·8	57	104	3568
21	(No potash), do. do.	Do.	58·7	56¾	96	3426
22	Potash salts (alone), do. do.	Do.	38·8	56¼	64	2246
	Guanos.					
23	Peruvian, ...	Do.	46·9	56¼	248	2890
24	Fish, ...	Do.	48	57½	184	2944
25	Ichaboe, ...	Do.	50·2	57½	136	3024
26	Imitation, ...	Dissolved Peruvian guano.	48·4	57½	200	2984
27	Unmanured continuously.	Unmanured.	35·8	57½	64	2112
	Superphosphates.					
28	10 % sol. phos., pot. salts, sulph. of am.	Nitrate of soda.	53	56¾	248	3260
29	25 % do. do. do.	Do.	51·7	57½	232	3208
30	40 % do. do. do.	Do.	55·5	56½	216	3352
31	Same as plot 9, (1886 like 1887).	Same as plot 13, double nitrate,	59	56¾	240	3634
32	Same as plot 10, do.	Do. 14, do. sulph. of am.	58	57½	120	3452
33	Various, — do.	Do. 19, do. sulph. of pot.	58	57	152	3456
34	Frey Bentos meal, chiefly super. and potash,	Do. 20, do. mur. of pot.	54·7	57	120	2760
35	Rape cake dust, superphos. potash salts, .	Same as 1886.	51·5	57½	144	3104
36	Mostly unmanured, ...	Slag phosphate, nitrate of soda, potash salts,	59·3	56	240	3560
38	Same as plot 9, superphosphate of lime, .	Same as 1886.	50·3	55	184	2952
39 40	Unmanured, ...	Unmanured.				

TABLE V.—*Barley Crops, Pumpherston*, 1879, 1883, *and* 1887.



1879........ 1883 - - - - - 1887 ——

TABLE VI.—*Barley Crop, Harelaw, 1887.*



Unmanured half——— Manured half..........

Manured with Nitrate of Soda, 1887, - - - - - -

THOMAS-SLAG OR BASIC CINDER.

By Dr A. P. Aitken.

In the preceding volume of the *Transactions*, pp. 245–253, an account was given of an experiment made to show the value of having insoluble manures ground to the finest possible flour. It was shown that the whole success of mineral phosphates as a manure depended upon their fineness, and it did not very much matter what was the kind of phosphate, so long as it was finely ground. Among the manures tested was what was called *basic cinder or slag*, and which is now being sold under the name of *slag phosphat-meal*. It is known on the Continent chiefly under the name of *Thomas-slag*, after the name of one of its inventors. This last name is a specific one, not likely to be given to any other substance, and it would be well if all the other names were now dropped, and this one adhered to, so that farmers may not be confused by a number of names so different as to seem to apply to different substances, and this is all the more desirable since it seems that other kinds of slag meal are being sold that are not the true Thomas-slag.

The substance secured by me for experiment was of exceeding fineness, the whole being able to pass through a wire-cloth sieve of 150 wires per lineal inch, or 22,500 holes per square inch, and the result of the experiment showed that Thomas slag when applied in that state to turnip crops was as good a manure as superphosphate.

As this is now the cheapest kind of phosphate in the market, and as it is being widely advertised, it is creating a considerable amount of interest, and on all sides the questions are being asked—What is it? How is it got? What is it good for? How should it be applied? Is it an economical stuff to use?

Thomas-slag is a substance formed as a bye-product in the manufacture of steel from pig-iron, by the "basic" or "Thomas-Gilchrist" process. Steel is chiefly a compound of iron and carbon. It may be made from pig-iron, which also is a compound of iron and carbon, but containing a larger proportion of the latter element than exists in steel. In order to convert pig iron into steel, a portion of the carbon must be burned away, that is to say, oxidised at a very high temperature. Besides carbon, there are various impurities in pig-iron that have to be got rid of, and one of these is phosphorus. Some kinds of pig-iron, according to the ironstone from which they are formed, and notably that made from Cleveland ironstone, contain so much phosphorus as to render them unfit for making steel of good quality. On account of the difficulty of getting rid of this impurity, only the purer kinds of pig-iron could formerly be used for steel-making, and steel was therefore a dear commodity. In 1879 Messrs Thomas and Gilchrist discovered a method of making steel which got rid of the phosphorus, so that steel can now be made from inferior kinds of ironstone. The result has been an entire revolution in the steel trade, and so great a cheapening of that article, that it is now used for making rails, bridges, armour-plates, &c., for which purposes iron only used to be available. The method essentially consists in adding lime to the pig-iron, and in lining the furnace, or "converter," as it is called, with that material, instead of with bricks composed largely of silica, as used to be done. On that account it is called the "basic" process, as distinguished from the former "acid" one. In the converter the pig-iron is raised to a very high temperature, by a blast of air which is blown through the molten mass to burn off some of the carbon. The converter is a huge pear-shaped vessel mouthing upwards, but capable of being turned upside down. While the blast is roaring through the molten metal, a great flame issues from the upturned mouth, presenting a brilliant and striking spectacle. The flame is due not only to the combustion of carbon, but also to the combustion of other metallic and non-metallic impurities, and at the close of the operation, which lasts only for about a quarter of an hour, the iron itself begins to be burned.

Among the impurities that are burned in this way is phosphorus, which is converted into phosphoric acid. The phosphoric acid unites with lime, which is present in abundance, and forms with it a kind of phosphate of lime. As soon as the blast is discontinued, this phosphate, along with other oxidised impurities, rises as a scum to the surface, and constitutes what is known as the basic or Thomas slag. The converter is then slowly tilted round, and the floating slag is poured out into boxes capable of holding two tons or more, and there it is allowed to cool. The steel is thereafter cast into ingots, and the converter is ready for another charge. When the slag is cold it is removed from the boxes, and for some years it was cast aside as a waste product, and its accumulation formed huge unsightly heaps in the neighbourhood of the steel-works. It was known that this refuse material contained a large amount of phosphoric acid, and many attempts were made by chemists and others to extract it; but although numerous patents were taken out by experimenters, none of the processes were able to be worked at a profit. It was some time before it occurred to any one to try the effect of simply grinding it to a fine powder, and applying it directly as a manure to the soil. When that plan was tried it was found in some instances to be a failure, and in others to be attended with considerable success. These experiments will be referred to immediately, but, in the first place, it will be as well to refer to investigations made by chemists to discover what is the nature and composition of the substance.

It was found by Hilgenstock that the phosphate of lime contained in the slag differed from ordinary phosphate of lime, such as is found in natural phosphates and in bone ash. Ordinary phosphate of lime is known as tribasic phosphate of lime or tricalcic phosphate, in which three equivalents of lime are united to one equivalent of phosphoric acid, and whose composition is thus expressed—

$$\left.\begin{matrix} CaO \\ CaO \\ CaO \end{matrix}\right\} P_2O_5 = \left.\begin{matrix} 56 \\ 56 \\ 56 \end{matrix}\right\} 142,$$

viz., 168 parts by weight of lime, united to 142 parts by weight of phosphoric acid: but the slag phosphate was found to have four equivalents of lime united with one of phosphoric acid. Its composition would therefore be expressed thus—

$$\left.\begin{matrix} CaO \\ CaO \\ CaO \\ CaO \end{matrix}\right\} P_2O_5 = \left.\begin{matrix} 56 \\ 56 \\ 56 \\ 56 \end{matrix}\right\} 142,$$

viz., 224 parts of lime to 142 parts of phosphoric acid. It is therefore called *tetrabasic* phosphate of lime.

This is an entirely new substance, and is one of a number of new substances that have been found in the slag, but which might not have been discovered had the steel companies not adopted the plan of pouring the slag into boxes instead of pouring it on the ground, as was the practice at first. When the slag is allowed to cool in the boxes there is a hollow part in the centre, in which these new bodies are found crystallised in well-marked forms. The tetrabasic phosphate is found in well-defined flat square crystals. It is a very interesting substance, from a chemist's point of view, but there is one characteristic it possesses that is especially interesting to agriculturists. It is a phosphate which may be said to be supersaturated with lime, and as a result of this supersaturation the lime and phosphoric acid are in a somewhat feeble state of combination, so that it is capable of being decomposed by the carbonic acid of the soil, and by the acids contained in the roots of plants. Therefore, when it is applied as a manure to crops, they are able to extract the phosphoric acid from it.

The amount of phosphoric acid contained in the slag varies a good deal, for it depends upon the amount of phosphorus contained in the pig-iron.

The following shows the composition of two slags,—No. 1, made from iron containing $1\frac{3}{4}$ per cent. of phosphorus, and No. 2, from a sample of iron containing $2\frac{1}{2}$ per cent. of phosphorus.*

* Stead and Readsdale, *Journal of Iron and Steel Institute*, 1887.

Composition of Thomas-Slag.

	No. 1.	No. 2.
Lime,	42·67	47·34
Magnesia,	3·49	6·01
Alumina,	1·87	1·43
Peroxide of iron,	11·43	2·07
Protoxide of iron,	17·17	12·72
Protoxide of manganese,	4·51	3·43
Protoxide of vanadium,	0·85	1·19
Silica,	3·15	5·76
Sulphur, }	0·62	0·51
Calcium, }	0·78	0·41
Sulphuric anhydride,	trace	trace
Phosphoric acid,	13·80	19·19
	100·34	100·06
Metallic iron,	21·35	11·36
Metallic manganese,	3·24	2·65

The chief peculiarities of this substance are that it contains from an eighth to a fifth of its weight of oxides of iron, and some metallic iron; that the base lime is far in excess of the acids, and when freshly made it is in the caustic state, so that the reaction is strongly alkaline. There is an almost entire absence of sulphuric acid, and the only thing in it that is soluble in water is some of the lime, which, when put on the soil, will have the effect of a gentle liming. One could scarcely anticipate that a substance of that composition would be a successful phosphatic manure, as he would probably be curious to know the effect which the large amount of iron oxides might have upon the crop. Now that that matter has been satisfactorily proved, it is important to note the variation in composition to which the substance is liable. The two analyses given above show that the phosphoric acid may at least range from about 14 to about 20 per cent., equal to from about 30 to about 40 per cent. of phosphate of lime, so that one sample of the slag may have only three-fourths the value of another sample.

During the short time the slag has been in existence, a large number of experiments have been made with it, chiefly on the Continent.

In 1885 Professors Wrightson and Munro made a somewhat extensive series of experiments with it on the experimental farm attached to the Agricultural College at Downton, where the soil is light and calcareous, and at Ferryhill in Durham, where the soil is heavy clay, and almost destitute of lime.

These experimenters applied the slag to the turnip crop, and compared its effect with those of superphosphate, precipitated phosphate, ground Cambridge coprolites, dissolved slag, and also mixtures of slag and superphosphate.

The results they obtained show that the slag possesses a very notable manurial value. When equal weights (viz., 4 cwt. per acre) of the manures were applied, it was found that on the chalky soil of Downton superphosphate gave an increase of 140 cwt. per acre over the adjacent unmanured plots, the slag gave an increase of 90 cwt. per acre, and the coprolites an increase of 21 cwt. per acre. On the clay soil of Ferryhill the increase was respectively 170, 220, and 151 cwt. The slag was therefore far behind the superphosphate on the chalk soil, but rather in front of it on the clay, while in both instances it was superior to the ground coprolites. When equal weights of phosphoric acid were employed, the superphosphate was superior to the slag.

The authors explain that the slag contained only 14 per cent. of phosphoric acid, and that it was not as well ground as the coprolites, but they do not say what was its state of fineness. Had the fineness of grinding been carefully noted or controlled, it would have added much to the value of these experiments.

A number of experiments have been made with Thomas-slag in Germany on the farms attached to the agricultural schools and colleges, and the results are published in Biedermann's *Centralblatt der Agricultur-chemie* and the *Jahresbericht der Agricultur-chemie* for 1886. The effects produced by the slag are far from uniform. Professors Fleischer, Fitbogen, Maercker, and Stutzer describe their experiments made in various ways with various crops, and it would seem that the best results are obtained on moss and moorland, where there is great store of organic matter, also that the manure does very well on clay land, and on wet land generally. It is probable that the better results obtained on these soils is due chiefly to the caustic lime contained in the manure, for it is on such soils that lime is applied with greatest advantage.

The slag has been found very suitable for cereals and for grass, but not for potatoes. It was found, however, that the effect of the slag used for the potatoes was distinctly visible on the succeeding oat or barley crop. As a preparation for grass or pasture it is strongly recommended, and, when used as a top-dressing on wet meadows, it is found an effective manure.

These experimenters made comparative experiments to test the value of slag relatively to superphosphate and other forms of phosphatic manure. The general result is that the slag, when applied in equal quantities with superphosphate, is just half as good a manure, so that, if used instead of superphosphate, double the quantity must be employed.

It is unfortunate that the samples of slag used in many of these experiments are not sufficiently described. They were doubtless of very different degrees of fineness, and therefore they were not of a kind to enable any just comparison to be made between slag and superphosphate or any other manures.

Professor Paul Wagner of Darmstadt has published in separate form the results of a very extensive series of experiments with the slag as a phosphatic manure for barley, wheat, and linseed. The experiments were made in zinc boxes, and arranged so as to exclude many of the accidents to which field experiments are liable. The slag was ground to three different degrees of fineness; No. 1 passed entirely through wire-cloth of 120 wires per lineal inch; No. 2 was not quite so fine—17 per cent. of it refused to pass through the sieve; and No. 3 was so coarse that none of it passed through the sieve, but the half of it passed through a sieve of 60 wires per inch, and the remainder all passed through a sieve of 30 wires per inch. These samples of slag were compared with coprolites as finely ground as slag No. 1, and with superphosphate.

Equal weights were applied to all the boxes, and along with the phosphates there were applied potash salts and nitrate of soda in abundance. Superphosphate produced the largest crop, and if the superphosphate crop is put down as = 100, the following table shows the relative value of the forms of phosphate:—

Superphosphate,	100
Slag No. 1,	61
Slag No. 2,	58
Slag No. 3,	13
Coprolites,	9

The soil with which the boxes were filled varied in different series of boxes,—viz., light sandy loam, calcareous loam, and calcareous soil. The conclusion he draws from his experiments is that, in order to compete with superphosphate, the finely ground slag must be applied in double quantity. Had he operated upon peaty or mossy soil or upon stiff clay, he would have obtained figures much more favourable to the slag, for these are the soils upon which it has been found to produce the best results: and had he grown a crop which is especially benefited by the application of phosphates and lime, such as turnips or leguminous crops, it would have been a much better test of the value of the manure.

In Scotland we experimented upon turnips, and we used a slag rich in phosphoric acid, and ground to a fineness far greater than that used by other experimenters, and we consequently obtained results more favourable to the Thomas-slag than those got elsewhere. It was found to be, weight for weight, superior to superphosphate.

In reviewing the published records of the manurial experiments made with this substance, we may summarise them in the following manner:—

The Thomas-slag possesses valuable manurial properties, due, in the first place, to its containing phosphate of lime in a form easily decomposable in the soil: and, in the second place, to its containing caustic lime.

It is therefore an appropriate manure for turnips, leguminous crops, clover grass, and pasture; and secondly, for cereals, and it is found to be well adapted for application to moorland, moss-land, stiff clays, and wet meadow land.

In order that it may be available as a manure at all, it must be ground to an exceedingly fine powder.

So far as is at present ascertained, the degree of fineness requisite to ensure its success is that it should be able to pass through a sieve of wire-cloth of at least 120 wires to the lineal inch.

When ground so finely that it is able to pass through wire-cloth of 150 wires to the lineal inch, it is a very active manure, capable of competing successfully with an equal weight of superphosphate.

When ground less finely its efficacy rapidly diminishes, so that when only 80 per cent. of it passes through wire-cloth of 120 wires per lineal inch, it must be used in double quantity, so as to compete with superphosphate.

The amount of phosphate of lime in it varies from about 30 to 40 per cent. The finer ground part of the slag is richest in phosphate.

It should, therefore, be sold under a double guarantee—in the first place, a guarantee of fineness; and, in the next place, a guarantee of percentage of phosphate.

Seeing that it contains caustic lime, it should not be mixed with sulphate of ammonia nor any manure containing ammonia salts.

It has sometimes been mixed with superphosphate, but its proper use is as a substitute for superphosphate rather than as an adjunct to it.

It should be well incorporated with the soil, and applied early—perhaps in autumn.

It has not been known to do any harm even when applied in large quantity, but from 4 to 10 cwt. per acre, according to circumstances, is a favourable dose.

It is not a complete manure, and therefore potash salts or nitrogenous manures, or both, must usually be applied along with it, just as in the case of superphosphate.

There is an abundant supply of the substance, and it is a valuable manure with a great future in store for it, if it can be supplied at about thirty shillings per ton, and ground to an exceedingly fine powder.

EPITOME OF EVIDENCE TAKEN BEFORE A COMMITTEE OF THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND ON PLEURO-PNEUMONIA.

At the meeting of Directors held on 4th May 1887, a committee was appointed to inquire into and report as to the practicability of making an exhaustive inquiry in regard to pleuro-pneumonia.

The committee consisted of Mr Paterson of Birthwood; The Hon. R. Baillie Hamilton; Mr Maxwell, yr. of Munches; Mr Marr, Cairnbrogie; Mr Murray, Catter House; Mr Middleton-Clay of Allan; Mr Stirling of Kippendavie; and Dr Aitken.

Mr Paterson of Birthwood was appointed convener.

The committee invited the co-operation of those in this country who were likely to be best informed regarding the nature of the disease, or who had practical experience of it among their herds.

The principals of the three Scottish veterinary colleges, and other veterinary surgeons, were asked to give evidence before the committee, also the representatives of local authorities, and a number of dairymen and other stock-owners.

The following witnesses were examined before the committee:—

18*th May* 1887.

1. Mr Thomas Elliot, Blackhaugh, Galashiels.
2. Mr R. Rutherford, F.R.C.V.S., Edinburgh.
3. Mr William Cairns, Fountainbridge, Edinburgh.
4. Mr Robert H. Runciman, 7 Montgomery Street, Edinburgh.
5. Mr William Cooper, Sunnybank Cottage, London Road, Edinburgh.

31*st May* 1887.

6. Mr James Stenhouse, jun., Turnhouse, Cramond.
7. Mr James Biggar, Grange, Dalbeattie.

8. Mr Patrick Webster of Westfield, Forfar.
9. Principal Williams, New Veterinary College, Edinburgh.
10. Principal Walley, Royal (Dick) Veterinary College, Edinburgh.

14th June 1887.

11. Principal M'Call, Veterinary College, Glasgow.
12. Mr Robert Reid, M.R.C.V.S., Inspector under the Cattle Diseases Act, and Superintendent of Slaughter Houses, Leith.

27th July 1887.

13. Mr R. O. F. Stewart, Montrose.
14. Mr Andrew Spreull, M.R.C.V.S., Dundee.

Edinburgh, May 18, 1887.

Present:—

Mr Robert Paterson, *Chairman.*
The Hon. R. Baillie Hamilton.
Dr Andrew P. Aitken, Chemist.
Mr F. N. Menzies, *Secretary.*

Mr Thomas Elliot, Blackhaugh, Galashiels, called in, and examined.

I have had about fifty years' experience of pleuro-pneumonia. I never knew it in home-bred cattle unless they had been in contact with Irish cattle. It was from Irish cattle that I got the disease. My experience is that the disease is contracted during transit. We used to winter and graze large numbers of cattle at that time, generally about 600. They were wholly Irish for many years. We had the disease very regularly during many years—seldom wanting it; not one year at a time. I believe it is created very much in the course of transit from the holds of the vessels in which cattle have been in not being properly cleaned, when cattle have been brought across. I have come at times in the boats with cattle. I think inquiry should be made into the causes and remedies of pleuro-pneumonia by medical men, and possibly, if inquiry were made into the transit of cattle between Ireland and Great Britain, there would be a great improvement. I have seen the disease in these cattle six months after they were brought from Ireland to this country. I have seen it as long as that in developing itself twenty-four years ago. I am certain it is the same disease as it was fifty years ago. I have seen a fat bullock diseased, and taken him home, and slaughtered him, and put in a sound animal without cleaning out the stall or litter, to see if it would take disease soon. I have done that at different times, and I have put an animal into a field amongst cattle that I knew had disease. They always took it after a few months. My opinion was that the disease was contracted very much by breathing the breath of each other. I do not think it is likely the disease could spread far unless there is contact. I do not think that cattle one hundred yards off would have much risk, though there were others there that had it. It is more than fifty years since I was working amongst these cattle. Pleuro-pneumonia did not pull them down in condition till a certain time. Cattle among which pleuro-pneumonia occurred were kept apart for some time. I never knew of a case where the disease broke out amongst home cattle kept by themselves. I am of opinion that could not do so, and that the disease is only carried by contagion, and that it does not spring up spontaneously in the beasts' bodies; that has been my experience. We came to that conclusion twenty-five years ago. We had a consultation at that time on the subject, and I have never bought an Irish bullock since. I do not say that I have not had any, because one or two might be mixed in the lot by the dealer; but I have not had a single case of pleuro-pneumonia for twenty-four years, except once, when it was amongst a lot of black Highland bullocks, and we traced the animals as having been grazed with Irish cattle above Denny; that is the only case I have had for twenty-four years. I was never afraid that the disease would be carried by the cattleman. He went among both diseased and healthy stock. I attribute my immunity from the disease entirely to the care exercised in buying cattle from respectable English and Scotch people, and I hold that it cannot exist in Scotland if proper steps are taken. I have still a large number of animals. Pleuro-pneumonia, if not imported, would die out here; it is not indigenous in the country. If you did not introduce foreign cattle, it would die out. In my youth it was unknown. It was unknown till Irish cattle came into Scotland. I will tell you one thing: I drove out the first six store Irish bullocks that were shown in Edinburgh to Gala Water, so that the Irish importation of cattle is not so very old. All the orders are wrong, both in regard to this and foot-and-mouth disease. You harass and persecute your own people at home with orders, and put them to great trouble and loss, whereas you allow the men who bring in the diseased cattle into the country to go with impunity. You interfere with your own people every day in the world, and you try to insert every kind of restriction you can for them. I do not see how the Irish cattle should be more unhealthy than our own in winter; but it is a moist climate, and the animals are often very poor from lying out all winter. I have no doubt that it assists in developing the disease. I think that the transit from Ireland to Britain is the worst in the world; there is nothing so bad. Cattle will be brought from America to Glasgow, and they will be in a better condition than those that are brought from Belfast to Glasgow. I think the evidence you might have in the autumn in Scotland shows what the Scottish farmers think of Irish cattle. If you go to Hallow Fair, you will find the north of England cattle standing on one side, and the Irish cattle on the other. You will see the north of England cattle all sold before the Irish. That is a proof that the Scotch farmers think the Irish cattle dangerous, and they only take them when they cannot help it. I have sometimes thought that if you were to try to amend the system of transit, it would do a great deal of good to rid the country of the disease. I have thought it might do if you allowed cattle to be classified three-year olds, two-year olds, and one-year olds, and to license the boats to carry certain numbers, as is done in regard to omnibuses, and if that were done I don't see why you could not bring over healthy animals. I am certain that if the Irish landlords and the Irish graziers had paid more attention to the matter of their animals when they came to England and Scotland, they would put one and a-half millions more money in their pockets than they do per annum. They have suffered immensely from carelessness in the transit. I think an exhaustive inquiry into this would be beneficial to the country. I think a great deal might be done by making an inquiry, and by putting efficient orders in force.

Mr R. Rutherford, F.R.C.V.S., Edinburgh, called in, and examined.

I have been in practice twenty-seven years. During that time I have treated many outbreaks of pleuro-pneumonia. The system I would advise to be followed in an outbreak of pleuro occurring is careful examination of every animal amongst which the outbreak has occurred. Slaughter all of the affected, and above all, those that are suspected, and immediate inoculation of the remainder. I would kill all suspected animals with a higher than normal temperature, indicating pleuro-pneumonia. I have invariably found when I have got a temperature of 103°, and the breathing a little hurried, especially on being moved about or excited, these animals that had been slaughtered have been found to be cases of pleuro-pneumonia. If an animal shows a temperature of 103°, it should be destroyed as a matter of policy. Successful inoculation confers immunity. I mean by successful inoculation, that the operation shall be carried out in a proper manner. I have reason to know that it is very frequently improperly performed. If animals are inoculated, and still take the disease, it is the fault of the operator. I had information at the time that in the Cumberland outbreak it was improperly done, and the same thing occurred in Perthshire. I have never known an animal successfully inoculated succumb or even contract the disease, although it has been subjected to subsequent outbreaks. I have never known an animal take pleuro-pneumonia after passing through a successful inoculation; it never produces pleuro-pneumonia. If the animal has pleuro-pneumonia already, inoculation aggravates it. Pleuro-pneumonia cannot always be detected. The incubative stage cannot be detected. At the present time I know of no means of being absolutely certain. If you have an animal subjected to examination whose temperature is natural, and whose appearance in regard to health is normal, it would be rash for any one to say that it was affected with pleuro-pneumonia, and yet that animal might have it in an incubative form. Inoculation arrests it at that stage, for at that time there is no lung lesion. I think an inspector should have absolute power to put down anything he suspects. He is acting in the public interest. If a cow has pleuro-pneumonia and recovers, she remains capable of disseminating the disease for a long time—I should say at least twelve months I have not lost an animal from inoculation out of some hundreds lately inoculated—that is, from inoculation itself. Calves should not be inoculated under three months. It produces an inflammatory condition of the joints before that time. Autumn, spring, and early summer, before the flies become numerous, is the best time for inoculation. I would not inoculate cows in calf, if within two months of calving. I did so in the case of one for Professor M'Call, within a month or six weeks from calving, but that is not quite long enough. I think the disease can be eradicated by means of inoculation. In the first place, it is absolutely necessary that your operators are thoroughly up in their work, but there would be difficulty in finding such gentlemen at present; I would appoint them only by examination. The general demand would soon force the veterinary surgeons to attend to it. I do not think there is any danger of infection being carried by inspectors visiting the byres, and I am certain that if they were carrying inoculating matter with them they would not carry infection. At a meeting of the Central Society in Paris only a few months ago, it was shown that their system, in fact, is wrong, and that their failures are owing to their having pursued a wrong method of inoculation. I am prepared to admit the possibility that a percentage of animals may have the disease in a limited area of the lung; such cases have come under my notice, but it is not my experience that these animals, after passing through inoculation, disseminate disease. On the contrary, so strong am I of that opinion, that I stuck out against Professor Brown on that point, and advised the Kirkcudbright authorities to get a number of animals inoculated. Eleven out of forty-six were inoculated, and those that were killed were more or less diseased. I was positive, from the manner in which the eleven took my inoculation, that they would be saved. I did it twice to make sure of it. They were very valuable animals. Mr Biggar put the cattle on three different places on the estate, and he purchased store cattle, which he mixed with those animals; and now, after a period of six months' exposure, not a single animal has been found ill with the disease. Mr Biggar is now so satisfied as to the impossibility of the animals taking the disease, that he has mixed them with the whole of his stock on the Grange, a neighbouring estate. I am very particular in killing off everything that shows the least sign of the disease, even if there is only a moderate suspicion. The consequence of that is that it is almost impossible for an animal to escape observation unless the disease is in an exceedingly limited area. Complete inoculation alters that area. The whole power of the disease seems to be destroyed. I believe there is a consuming of the material out of which the disease grows, and the lesion of the lung becomes a non-contagious one. In many outbreaks I have been placing fresh stock among the inoculated animals, and I have never got pleuro-pneumonia among fresh stock. In some cases, where I have thought the premises were capable of conveying the disease, and had bad drainage and other unfavourable surroundings, I have insisted on a long quarantine, because I believe there is more danger from surroundings to the animal than from animals themselves. If it was the case that those inoculated animals continued to communicate the disease, we would have had the disease continually in Edinburgh and other places. Now, it is a positive fact that I can take you to scores of places where pleuro-pneumonia has not been known since successful inoculation was practised, and prior to which it never was absent. I attended Mr Stenhouse's cattle; the outbreak was last summer, about nine months ago. I was called in for consultation by Mr Borthwick, V.S. The stock is a very large one. I think that there would be about eighty cows. After an examination, carefully conducted, I found seven cases, and had them all destroyed; some of those cases were only strongly suspicious. When they were destroyed, all of them were found to be affected more or less with disease. We inoculated all the other animals, with the exception of two or three that were very close on their calving. We did not lose an animal after that, and there was no more disease. In dealing with inoculation it does not follow that with the most careful examination you may be able to hit on all the cases on your first visit. If there are any other cases developing the disease, and they are inoculated, those animals will declare themselves within fourteen to twenty-one days, and show the disease so distinctly that there need be no doubt about it. So firmly is that my opinion that, in dealing with an outbreak, after I get over the fourteenth day I am satisfied there will be no more slaughtering. I have had a rare case occurring in the third week. There are many methods of performing the operation, and if the virus is properly introduced it produces a lesion. Unless this is carefully and properly made, you do not get inoculation. When I get inoculation at the seat of operation it is always the same lesion. I can distinguish certain phenomenal appearances at the seat of inoculation that satisfies me whether it has been effectual or not. It may vary in intensity, but it is the same lesion. In the case of a cow falling down against the manger, or getting a kick on any part of the body, you get a specific exudate at the seat of the blow, evidently the pleuro-pneumonia exudate. When I have inoculated a lot of animals with the same virus exactly in the same way, and at the same time, and get from a few or even from one of these animals a specific lesion, and though I do not get it strongly developed in the others, if they get over the fourteenth day, they are safe. I have perfect confidence in the quality of the virus, if I know that I have got a lesion produced in a few. If an animal has pleuro-pneumonia, you get one of two results. You get an aggravated lesion, or none at all. I do not think that it aggravates any disease that might be in the lung itself. You have an alteration of the lung lesion from a contagious to a non-contagious one where you have disease in a limited area. You would be surprised how bad an animal may be, and yet escape observation. I have myself made individual examination of animals, and I have passed animals apparently healthy, showing no indication of pleuro-pneumonia, and yet in a week they have shown that they ought to be destroyed, and have been ill for three weeks. You may have a large lung lesion without being able to detect it. I do not think inoculation aggravates the lesion. But this I can say, that it aggravates the general condition that develops the disease. Where the disease is already established, you get in the majority of cases no result at the seat of operation. In dealing with an outbreak, if I have got a certain appearance on the tip of the tail, though not actually a lesion, and the temperature remains an average temperature till the fourteenth day, if I cannot detect abnormal lung sounds, and the animals are feeding, I believe that after the inoculation the animals are safe. It might be laid down as a rule that such animals as do not accept the inoculation in some form should be slaughtered as suspected. I would consider the non-taking on of the inoculation as a suspicious indication to be inquired into. I would slaughter any that were suspected. You know where the animal came from first, and what was the state of health in the place where it came from. If inoculation became compulsory, there should be a system of branding animals, certifying that at the time of the sale, and for a certain time prior to that, they were absolutely healthy. If we had such a thing as that, the disease that is in Ireland could not be. For years and years Edinburgh was a hotbed of disease, but now it is one of the healthiest parts in the kingdom, and that because the disease has never gone beyond the first two or three cases. I do not think that we have enough of powers. My idea is that the virus is never too strong; it is a virus unlike other poisons—it will not bear diluting. The pure lung virus is only got in an early stage of the disease. You may kill an animal, and not get enough virus to inoculate one animal, because the lung has passed beyond the stage when it contains the pure virus and nothing else. From using impure virus there would be blood poisoning, and you would produce a spurious tail lesion, and the animals are supposed to be inoculated when they are not. So long as I have the true pleuro-pneumonia lesion, I can go on inoculating. There is none so good as from the lung lesion. When the virus is transmitted by inoculating from tail to tail, it loses its potency, and after the second time it would fail to be sufficiently effectual. In dealing with an outbreak, an operator does not require to go out of the byre—he has the material ready at hand in the affected animal. From microscopical observation, I believe you get the same lesion in the tail as in the lung. There is but one way of disseminating this disease, that is from the lungs. It would not be as effectual if you were to take up the system of stamping out by slaughtering, and, instead of inoculating, isolate the animals for a certain time, because these animals you isolate had been exposed to the disease, and the incubative period may be six months. Inoculation is a test as to whether the beast has pleuro-pneumonia, even in the initiatory stages. There are various methods of inoculation. I think that is a thing in regard to which it would be very useful to have experiments carried on. It is possible to stamp out this disease, just as we stamped out rinderpest without inoculation. If you do not kill all the animals, less than 10 per cent. would require to be slaughtered according to my method. I think it would just be the first case and any other suspicious case that you would have to kill. All beasts cannot be inoculated, because there are some that are not in a suitable condition of body. I do not think it is at all necessary to have compulsory inoculation throughout the whole country. It is more necessary to recognise the fact that inoculation applied to pleuro-pneumonia reduces it from a disease dangerous and rapidly spreading, to a disease easily handled. The infection does not appear to linger about the body or clothing of a man; the disease comes off from the breath, and is continually being discharged on the premises, and the effects of the virus are more continuous than the accidental application to a man's clothing, who is soon out in the open air, where it becomes dissipated. But we should be careful to investigate about that as about everything else. The disease will linger about a place about six months. I would insist, in the event of one case, to have everything disinfected. If there had been no cleaning, that would be sufficient to make it unsafe to put cattle in the byre, but six months' interval would be abundance of time. I would not put cattle into a place where there had been disease already, if six months uninhabited, and without anything being done, for germs of the disease might be hanging or lying about the byre, the woodwork, and so forth. If I were inoculating a part of a herd, and putting the specific virus on their tails, that would not give pleuro-pneumonia in the lung to another animal that had not been inoculated; it does not produce the lung lesion. When the animal whisks its tail, and the virus gradually dries up, there is no danger to other animals though the virus should be cast about in a dry state. I have tried to inoculate with dry virus, and could not do it. Cobra poison and smallpox poisons would do that, but that is not the case with this poison. All that I say is based on the experience of dealing with hundreds of outbreaks. The virus should not be kept too long. Extremely cold weather seems to destroy its potency. It keeps longer in cold weather, but it is not so safe. I think it would be important to see by what method satisfactory virus could be preserved, so that a perfectly good thing could be got at any time. I should like very well to see virus that could be kept for any length of time, whether taken from the lung, or by cultivating it. All the Governments in Australia are in favour of inoculation; you can get a copy of the work relating to these experiments by writing to each of the Governments, notably Queensland, South Australia, Victoria, and New South Wales. I cannot make a calculation as to the difference to the country by stamping out, by slaughtering, and by inoculation; I could not say, but if the whole country could be compared to, say the city of Edinburgh, it would be a very great advantage. Edinburgh has had to pay thousands of pounds of indemnification every year, and now it does not pay as many hundreds. I believe that the inspector gets more for his salary than the amount that is received for indemnification, and the cause of that is inoculation. Undoubtedly the majority of owners in Edinburgh inoculate when disease occurs. There is no doubt that if inoculation was to be dealt with by the whole body of inspectors as it has come to be done by a few, it would be a disease that they could localise to the spot. I think inoculation undoubtedly better than stamping out. If inoculation were pursued in Ireland especially, where the disease is constantly in existence, with the same success as it can be done in Scotland, we would have little pleuro-pneumonia; and when it did exist it could be dealt with by a skilled veterinarian, and it would become a matter of not the slightest consequence whatever. You would have the one per cent. that might die from inoculation, and also four or five from those that did not take the inoculation, owing to their having the disease, and you might even have an outbreak occasionally. But what is all that when you know that you can stop it by slaughtering two or three? You cannot possibly be certain to be free from disease even if you killed off thousands. If you could slaughter all the cattle in Ireland, and stop breeding for twelve months, you might prevent it. The inspection in Ireland is very bad. There is an inspection, but it is a kid-glove kind of inspection. I do not hold that having inoculated an animal at one time gives it immunity for ever, but I think it highly probable. If new animals were brought into a byre they would not, if diseased, affect the inoculated ones. If any one can cultivate the virus, and prove that that virus is as capable as the other of preventing an outbreak, it would be very beneficial. We might have several outbreaks, but this cultivated virus would arrest them. If one could show that he can cultivate the virus, I could see that in a certain number of years, because every animal would be inoculated with this cultivated virus, the disease would die out. But a national measure of that kind is not necessary, because in the plain fact of an outbreak you have the material and the means for putting an end to it. I have long advocated the system of compulsory inoculation along with slaughtering and rearrangement of the Quarantine Laws. I think it is quite possible that the auction marts that the animals have been in that had the disease would remain dangerous for a certain number of days; but the most of those marts are open to the air much more than close confined buildings. We have had outbreaks that have made me conclude that the disease can be carried in currents of air. I should consider it dangerous to have infected animals at a distance of 200 yards. I have known of infection being carried over a field of 200 yards in width; that is quite a common thing. When an outbreak occurs, you should declare an area to be kept free around the place where the disease has broken out. In some cases the owners of stock would only have a certain number inoculated, and the result was that these animals were saved and the others died. I have inoculated lots of animals, and I have brought in fresh ones, and put them alongside of the inoculated ones without bad results. I believe that inoculation gives absolute immunity during the life of a beast. I have inoculated calves and other young stock, and these have grown up, and while pleuro-pneumonia existed around they remained the only free animals. My experience of my system shows that there is certain immunity, and I have not met a case showing the reverse. That is a matter that the Society should take up, and you will get most valuable information on the point. I would suggest that the Society should take up and investigate whether it could be shown that in the case of animals that have passed through inoculation, and declared free of disease, any of them could communicate the disease to others. We know that inoculated animals healthy at the time of the inoculation cannot produce the disease in other animals. The only point is whether those that have escaped observation, and supposed to be slight cases, can communicate the disease? I say they cannot. The question is, can the disease exist or lie latent after successful inoculation; and if so, for how long? I think that is a good thing to investigate. It is a thing deserving of investigation whether there might be really any danger to healthy stock if inoculated tails came into contact with them. Then, again, will animals, themselves healthy and inoculated, communicate disease to animals healthy but not inoculated? These are two of the most important points as affecting our export trade.

Mr Rutherford, F.R.C.V.S., Edinburgh, called in, and re-examined.

An animal will not accept inoculation twice; that is my uniform experience. In the limited area cases, I think the lesion becomes altered. The introduction of the virus on the outside modifies the tendency to lung lesion. During years and years' experience, I have inoculated thousands of animals in every instance in the face of the disease. I must admit that some of these animals may have had the disease in an exceedingly limited area. In numberless instances I have over and over again, immediately when those animals recovered from the inoculation, placed fresh stock amongst them, and yet they remained perfectly healthy. That is not my experience alone, but that of all who have taken an intelligent observation of the matter. Inoculation in the tail tends to develop more rapidly the lung mischief in cases that are not healing up. In those cases that are healing up, the inoculation simply fails. Those animals that have become naturally cured of the disease should be destroyed. Those are the most dangerous animals to go about. I admit that in the best of hands you may have isolated cases of animals not accepting the inoculation, and four or five months afterwards showing pleuro-pneumonia through the thread being stripped, or other cause, but such are rare. The same thing happens in the vaccination of children. An animal may succumb, but that does not affect the main argument. In regard to the cutting off of the tails, I feel whether the tail is cold when I go round the stock that is inoculated, and if I find that the tip of the tail is cold, I remove the dead part of the tissue. If the lesion is confined to the exact seat of operation, and the tip of the tail has the warmth of natural heat, I do not interfere, but I make a point of seeing all those animals. I would lay it down as a rule not to trust to chance in these matters, but to examine all these tips up to the fifteenth or sixteenth day. The indications that warrant and necessitate removal of the point of the tail are such as would satisfy the surgeon that if it was not removed it would result in gangrene. If you wait till gangrene occurs you will have to remove a considerable quantity. It is in the case of gangrene spreading up the tail or where I think it is likely to go, that I amputate. I am not able to prevent the exudate lesion spreading; it must follow its own course. When I have seen inoculation take strong, I have many a time had to amputate up to the top of the tail. My experience enables me to detect quite well what are the appearances of a successful inoculation, but the fear is of inoculation falling into wrong hands. We must train more of our young practitioners, and more of the old ones except some few who have already given it a great deal of attention. It is a pity that inoculation should break down on that ground. It has broken down on that ground in Cumberland. They have given it up now. When I am not quite sure if I have got a right tail lesion my plan is to inoculate again. I am content with a very small indication, so that I get development in the other animals in the same way. The inoculated animal accepts it unmistakably. I have adopted the system of re-inoculating an animal when it did not take. After the experience of years, I can speak to its general success, and I would advise the Government to adopt protective inoculation, along with compulsory slaughter.

WILLIAM CAIRNS, Fountainbridge, called in, and examined.

I have had over twenty years' experience of pleuro-pneumonia. We had it on our place almost constantly for ten years previous to 1878. I had from 35 to 40 cattle. I lost a good many. We sold them for slaughter. Some would not take the disease for some months, others would take it soon. There were always some animals left in the byres. I tried almost everything for these different outbreaks. I have had no outbreaks for three years; I attribute this to inoculation. I have not inoculated for two or three years. I have been fortunate in buying cattle and keeping clear all that time. The last time I had the disease was in 1883 and 1884. Mr Rutherford pressed me to inoculate, and I complied in 1878. At this time our byre had not been clear for sixty days for some years. Our stock was reduced from 40 down to somewhere about 15. I bought five cows on a Tuesday, I had them inoculated on the Wednesday morning, and the same day I bought three others and put them into the byre. The three, which were Ayrshires, cost me £70, and these were put into the same byre with the five. I would not risk inoculating them. They were along with six or eight of the old stock that were in the byre. Well, the three Ayrshire either died or were ordered to be killed for pleuro-pneumonia within three months from that time. The inspector said it was pleuro-pneumonia. The three died, and the five that had been inoculated were all right. From that I was satisfied that inoculation was a sure preventive. Again, I have seen perhaps one or two that Mr Rutherford tried to inoculate but would not take it on, and none of those animals showed disease afterwards. I have had fatal cases from inoculation from swellings at the tail head. At first we lost several, but since then the losses have not been heavy at all—perhaps one out of fifty. All the animals I have inoculated have been cows in milk. I inoculated about ten days or a fortnight after calving. I find it difficult to detect when a cow is first affected with pleuro-pneumonia. They go off their milk, but it might be a long time hanging about them. The only way to know at once is to kill one. I think that if an inquiry were made into the matter, it would be beneficial, but I will leave that to scientific men to say. The only thing that we found to cure the disease was inoculating. I have washed the byres from top to bottom, and put all the cows in one byre. The roof was open at the top, and we whitewashed it, and used carbolic acid. We then brought in a fresh stock, but afterwards there was an outbreak. We had always some of the old stock there in the byres. I think the old stock carried on the disease. That old stock is a fluctuating stock, coming and going. I get my fresh stock inoculated for some months after an outbreak. I have sixty cattle just now. The average time I keep each animal is from nine to twelve months. Cows seem to thrive faster after inoculation. If it was not the risk of losing the cows from the operation, I would have the whole operated upon. If you have good virus, and a good man in charge of the stock, and who does not knock them about, the result would be satisfactory. I have seen them swell up when they were inoculated. When a cow has been inoculated she needs to be tenderly treated for a fortnight. I know nothing from which they are liable to danger, if they are not abused in any way. They must be kept warm.

Robert Howden Runciman, 7 Montgomery Street, Leith Walk, called in, and examined.

I have been engaged in dairying for the last eight years. During that time I have had three outbreaks from pleuro-pneumonia. It will be about three years since I had the first outbreak. I allowed them to stand as they were, and got them inoculated. The first case stood for a considerable time. It was a new disease to me, and the cow was allowed to stand too long, and a good many of the cows got affected thereby; but as soon as I knew, I got from thirty-five to thirty-eight inoculated. I think there were four slaughtered at that time. There was one loss after the inoculation. She did not die from pleuro-pneumonia. She got a stroke from a stool, and died from swelling at the tail head, and that went into her inside. The second outbreak was one cow that had been improperly inoculated. At that time I got all the fresh ones—sixteen or seventeen—inoculated, and that was the only case I had. The third outbreak was on the 24th of November. I had an animal standing that had been off her meat for a day or two. It was accordingly sent away, and was found to be a case of pleuro-pneumonia. I got the other cattle inoculated. Mr Rutherford took the virus from the diseased cow. There were one or two that did not take it, and they were done a second time. I think I only lost two through cold, and then I was clear for six weeks, when there was one dropped off on Christmas day. She had been inoculated, but it did not take properly. I have had no fatal cases from inoculation beyond the animals I have described. This cow had been in my place for six months. The disease had been pretty bad a short distance from me. I could not account for it in any other way except coming through the atmosphere. There is not much of coming and going to the byres; we rather avoid each other in these circumstances. We always keep a strict look-out against strangers coming into the byres. As soon as it is known that the animal has pleuro-pneumonia, she is removed. I had in my possession an inoculated cow that took pleuro-pneumonia. So far as I remember, it would be four or five months after inoculation. It was about six months after that beast came into the place that the third outbreak occurred. This case of the six months was pretty bad. She had not been showing it for more than a few days. My whole stock was inoculated then. Two or three did not take it. Some of these cases that did not take on the inoculation were in my possession at the time when I brought in my fresh stock. I have had none inoculated since I was clear. What I mean by clear was the time that we were allowed to buy in February, and I have not had any more inoculated. I go on the principle of let well alone. I have disinfected the premises to the best of my ability. I am satisfied with the operation by inoculation in my own mind. I would not be afraid to inoculate my other animals, if it is properly done.

William Cooper, Sunnybank Cottage, London Road, Edinburgh, called in, and examined.

I commenced business as a dairyman in 1859. I have never had an outbreak of pleuro-pneumonia since I began to inoculate, but before that was scarcely ever free from the disease. I began to inoculate in 1878. Then there was an outbreak, and I had 42 cattle. We were afraid it would be serious, because we suffered so much before. We got 27 of the animals inoculated. We were making the others fat. We lost one cow, but we blamed its death on a servant who had given it a stroke. They were sold in the Edinburgh market. I did not make any inquiry about them afterwards. I bought fresh cattle. I put them into the same byres with the inoculated animals. The fresh ones did not take the disease. I think that animals brought in from the country, and put alongside animals having pleuro-pneumonia, would take the disease. I had thoroughly cleaned the byres before I brought in the new stock. I mixed the new stock with the others, and the inoculated animals did not give off disease to the new animals. We had another outbreak two years after that one. I sent for the veterinary surgeon, and I got 37 inoculated at that time. It broke out in the byres, but I cannot say where it came from, as I frequently buy new stock. The animal that brought the disease was among the fresh ones that came in. I think it would be three or four weeks before I discovered the disease. None of the animals I have had inoculated have taken pleuro-pneumonia. I waited until the inoculation was healed up before I brought in others. I did nothing to destroy any infection that might be in the byres but cleanliness; new stock were in risk of taking infection about the byres, if there had been any. But I have never discovered any case occurring from that cause. One cow that had been inoculated was destroyed, but it was not the original injury to the tail that was the cause of death. The servants gave this cow a stroke with a stool. I was very careful during the time of the inoculation to keep the animals dry and tidy; they required to be properly attended to.

Edinburgh, May 31, 1887.

Present:—

Mr Robert Paterson of Birthwood, *Chairman*.
The Hon. R. Baillie Hamilton of Langton.
Mr W. J. Maxwell, yr. of Munches.
Dr Andrew P. Aitken, Chemist.
Mr F. N. Menzies, *Secretary*.

Mr James Stenhouse, jun., Turnhouse, called in, and examined.

I farm a thousand acres, paying a rental of £3000. I have three holdings. I have had a dairy since October 1880. I have only had one outbreak of pleuro-pneumonia; twelve months ago. I found the cows unwell. I sent for Mr Borthwick, the veterinary surgeon at Kirkliston. He brought out Mr Rutherford from Edinburgh. Mr Rutherford tested them with the thermometer, and condemned seven; he said it was a case of pleuro-pneumonia. Before he tested the animals with thermometer he pointed out the same animals that were dull and hanging, and that Mr Borthwick also condemned. Seven were condemned to be slaughtered. They had one slaughtered to get the virus to inoculate with. There were seventy-eight altogether. The others were all inoculated that same evening. There were none to do over again. I had no further disease amongst the 70 odd cows. I have some of them yet. I have had them for nine or ten months. I did not part with them for two or three months after they got better. Those I parted with were sold fat. I bought eight cows, and had them put in byres about 300 yards off. I allowed fifty-six days to elapse before putting them amongst the others. None of them took disease. I began to put animals into the large byre after having been inoculated, as they might be required. None of them took disease. I have not had another outbreak on my premises. I have generally about twenty other cattle. They get the straw from the same barn, but the people connected with the byre are distinct, and there was no necessity to have any communication. The straw barn and a court are between the sheds. There is not more than 30 yards between them. The twenty cattle referred to were in the courts all the time. They were about the steading the whole time that the others were affected. I was going through both byres once or twice a week seeing how the cows were progressing. I had no fear of carrying contagion from the one to the other. If the disease broke out again I would have inoculation at once without any hesitation, and kill every animal above a certain temperature. I am of opinion from what I have seen that cattle about 150 yards off from an infected spot are comparatively safe if you do not go amongst them. I disinfected my byre. We constantly used carbolic till lately. We whitewashed, and washed the walls with hot water. When inoculation fails to be a preventative it is the fault of the operator *entirely;* it cannot fail if properly carried out, and much depends upon the attention given while the inoculation is running its course, and care must be taken never to try it on an animal with temperature too high. The animals are very tender at that time, and are very easily injured. We had to stop every draught and to take great care. The man was always there, and I was constantly going about. I think that to slaughter the whole herd is perfectly unnecessary, after the experience we have had. Mine might have been slaughtered, but when you kill seventy animals it is a serious thing.

Mr James Biggar, Grange, Dalbeattie, called in, and examined.

I hold about 650 acres in two holdings in Kirkcudbrightshire. I have Galloways; I have had one outbreak of pleuro-pneumonia. I have two farms and two steadings. The steadings are about three-quarters of a mile apart. We have had breeding cows at each place, and the young stock from these cows. We graze a few cattle in summer, and we feed a good many cattle in winter. The outbreak took place about the beginning of June last year. The outbreak of pleuro-pneumonia was at Chapelton, where we had the smaller number of cattle. At Grange, just previous to that, we had a cow sick. The veterinary surgeon treated her for inflammation of the lungs;

she got better. I should think that was in April. At Chapelton, about the beginning of June, a cow was seized, and treated for inflammation of the lungs. She was put into a loose box, and died about the 15th of June, and was buried. There was no examination made, but two or three days after another cow was affected, and put into a byre that had been used for feeding cattle. Mr Irvine, veterinary surgeon, who is also local inspector, was brought, and as soon as he saw the second cow at Chapelton, he was suspicious. He said he would like the opinion of another veterinary surgeon. Then we had a different cow, which died in two hours' illness; she was brought in to milk, and was not quite well when she came in; and in moving her from one byre to another she died. A *post-mortem* examination showed inflammation of the bowels; there was no pleuro-pneumonia, but one of the lungs had an encysted part—something that had been there a year before. It was an animal that I had bought from a breeder in the same county nearly two years before. Mr Paterson, V.S., of Dumfries, was consulted, and said that the appearance of that lung was that of an animal that might have had pleuro-pneumonia twelve months ago. The three cows had been standing together in the byre for ten days. We said, "Would you wish to be satisfied as to whether this is pleuro-pneumonia"? and they immediately suggested that we should slaughter one of them, which we did. As soon as they saw the lungs, they pronounced it pleuro-pneumonia, and we took the necessary steps to make the thing known to the chief constable. The two or three animals were slaughtered—only those that we were obliged to slaughter. The local authority met, and immediately ordered the slaughter of those animals that remained—two cows, I think, and a calf. Other cases appeared, and we telegraphed to Mr Rutherford, asking if inoculation should be adopted. He replied he would recommend inoculation. We telegraphed to him to come down at once. Other eight cattle had been condemned. Professor M'Call had been brought, and a calf was killed for his satisfaction. He was present at the meeting of the local authority, and said that eight animals were affected—other four cows and four calves. These were ordered to be killed next day, and we telegraphed to Mr Rutherford to come down, and if he wished to inoculate to take the virus. He could not come himself, but he sent his assistant, Mr Manuel, who took the virus from the lungs of some of the animals, and inoculated eleven head. They all did well; some of them are living still. There are three cows left alive out of the five, and there is one yearling heifer left, and two calves left, the others have been killed. On the 5th November following we took four of the inoculated cattle and four others that had never been inoculated or previously in contact, and put them together on separate premises a mile distant, and on which no cattle had been for twelve months; we kept them three or four months. They were examined by the chief constable and by the veterinary surgeon, and at the end of three or four months we asked the local authority to go and examine them. They came with two of the veterinary surgeons, and they examined them outwardly and saw nothing. We volunteered to send to the local slaughter-house the two calves. The inspectors went there, and pronounced them perfectly healthy. We have still one with us. The disease appeared in June, but it was near the beginning of July before we inoculated. Those cattle were put up on the 5th of November, and were kept over three months. Those that were found fit subjects for inoculation all lived. Mr Rutherford was not satisfied with the taking of the inoculation, and he told me that he had inoculated them the second time. They took it the second time. I saw the lesion of those he did a second time. They were swollen in the tails. The increase of thickness was nearly twice the normal size; he had already cut off parts of the tails of two. Looking back over the whole events of the outbreak, I would inoculate again. I have no proof that those cattle that were inoculated would have taken the disease if they had been left alone. I was not present when Mr Rutherford made the inoculation; but he told me he was afraid that the thread had not been sufficiently saturated, or that in drawing the thread into the opening sufficient care had not been taken to prevent the virus being stripped off. It was done by his own assistant, who had been taught his own method. Mr Rutherford was not satisfied with the first inoculation. I am not able to say that his inoculation produced a difference from the assistant's inoculation. Some of the tails swelled on the first occasion. He examined them, and was not quite satisfied. After having inoculated them himself, he was satisfied. He saw them a fortnight after to satisfy himself. He was there twice. The operation of inoculation is quite simple. It appeared to me to be a matter not of great difficulty. I had fifteen cattle in the cow-byre. I may say that our outbreak of pleuro-pneumonia was the first outbreak that was known of or reported to the authorities in our district for some years before. There had not been a case in the Stewartry of Kirkcudbright for five or six years. Ours was the first one that was declared to be pleuro-pneumonia, and the first animal that was infected was in our breeding stock, and we had had it several years. Soon after there was an outbreak of pleuro-pneumonia three miles off, and another outbreak ten miles off, and certainly there had been no direct interchange of cattle with us. We adopted inoculation on our own responsibility.

After we had tried inoculation, the local authority decided in these other two cases to try inoculation. With the exception of two or three cases, all did perfectly well. We filled up our premises about the end of October with fresh cattle—feeding cattle—about fifty in number. They all did perfectly well. There was no disease amongst them. I disinfected the byre most thoroughly. The premises were comparatively new. The passages were laid with concrete, and the woodwork was new. They were washed with soap and water, and we used chloride and sulphur fumes too; we went over them two or three times. I think it is hardly possible that any germs could have been left. I would like to see more inquiry as to the origin of the disease, and that the question of inoculation should be examined into in a more particular way. To judge from the results, inoculation must have been productive of perfect protection in our three cases. The results are all in favour of it, and there is nothing against it.

Mr Patrick Webster, of Westfield, Forfar, called in, and examined.

I farmed pretty largely at one time; not so much now. I am convener of the local authority of the county of Forfar. I have been brought a good deal in contact with outbreaks of pleuro-pneumonia. I think it desirable that an exhaustive inquiry in regard to it should be made. We got Mr Rutherford for the purpose of carrying inoculation out, and he went to a farm on Lord Southesk's property called Fithie, about November of last year; he slaughtered two cows that were affected, and two afterwards that were in contact. At Fithie there were 52 cattle that were inoculated; and out of that inoculation there were five afterwards that were killed, but I can explain that. When Mr Rutherford was down there were 16 or 18 cows, and there were some of the cows he had inoculated. He said he was not very sure whether they would all stand it or not. Amongst the doubtful were three or four that he thought he would give a chance to. So that out of 52, taking off these three or four, there was almost no loss. And there has been no loss since. That was done in November. I do not think it will break out, now that there have been months and months since without any outbreak. I will give you further information. There were 32 or 34 young cattle that were brought into the place where the cows were killed, and there inoculated. They were kept in the steading four or five days before being let out again, and they had every chance of being affected, but not one of them showed any symptoms of being affected. There were two cows killed, and these young animals were all inoculated at that time. None of them have shown any symptoms in the least. The inoculation protected them. If there had been any infection to be got we hold that inoculation prevented it. Mr Rutherford, who inoculated the 32, thought them not safe, and that was why he inoculated them. They were all free from pleuro-pneumonia at that time. If the smallest disease is begun, the inoculation will not stop it, but it prevents it spreading. None of these 32 were killed, and never were affected with pleuro. The total number that we had slaughtered in the county up till then was 83. The compensation for cattle slaughtered amounted to £760, 14s. 1d. That was when our policy was for inoculating. Then there was the compensation for animals slaughtered, for being in contact. That amounted to £37, 9s.—the whole amounting to £798, 3s. 1d. Now, to show the difference when the policy was changed by the Privy Council, so that you are not to inoculate. You were to kill everything that was in contact, and we have been doing that for some time past; as to those in contact, where we had only four before, there are now 117. The compensation for cattle slaughtered, being affected, was £519, 2s. under the new system; but the compensation for slaughtering cattle in contact was £1126, 7s. 9d., in place of £37, 9s. before. The total cost under the new policy is £1645, 9s. 9d., in place of £798, 3s. 1d. under the other. When we inoculated, there were only four in contact that had been diseased. But when we slaughtered, the 117 in contact might not be; nevertheless, we were obliged to slaughter them, on account of the policy then carried out. We were not now allowed to inoculate,—at least I reasoned in that way. We had to kill everything; for I understood that it was according to the Privy Council orders that we were not to inoculate. A farmer at Scotstoun, near Montrose, came to us with regard to the subject of contact. Suppose, he said, a diseased cow in the byre, and near the court into which all the droppings of the byre are put,—would the Privy Council look upon that as being in contact and so have the animals all killed? We read it, that the droppings, if put into the court, would cause infection. According to my view, that is destroying a lot of animals that have no disease about them. I think it is cruelty to animals to go on destroying them. There is no doubt that central marts have been the means of spreading the disease so far. It is the cows that we complain of. I am decidedly anxious that there should be a thorough and exhaustive inquiry.

Principal WILLIAMS, of the New Veterinary College, Edinburgh, called in, and examined.

I think that such an inquiry into pleuro-pneumonia as is proposed, if properly conducted, would tend to the good of the country. I have had great experience in dealing with pleuro-pneumonia. I could detect it from an elevation of temperature in the preliminary stages, taking into account the general condition of the animal. I would give a diseased animal no treatment except the pole-axe. There is no cure for it. I speak on forty years' experience of it. I believe that pleuro-pneumonia in all its stages is an incurable disease. There are mild attacks and severe attacks. I am convinced about its being an infectious disease. It is carried in the breath by animals suffering from the disease. I am of opinion that cohabitation is necessary in the great majority of instances. There may be some very rare exceptions. It may be possible to carry it from 200 to 300 yards;—300 yards I would put as an outside limit. I do not say it would not be carried by excreta as well as by the breath. I do not think it possible for the disease to be carried to animals by a man who has been in the neighbourhood of a diseased animal. I know what the disease consists of, and have seen the actual organism that causes it. I find this organism in the lymph and in the tissue of the lung. It is a micrococcus and an organism that requires oxygenation. It will grow in fibrous tissue in any part of the body. I always find it, and I can grow it outside the body. I have never inoculated an animal so as to produce the disease. My only proof that it is the actual real organism of the disease is that it is constantly present. It would be a very important part of the investigation if you could cultivate and produce an illimitable amount of inoculative fluid. I would desire to experiment with the lymph itself. I think the micrococcus is the cause of the disease, not the consequence; it is the cause undoubtedly. It grows in the tail to an enormous extent when the tail is inoculated. It is in the tail as well as in the lung. It is my opinion that the micrococcus is the actual thing breathed out with the breath. This disease is in all cases a fever. It leaves the animal impervious to pleuro-pneumonia, but it does not do so without leaving results. I think it leaves lung lesion. I think that an animal that has had no lung lesion must have had no pleuro-pneumonia. There is in my experience always some small spot. I think that the introduction of the organism into the circulation is the beginning of the fever, and you have the precedence of the blood-poisoning before you have any pleuro-pneumonia evil. I think that this process of inoculation is not one that gives immunity to an animal from pleuro-pneumonia during the rest of its life if it succeeds in taking on the inoculation, but I would say for two years. I would put a term to the immunity without further experience. I think it a good thing for the Society to consider this as part of the inquiry. Practically, it gives immunity during the ordinary life of a feeding beast. Anybody could inoculate. I think it could be entrusted to the hands of an ordinary veterinary surgeon. The only thing is the selection of the lymph ; it is a difficult thing to select the lymph. It is a thing to which you would require to train the veterinary surgeon, otherwise the process would break down. After a man has seen the lymph containing the virus, there is no chance of his mistaking it thereafter. It is my opinion that the best way to treat an outbreak of pleuro-pneumonia is to slaughter everything that is suspicious, and inoculate all the rest. There are certain stages of this pleuro-pneumonia disease in which it is impossible for the most skilled expert to detect the disease in the animal at first, but that is not a common thing. As to how long it would be impossible for one to detect the disease, given pleuro-pneumonia in a herd, any deviation from the normal health in any single individual animal would be sufficient to show that the disease was latent there. I would treat it as disease even in the absence of positive symptoms; professional skill enables one to detect it. It is only one in a hundred that I would fail in. I include in that the fact that the cow has not been able to take on inoculation. If it did not take the inoculation within fifteen days or three weeks, I should say it was a suspicious case. An animal with pleuro-pneumonia in the initial stage will sometimes take inoculation, and will have both the inoculation lesion and the pleuro-pneumonia lesion, but it is very rarely the case. I have had actual experience of that from my own observation. I have found that an animal had all the symptoms of a thoroughly well-made-out case of pleuro-pneumonia, and yet it took on inoculation. There are few cases of that kind. I have seen two such cases within the first three weeks after inoculation. I think it is as perfect as vaccination in the human being. Then, when an animal does not take on inoculation, in the event of there being an outbreak, I would regard it as tainted—as having had the disease; I would slaughter that animal. I should not prescribe inoculation for a healthy herd. If they were only within 300 yards of the disease, I do not think I would do it; unless the disease was in the byre, I would not do it. I have done it to please people—to satisfy clients. It is the same as in vaccination; you cannot account for its failure. I am of opinion that in inoculating animals there are uncertain circumstances, when you have to depend on the exudate of a recently killed case of pleuro-pneumonia, and that you would be in much more certain circumstances if you depended on virus of your own cultivation. That is what is wanted—if we could have a pure virus. I do not think it necessary, in order to succeed in inoculation, to have some kind of irritation produced, such as a seton produces. The cause of the severe exudation going up the back, and causing death, is constitutional on the part of the cattle. It is a mistake to shut all the ventilators in a byre. We give them plenty of ventilation. I am of opinion that, generally speaking, I will not say in every case, the animal contracts pleuro-pneumonia from another. I have great doubt whether it will be made out eventually that objects and things contain the infection for a length of time. It is shown by the fact as to men going about and what I have seen otherwise. I am of opinion that it would be beneficial for the country were the Society to take up an investigation on the inoculation line. I do not think that the inoculation so modifies the character of the pleuro-pneumonia in the lung as to make it innocuous to other animals. It might break out three months after. It is these cattle that spread the disease. I find that these cases generally show bad symptoms. After inoculation they are generally dead in three weeks. I consider it a good point of the system that it rapidly brings forward the disease; and the weak point is when it does not take on. We want, as an experiment, to introduce inoculated cattle into fresh herds. It would be a great experiment. Putting the defects of the inoculating system against its beneficial effects, I am strongly in favour of inoculating. It is undoubtedly a good thing for the individual. But whether it is for the nation at large is a thing that must be found out by experiment—that is, by the introduction of inoculated cattle into healthy herds. The experiments carried on in foreign countries were badly done. In fact, they did not know how to do it. If you carefully read the reports you will find that out. There is bad lymph, bad results, and it is badly performed. I have not discovered the micrococcus in anything except in the lymph. I think that the country should take the question up by bringing a lot of inoculated cattle, and introducing them into healthy herds; that is the crucial point. It has been my opinion all along that something should be done. It would not cost anything like the money spent in Lanarkshire. If by introducing inoculated cattle you had pleuro-pneumonia, then we must go on with the stamping-out process; but, certainly, it is well worth trying the experiment. It should be carefully conducted. In many places it could be done where there would be no fear of carrying the contamination. I think all local authorities should be abolished. The veterinary inspector of the district ought to order slaughter, without consulting the local authority. The imperial authority ought to pay if the inspector acted for the public. I should say that stamping out is the safest way, but it is expensive. I think that inoculation will always be the cheaper way. With our present knowledge, I would recommend the inoculation system, so as to keep pleuro-pneumonia under control. Inoculation will rid it as permanently as the stamping out, provided that this experiment succeeds. My opinion is that it will. It is only by having an inquiry that that can be found out. If you could get the virus cultivated, it might be applied to the whole stock of the country, but I would not like to commit myself on that point. If you inoculate infected herds, you do quite sufficient in keeping out disease from the country. Those that succeed are kept a year or two till they are fed, and they are sold to the butcher. There is thus no chance of any spreading of the disease.

Principal WALLEY, Royal (Dick) Veterinary College, Edinburgh, called in, and examined.

I am Principal of the Dick College, and have had over 30 years' experience in reference to pleuro-pneumonia. I am not always able to detect it at an early stage, simply because it is a fever, and resembles in its general aspects many other fevers. Cattle are subject to febrile symptoms, which may be caused by a variety of circumstances. I have inoculated many animals, with sometimes very good results, and sometimes very bad ones. I have had some deaths from inoculation. It is impossible to ascribe the cause of death in all cases. You may inoculate three different lots of animals in one day, and one may take it, and the other two may not take it, although inoculated in the same way, and with the same virus. I think bad results may be largely attributed to local causes, such as bad hygienic surroundings and heat. My greatest loss was during the summer; prior to that I only lost one. In spite of all my endeavours, I could not get my instructions carried out. The people kept their cattle too warm. Heat increases the activity of inoculation. We don't want to get them exposed during winter, but it has been shown that you get more pronounced results by keeping the tail at an artificial heat than otherwise. The results of my observations generally have been, that if the animals are inoculated immediately the disease breaks out, and if the disease is detected at the earliest stage of the outbreak and the animals immediately inoculated, it is very successful in preventing the further spreading of the disease among them. If, on the contrary, the disease has been hidden, and the animals exposed for weeks or months to the infection, it is sometimes very unsuccessful. Inoculation does not usually arrest the disease until the old cases are removed, as I can show you by statistics. If a diseased animal is in an extremely bad state, the inoculation, to a very large degree, has no power on the other animals until it is removed. It is possible to detect the disease, by the aid of the thermometer, knowing it to be in the neighbourhood, but the thermometer is positively useless after the acute stage is over. As a general principle, the thermometer is only useful in the febrile stage. The consolidation of lung resulting from pleuro-pneumonia gives you no different physical condition than does a patch from any other disease. If you suspect pleuro-pneumonia, and use the thermometer, it is the earliest guide to its presence, as at present known, or possibly ever will be known. On March 22, 1886, J. sent a cow to Leith slaughter-house. She proved to be the subject of pleuro-pneumonia, and was slaughtered. He did not report, but we got our report indirectly. I visited the byre the same evening, or the next, and I found the cows had been inoculated by A. Now, on the 31st of March I took out a cow with pleuro-pneumonia which the owner said had been distinctly declared by A. in the morning to be right. She had pleuro-pneumonia very markedly. I found her temperature to be 105°. On 13th April I took out one cow from his byre as the subject of old pleuro-pneumonia. I pointed out another cow alongside of her, and they were both found to have pleuro-pneumonia. One had had the disease certainly three or four months. The lung was in the usual condition seen in old pleuro-pneumonia. Neither of these cows took the inoculation though it was practised on them. From the same byre on 7th May I took out another cow under identical circumstances, and on *post-mortem* examination it was found that the cow had been diseased for three or four months. She also had been inoculated on March 22. That beast had had pleuro-pneumonia certainly three or four months. All fever hastens the breaking up of damaged tissue. I think that the fever established by the inoculation would arouse fresh action in such a lung lesion. I will give you another case. On the 9th July a cow was detected at the slaughter-house, belonging to Mr M'L. She had been sold by him at one of the marts on the Tuesday. She had been bought by Mr W., and sent to the slaughter-house in the usual course of trade, 9th July. The *post-mortem* revealed pleuro-pneumonia of twelve or fourteen days' standing. I found twenty-one cows and one bull in his byre. I inoculated twenty cows, leaving one uninoculated at the owner's desire. The bull was a Danish bull, and had been in the place for some months. Its antecedents I could not trace. On the 9th August I ordered a cow to the slaughter-house, and I found pleuro-pneumonia. On 17th September I took out one cow with pleuro-pneumonia, and about her I had no doubt. I also took out two others showing apparent symptoms of the disease. They had all been inoculated twice, and unsuccessfully. The first-mentioned cow had the disease; one of the suspicious cows had consumption of the lungs, and the other had a foreign body passing through her stomach. These are the two things that trouble us in diagnosis of pleuro-pneumonia, *i.e.*, consumption, and the lesions produced by foreign bodies. On the 18th I found another cow apparently diseased, and I reinoculated all except the bull and the Ayrshire cow. That was three times inoculated. On the 19th I took out this cow with pleuro-pneumonia. I am satisfied that my lymph was good. I can simply prove that the lymph I used on this lot was used on two other lots the same day successfully—in fact, in one or two instances too much so. I inoculated twenty cows. It did not take in any of the cows except three or four. I amputated their tails, after having got in these three or four tails proper pleuro-pneumonia lesions. Whenever the inoculation spreads up we amputate the tails. I had a case of pleuro-pneumonia amongst those that did take it on after the third time. On the 25th I took out another cow. On the 28th I took out three cows, all showing marked symptoms of the disease. These three were inoculated either twice or thrice. They took the lesion the way that I wished it at least twice. On October the 18th the Ayrshire cow showed signs of pleuro-pneumonia, and was killed. That same day I persuaded the owner to kill the bull, as he was then fat. He had always been in good condition. A day or two before he had not been well, and on killing the bull I got a patch of pleuro-pneumonia from four to six months old. It was a very advanced case, and I have no doubt that the bull was the cause of the mischief in spite of inoculation. That ended the outbreak so far as he is concerned. Most of the cows that are brought to the Edinburgh byres are sold as fat—in fact, I may say all. There is not one in 2000 sold in any other way—they are sent to the abattoirs direct, or sent to the sales. The average mortality among the cases I inoculate is very small, but one never knows what mortality he will have. Where inoculation is satisfactorily performed, you certainly establish a pleuro-pneumonia fever. If you inoculate an animal, and it gets an injury about the fore-quarters, you get the swelling there the same as on the hind-quarters. That is a proof that the virus is in the system. The cause of the part swelling up where an injury is received, is owing to the inoculated virus being absorbed into the system, and being thrown out into the tissues with the extravasated blood; it causes at that point lesions identical with the original lesions in the tail, and they extend in the same way as in the tail, so that a blow is dangerous to a cow in any part of the body. My strong point is this, that you never know in any byre where you are inoculating, whether there is not an "old stager," as we call them, or not; and that inoculation does not reveal its presence. I do not want you to suppose that I am an opponent of inoculation; up to a certain point I advocate it. I have inoculated animals in two byres with the same lymph and in the same manner. In the one case the lesions were so serious that we lost several cattle with them. The local conditions have a great deal to do with the results of inoculation. I cannot give you any better proof of this than that afforded by the fact that some cows inoculated with the same instruments and with the same virus, took very severely, and the others not at all; and those that took it severely had the proper pleuro-pneumonia lesion. There was no septicæmia. Inoculation is a local means of suppression; but if you are to send the contaminated remnant out, you do not know whether there is, or is not, an old case amongst them to disseminate the disease. So long as we get a piece of dead lung encysted it probably does no harm, but when it becomes connected with a bronchial tube, the infection is spread by the breath, and I was the first to draw attention to this fact. If you have a cow with acute pleuro-pneumonia, that cow is more likely to spread the disease more rapidly than would a cow with a chronic lesion. The one is giving off material from the mucous membrane of the bronchial tubes, whereas the other is giving it off from the small patches. I have one case here to which I wish to direct your attention connected with G.'s byre, where there was a cow of which I was suspicious. She was inoculated by B., and she remained in the byre after it was declared free, and four cows were brought in subsequently—two Danish cows and two from Lanarkshire. When we killed the suspicious cow, we found an old pleuro lesion, and the four fresh cows all contracted the disease from her. Inoculation is of the highest possible value in byres where the animals are to be removed for slaughter, but not where they are to be sent through the country to mix up with cattle in other places. Unless inoculation was made compulsory all over the country in both old and young animals and the animals themselves isolated afterwards, you would not get rid of it. I would certainly include half a mile to a mile in an infected area. I would make it compulsory that animals within that area should be inoculated—say within half-a-mile. I do not think it equally important to inoculate feeding beasts, because they are killed when fat. If they were lean I would isolate them subsequently. I have succeeded in reducing the excessive activity of the lymph, and in diluting it to some extent with glycerine. This will also keep the lymph as long as is required. I have succeeded in inoculating an animal successfully after having had the lymph in my possession for two years. You have got the experience of the Netherlands and Denmark, which shows that the very best way of dealing with pleuro-pneumonia is to stamp it out. I consider inoculation is a failure. I do not think that experiments require to be further tried. I think that the Highland Society and the Privy Council might make more close inquiry into the sources of pleuro-pneumonia in this country; and they will find that a good deal of it has been brought here from Dublin and Cumberland, and it is still coming. I may direct your attention to this one prominent fact, that since the restrictions have been put on Dublin and Cumberland, Edinburgh has been kept free, leaving inoculation out of the question altogether. We have no disease in Edinburgh at the present moment, and nothing has been brought in for several months. There is no question that the restrictions in Dublin and Cumberland have had a good effect. It is exactly a repetition of what took place in regard to the foot-and-mouth disease. As to restrictions, I would not allow the cattle to come from any quarter where it existed—such as from Dublin. They boast about the north of Ireland being free from pleuro-pneumonia. You are told that in Glasgow they do not get pleuro-pneumonia from Ireland the same as in Edinburgh. Cattle come to Glasgow as *mincers*, and your cows mix with them coming across. They do not go into byres at all in Glasgow; they go to the slaughter-house.

EDINBURGH, JUNE 14, 1887.

Present:—

Mr ROBERT PATERSON, *Chairman*.
Mr PATRICK STIRLING, of Kippendavie.
Mr JOHN MARR, Cairnbrogie.
Mr JONATHAN MIDDLETON, Clay of Allan.
Mr W. J. MAXWELL, yr. of Munches.
Dr A. P. AITKEN, Edinburgh.
Mr F. N. MENZIES, *Secretary*.

Principal M'CALL, Glasgow, called in, and examined.

I am Principal of the Glasgow Veterinary College, and have been engaged in farming for upwards of twenty years. I have not now a dairy,—all crop and grass. I have had two outbreaks of pleuro-pneumonia on my farms. The first outbreak was fully twenty years ago. The second year after I had taken Gallowhill, I bought a cow in the Glasgow Cattle Market. I understood from the party I bought her of that she had come from the West Highlands direct; but I found afterwards that she had been lying about the Glasgow Cattle Market for eight days before I bought her. After she had been at the farm about five weeks, I observed her coughing. I examined her chest, and I detected indications of a lung affection. I ordered her out of the byre there and then, and had her put by herself. I also gave instructions to watch the others. But, unfortunately, the disease had spread by this time to the other animals. I think that, with scarcely an exception, the stock took pleuro-pneumonia in a very bad form, and I had many deaths. At that time there was no compensation given. We were under no restrictions; but I treated the cattle on the farm, and buried those that died. That was my first experience. I think I lost the half of them by death. For a long time I could put no cows on the farm. I had to purchase sheep to eat the grass. The treatment I gave those that I carried through was as follows:—In the first place, I took out all those that were badly affected. I used carbolic acid largely. I gave it to the animals in water to drink, and I also washed their bodies with crude carbolic acid. We scattered sawdust on the walks, and watered them with brown carbolic acid, and with a brush dipped in it we sprinkled it over the wall in front of the cattle for them to inhale. My object in sprinkling was to liberate the gas and destroy the virus. The cloths were attached to strings through the apartment, so that they might dry by evaporation, so as to get the atmosphere thoroughly disinfected. That seemed to have no effect in staying the ravages of the disease. I gave the animals iron, and other agents that I thought would be of use. It was about twelve months before fresh stock was brought in. The animal I refer to was in my byre before I discovered pleuro-pneumonia about six weeks. I examined the lungs of the animal after I killed it. They were not in a very bad state, but there were structural changes showing that pleuro-pneumonia had existed for some time, but I could not say how long. We often get the lung pretty good, except in one portion, which becomes encysted. In those cases where you have much structural disease the animal shows symptoms which attract attention to it. If that had been the case, I would have seen it at once. I was disappointed that the lungs were not in a worse state. I concluded that the cow had been labouring under disease before it came into my possession. Most of the other animals showed disease. If I recollect, they took ill about six weeks after this cow had been in the byre, and then at intervals of a week or so. The dairymen in Glasgow come to me readily to report outbreaks of disease. I am generally able to trace back the animal that communicates the disease. The next outbreak was about five years after that. I had to buy animals, as at that time I only bred a few. This animal was also from the Glasgow Cattle Market. It was in my possession about the same time as the animal in the first outbreak. It is a very fair average time, about six weeks, after a diseased animal enters into a sound stock before the other animals show indications of pleuro-pneumonia. If more than six months had elapsed before the disease broke out, I would have considered that pleuro-pneumonia had been encysted in such a case. The period when an animal with an encysted portion of lung may give off infection is uncertain. As soon as the capsule breaks up, the cow becomes a source of infection. On the advent of lung disease in a dairy I always put it in this way to our dairymen in Glasgow. The best plan is to kill the animal, and the earlier you kill it it will be all the better, because, if it be contagious pleuro-pneumonia, the carcass will be fit for human food, and if you allow it to go on it will be unfit. We kill the animal there and then, and if it is pleuro-pneumonia the party is compensated. On the other hand, if it is any other disease, the party disposes of it on his own account, and does not lose much money. In ordering the first animal in a herd to be slaughtered we require to exercise great care, because the symptoms of simple pleuro and contagious pleuro are so very like one another. Contagious pleuro is a *specific disease,* in which you have structural changes taking place in the lung, which are almost identical with the changes that are connected with simple pleuro. The symptoms of non-contagious "pleuro" and contagious "pleuro" being so much alike in the living subject, I would say that no man is justified in saying that that is not a case of simple pleuro. Without any history of the animal, suppose you have one labouring under simple, and the other labouring under contagious pleuro—about the same number of days standing, and I defy any one to say whether it is simple or contagious pleuro. To say *decidedly* that an animal while alive is labouring under contagious pleuro-pneumonia, and not simple pneumonia, is, in my opinion, more than any man is able to do. Whenever you allow me to kill the animal, I will be in a position to do so. The difference on *post-mortem* examination to a party who has had a large experience, is a difference able to be made out. Contagious pleuro-pneumonia is a disease of slow progress. The changes produced on the lungs of the animal affected with contagious pleuro are slow changes; whereas, when affected with simple pleuro, there are acute changes. An experienced eye can see the difference. In contagious pleuro you generally find that the tissue which connects the lobes of the lung together is consolidated and thickened. You have great broad bands connecting the lobes, but in simple pleuro the bands are narrow. That is one change of structure that helps you. In the contagious disease we have the lobes themselves consolidated. They become of a sort of grey marble in appearance, which is not so well seen in simple pleuro-pneumonia. I shall now give you my experience of the last stock that we dealt with in Glasgow, because it is a very interesting outbreak in many respects. The outbreak was amongst Mr Salmond's stock, at 207 North Woodside Road. He reported that he was suspicious of having pleuro-pneumonia in his stock. That was on 8th February, and at that time he had thirty-seven cows in his byre. On examination it was evident that one of the cows had a chest affection, and, as far as I could make out, it was pleuro-pneumonia. On killing the first cow I found both of her lungs affected. She had well-marked evidence of contagious pleuro-pneumonia. The following day we took out other two cows. We had now good ground for going upon, and we had no hesitation in the matter; one animal's lungs were badly affected, and the other animal was only recently attacked. I find the temperature generally ranges from 103° to 106°. Mr Salmond, hearing so much about inoculation in Edinburgh, was anxious to have his stock inoculated, and, after interchange of letters, he was permitted to do so. I said, "You will be allowed to inoculate your animals at your own expense; but you are clearly to understand that you are not entitled to any compensation from the local authority. If the inoculated animals show well-marked signs of pleuro-pneumonia they will be removed to the slaughter-house, and I will remain the judge." In Glasgow I value the animals, and pass what I think are fit for human food. I said I would not inoculate them myself, or any one connected with the College, for the reason that I am acting for the local authority. So Mr Rutherford came through that afternoon, and the lungs of an animal that had been killed in the morning were obtained for the lymph for inoculating the other cattle. Wishing to experiment with the same lymph, and for a test case, I brought from my farm a cow seven years of age, that had been always healthy, and within six weeks of her calving. I had her brought to the College along with two yearling Ayrshires, and a yearling bull. I said to Mr Rutherford, "I want you to inoculate this cow, and the two heifers, but not the bull. We will allow the bull to congregate with the two heifers. I want the brown cow inoculated, and as soon as she has recovered from the operation, I want to put her into Salmond's byre." On 9th February Mr Rutherford inoculated Salmond's cows and also the cow in calf, and the two yearling heifers belonging to me. I went with him that afternoon when he inoculated Salmond's cows, after he had inoculated the animals at the College. He first of all took the temperature of all the animals, to see whether they were in health. On completing his examination, he said there was only one above the normal. "She is 102½°. That is the one up at the top." "I think we might safely inoculate her as well as the others." I replied, "I want you to get a fair chance, and I think it is a pity that she should remain and be inoculated." Mrs Salmond objected to the cow going away, as she had been milking well. But I insisted that it should go. I said, "Are you satisfied that you have got all the others fit subjects for inoculation?" He said, "Yes." The cow Mrs Salmond objected to being removed showed on *post-mortem* an old encysted portion of the left lung. I was interested in that animal. It had been bought at the Wishaw sale. It was encapsuled, but at the same time the capsule was broken, and I am inclined to the *opinion that this was the animal that brought the disease into the byre.* I think Mr Salmond said it was about eight weeks that the animal had been in the byre. Mr Rutherford inoculated all the other animals that he considered fit subjects, but there were several cows he did not inoculate, as they were about to calve or had calved within eight days. When I said that I wished my brown cow inoculated, he said, "It is not giving her a fair chance; being so near calving she may die." I said, "I would risk it." He inoculated her, and amputated her tail, and the cow never showed any bad symptoms. It rose beautifully, and the calf was born healthy and well. On the same day Mr Salmond said, "We are badly off for milk, and I have such faith in inoculation that if you would allow me we will buy some cows and put them into the byre." I said, "Upon the same conditions as formerly, I will take that upon me; but you are to understand that there is no compensation in any circumstances. Those cows once in the byre can only go to the slaughter-house. They cannot go to be sold in the public market, but when you are done with them they must go to the butcher, and letters passed to that effect." He purchased on that date, 9th February, three cows at the Wishaw sale, and on the 14th he bought five cows at the Paisley sale, for the purpose of being inoculated and thoroughly protected. On 17th February, I visited the byre, and found a cow showing symptoms of pleuro. I said this cow must be taken away at once. This was one of those inoculated on the 9th, and on *post-mortem* examination both lungs were found to be affected. Mr Rutherford said the inoculation had not taken. The explanation in this case was, that the animal had not taken the inoculation, and that it had been affected with disease before inoculation. Mr

Rutherford saw it before being slaughtered. On March 1st I required to take another cow and kill it, and I found both lungs bad. This animal was inoculated on the 9th. According to Mr Rutherford, it was successfully inoculated, the tail was amputated, and it was considered safe; so that if the cow of the 17th was confirmatory of the fact that when an animal contracts pleuro-pneumonia by the natural method it cannot be inoculated, the case of the 1st March was the very reverse. Both lungs were bad. With the others it had the tail amputated, was considered to be free from disease, and still it succumbed to the disease. It was one of those in the byre when the disease first broke out. The tail of the animal was amputated on the 16th, and on the 28th I found the animal showing symptoms of the disease, and it was killed on 1st March. On 3rd March I found four cows showing symptoms of pleuro-pneumonia. I ordered two to be removed which had been inoculated, and took, according to Mr Rutherford, and had their tails amputated. The *post-mortem* took place on the following day, the 4th, and the lungs of both animals were found to be bad. The carcass of one was condemned. The disease had evidently been in existence prior to inoculation. So that we have here again two cows that were inoculated and took, and their tails amputated, and yet they showed well-marked symptoms of the disease. Then, on 7th March, I ordered two cows to be slaughtered. The *post-mortem* examination was as follows:—The brown cow bad of one lung and encystment commencing in two places. "This animal was inoculated by Mr Rutherford on 17th February, and took. The black and white cow had one lung affected, but less than any animal yet slaughtered; also inoculated on 17th February, and took." On 9th March, my own brown cow, which was brought to the college and inoculated on the 9th of February, was taken to Salmond's byre, and put amongst the others. She calved a perfectly healthy calf, and she is at the present moment as sound and healthy as any cow. On 15th March a brown cow, in good condition, was ordered to be killed. Back arched, temperature increased, symptoms of lumbago and rheumatic iritis, breathing disturbed, cough, but I could not make out lung affection. Mrs Salmond said, "This cow is in fair condition, and it would be a pity to let her pine away. If she has got any lung affection, you will be quite willing to compensate." I said that we would do so, and we took her away. In the *post-mortem* examination, the right lung presented three distinct encapsulated masses. This animal was inoculated on 9th February, and took, and was considered in health till 13th March. Two days after that she was killed. I do not think the lung had been long encapsulated; the masses were distinct from one another. You may have a portion of encapsuled lung surrounded by healthy tissue, and you are not able, if fat, to make out the condition of matters. On 22nd March requested to visit Salmond's, on account of a cow exhibiting symptoms of something in her throat, but found no obstruction. The temperature was increased, and the breathing disturbed; and as pleuro-pneumonia was in the byre, she was taken away and slaughtered. The *post-mortem* examination showed a lesion in the right lung upper lobe the size of two hands. The inoculation had taken, and the tail had been amputated. This cow was not inoculated till 16th February, and had to be inoculated again along with other eleven animals. On 21st March a brown cow, purchased at Wishaw on 9th February, exhibited symptoms of pleuro-pneumonia. This is one of the three cows bought at Wishaw for preventive inoculation, but as no compensation would be given, I allowed her to wait till 4th April. I would not have allowed her to live so long, except for the inoculation, in case it should be said that I was in too great a hurry. April 4th.—Brown cow again carefully examined; temperature 103°; breath catching, &c.; ordered to be slaughtered. April 5th.—*Post-mortem* examination showed left lung upper lobes consolidated. The upper lobe of right also slightly affected. This animal was taken into the byre on the 9th of February, the day of purchase, but she was not inoculated by Mr Rutherford till the 16th, so that she remained six days exposed to the contagion before the preventive remedy was applied. To make certain, she was again inoculated on the 24th, and again on the 29th. The tail was amputated. There were no cows excepting my own cow, that was inoculated previous to going into that byre. The Ayrshire cow stands as a monument of what can be done in regard to a sound animal. I approve of inoculation, provided it be performed on the animal before it has been exposed to the infection. This animal entered the byre, apparently healthy, on 9th February, remained seven days exposed to the contagion, was inoculated on the 16th, again on the 24th, and again on the 29th February. She remained apparently healthy till the 21st March, in all two days less than six weeks. The inference is, that six weeks is the incubative stage. She had apparently taken the disease almost as soon as she entered the byre. She was sound when introduced to the byre, but the week's delay in inoculation allowed the animal to contract the disease by the natural method, and therefore she was affected when inoculated. My opinion is that the lymph of pleuro-pneumonia is a material that requires to be handled with the very greatest care. I think if it is mixed with blood or pus it will be inoperative, or if you allow it to be exposed to the atmosphere. It will only give real and effective inoculation if you kill the animal and make use of the lymph immediately after death. It should be used the very day, and taken from a portion of the lung that is as little affected as possible, and free from pus and blood. I am sure that many of the failures are due to not attending to this. Reasoning from other facts, I would say that lymph taken from the lung, hermetically sealed in a close bottle, would not fail; but at the same time, I would prefer the lymph taken from the subject fresh, and there and then inoculated. I would not be surprised if it did not take effect if kept any time. In Glasgow there is no inducement to inoculate, because the cattle are kept in the byres. They do not go out to the fields. They give milk, and when they do not give milk to pay their way, they go straight to the slaughter-house. I do not think an animal slightly diseased and inoculated would be saved, or that inoculation would stay the progress of the disease. I think in most cases it would intensify the natural malady. If a healthy animal is inoculated with the proper lymph, it is safe; but I cannot tell for how long. Given an animal with sound lungs and inoculated, and the inoculation has taken, I consider it is safe to mix with other animals. I am going to allow the animals that were inoculated at the college to remain and grow up, and when I have an outbreak of pleuro-pneumonia, and they are in milk, I will put them into a byre. I would in certain circumstances advise local authorities in this country to adopt inoculation, and in other circumstances I would not. I think it is too late to inoculate when you have got the disease in a byre, for this reason, that if the animals have been in a dairy and breathing the same atmosphere, if one has succumbed to the disease, seeing there is an incubative period of six weeks, several others will be labouring under the malady when you inoculate. There is no doubt that some animals resist the disease for a time, and by inoculation you may save them. For example, you see the result in the animals that were bought for the purpose of inoculation. Only one succumbed, seven remained. I will tell you how inoculation will be of use to the country, and that is, make it as compulsory to inoculate calves as it is to vaccinate children; but the question is, where are you to get lymph? I have no doubt that the lymph of pleuro might be preserved, possibly in the same way as vaccine lymph. If inquiry was carried out on these lines, it would be attended with valuable results. If we could preserve the vitality of the lymph, then we could inoculate the calves. I would recommend the compulsory inoculation of all the calves in the country, because I would expect that in a few years we would get rid of the disease. We have stamped out rinderpest, and I do not see why we should not stamp out pleuro-pneumonia. The weak point is the fifty-six days' detention, after which the cattle go helter-skelter all over the country. The local authority have appointed me with power to slaughter and compensate. I do not require to go back and convene a meeting; we order slaughter there and then. I do not make a declaration till the animal is dead. The outcome of all this is, that for twelve years before the Contagious Diseases Acts came into operation the loss from pleuro-pneumonia was £6000 some odd hundreds a year, and now we have got it reduced to £600. There is no place where you will find less pleuro-pneumonia than in Glasgow. We have none now. I do not see any objection to recommend inoculation to be carried out under the same conditions as in the United States, where they allow animals to be inoculated, and then taken out for slaughter only. An animal can be inoculated at any time, even although it has a lung lesion. I do not think that an animal which has had an attack of pleuro-pneumonia, and recovered without any portion of its lungs remaining encysted, can take pleuro-pneumonia twice. Cattle labouring under disease by the natural method can be successfully inoculated. I have been able to prove that. I have recorded here several cases where animals were inoculated, and the inoculation successfully taken, so much so that the operator had amputated the tails and declared them all right, and yet these animals within a fortnight showed well-marked symptoms of pleuro-pneumonia. After they were killed the lungs showed structural changes which could not have come on after inoculation. And then as regards the temperature, that is not reliable. In some outbreaks we have a temperature 105° or 106°. In other cases we have the temperature normal, and the lung lesion well marked. Till within the last two or three years I had thought that it could not happen, but some of them—not old chronic lesions—have had pleuro-pneumonia with a normal temperature. If you allow a sound animal to congregate with an animal labouring under this disease for six weeks or so, and put it among sound stock, it is likely to contaminate that stock. I think that the contagion is not easily carried except by moving the infected animal, and by the breath. I would not like to say that it could not be carried except by an infected animal or the breath of that animal, but I think it is scarcely possible to carry it on your clothes. In my experience, I have not carried the disease to any animal. I believe by the breathing of the animal the organism of infection is exhaled. I do not think that the excrement, the urine, or the provender is fitted to convey it. I do not think that the contagion can be carried very far. I have known outbreaks in one byre which never extended to another byre, and yet not above eight feet betwixt them. I have always acted on the principle that the place where an infected animal has been is infected itself. I do not believe in what is called an "infected area" round the seat of the disease. If I had the power, I would not allow any one to make an infected area; I would only have an "infected place." Suppose there are two byres together open at the ends, I would consider both buildings as one and infected. I wish it to be understood that infection is not carried out of the byre to any distance, and I do not think it is easy to carry it out except by taking the animal out. From my experience, pleuro-pneumonia is not carried about, except by the animal. To extend the circle of infection to any great distance is doing no good. In a city it is different from the country in making an infected area. If you make half-a-mile or a mile, you take in a whole town. I think you would require to confine it to 100 yards. A result of the "infected area" is that the county of Lanark has been shut up for months and months, causing no end of inconvenience and loss of money, and I really do not believe it has done any good. There is no known means to cut short an attack of pleuro-pneumonia; it must run its course. Smallpox is similar to this disease in that it must run its specific course. If a few thousands of pounds were set apart for it, a great deal could be made out experimentally which is at present a matter of opinion and dispute. Another thing to see is, whether lymph could be cultivated so as to make it a safe operation, if we could have a quantity in a capillary tube. If that could be done there would be no difficulty in getting rid of the disease by inoculating the calves. If Parliament would vote a sum of money for a series of experiments it would be of great importance. I think it would be a very advisable thing for the Society to institute an inquiry, if you could get the Government to give a sum of money towards it. I have no doubt the magistrates of Glasgow would be willing to subscribe a sum of money. They are deeply interested in the subject, and so is every ratepayer.

Mr Robert Reid, M.R.C.V.S., Inspector under the Cattle Diseases Act, and Superintendent of Slaughter Houses, Leith, called in, and examined.

My experience of pleuro-pneumonia has lasted since 1864. That is my actual experience as an inspector. The ordinary percentage of deaths from pleuro-pneumonia during that time, before you had inoculation, was about 14 per cent. I began to inoculate between 1877 and 1878. I have not inoculated any myself. I had inoculation performed under my observation; I had four veterinary surgeons inoculating. The number of cases I have had during the present year of pleuro-pneumonia was 44—that is from June to June—out of 192 cows. When an outbreak occurs, it is immediately reported to me. They do not report to the police, as in the country, but report immediately to the inspector. I immediately visit, and any animal affected I send to the slaughter-house, leaving to their discretion to inoculate or not; but since 1878 it has been the universal practice in Leith to inoculate. The mortality from pleuro-pneumonia since inoculation began is considerably less. This year there has been rather a serious mortality. There have been ten outbreaks this year, but the number of cattle that died from it is less. From 1873 to 1878 I had 410 cases of pleuro-pneumonia, but since inoculation was introduced into Leith—from 1878 to 1887—I have only had 150 cases. The outbreaks have been less frequent since inoculation. From 1873 to 1878 our stock was only between 500 and 600, whereas it has now gradually increased to 900, so that that strengthens the previous statement. Fourteen per cent. represented the death-rate before inoculation began, now the percentage is only 2 per cent. I regard the great improvement in the death-rate is simply and entirely due to inoculation. I have not changed my methods in any other way. It is my opinion that inoculation is a great and sure preventive of pleuro-pneumonia. I do not think that there is any difficulty about the operation of inoculation. I think some inoculators are more successful than others. I attribute their greater success to the care in collecting the lung material, likewise attention to the temperature, and the care they have over the animals after inoculation, in keeping the cow-shed at a certain temperature. I have heard of an animal dying from the pleuro-pneumonia inoculation. I have seen cases of that kind. I can with confidence say that in Leith there is nothing about the system of inoculation that I could not practise with success. I do not think that pleuro-pneumonia is easily spread from one building to another. I do not believe that a man's clothes can carry contagion. The distance must be very circumscribed that carries contagion. The breath of the one must come into actual contact with the breathing power of the other. It generally takes about six weeks for an animal, that has breathed infection, to show any symptoms. I believe that a place where an animal has suffered from pleuro-pneumonia is an infectious place to a limited extent. I have never seen with extra precautions—with whitewashing and so forth—fresh cows brought in with bad results. I do not think that infection can cling about the byre, for I think that after six weeks a byre may be regarded as non-infectious. My experience has not enabled me to settle the point as to how long a place may be considered infectious. I am not sure in my own mind whether a place can be infected at all. I am distinctly of opinion that a place is not infectious at a given period after the removal, but I would not like to say the number of days. I have no reason to suppose that these cows would take pleuro-pneumonia if put into a stall which had held an infected animal the day before, if necessary precautions were taken. If I wished to communicate pleuro-pneumonia to an animal unfailingly, I would adopt actual contact. That is the only known process. It is far more economical to kill the affected, and inoculate, than stamping out the disease by killing the whole herd. I think that no animal that has been inoculated successfully can ever take pleuro-pneumonia within the life of the animal. It is not like a human being, you do not keep it long. I do not believe that any animal that has been successfully inoculated can ever take pleuro-pneumonia, and infect other animals with it. I have put healthy cows innumerable among inoculated animals in cow-sheds where the space is limited, and never one of mine has been affected. I have never known a case of pleuro-pneumonia occurring to an animal that has been successfully inoculated after fifty-six days, and that is the experience of the last nine years of inoculation, during which I have had innumerable opportunities of seeing the results. I think an animal may have contracted disease three months before it declares itself. It greatly depends on the system of the animal, the strength of endurance in that animal, and likewise the large dose of poison or virus it had received. I think the incubative period may remain longer in some animals than in others. I have always held that fifty-six days is too short for quarantine. I have long been in favour of three months. But I do not think that fifty-six days is too short if inoculation is adopted. Without inoculation I would make the period three months. I think that the Highland Society would do well to investigate the effect of inoculation as a preventive of the disease, the question of quarantine, and to discover what is the proper limit of quarantine under the two systems of inoculating and non-inoculating. Going outside of that, I think it would be well for the Highland Society to get at the bottom of this Irish question, because we are continually getting the disease over from Ireland. I think that the inspection of Irish cattle ought to be inquired into. I believe that there is more pleuro-pneumonia in Ireland than there is in Scotland since 1845. I think it is an important thing to discover whether a place could become infected with pleuro-pneumonia, considering the difference of opinion that exist between our authorities. I think it is a question that should be solved. Seeing that well-known authorities differ, I consider that it is the duty of non-professional men to take action and judge for themselves. I think the proper authorities to take up this matter would be those who are paying compensation, as being the men most interested in it. I mean the local authorities. If it came to four times a couple of thousand pounds, it would be cheap compared with the present method of compensation.

PERTH SHOW YARD, JULY 27, 1887.

Present:—

Mr ROBERT PATERSON of Birthwood, *Chairman.*
The Hon. R. BAILLIE HAMILTON.
Mr PATRICK STIRLING of Kippendavie.
Mr W. J. MAXWELL, yr. of Munches.
Mr JAMES MURRAY, Catter House.
Dr A. P. AITKEN, Edinburgh.

Mr R. O. F. STEWART, Montrose, called in, and examined.

My answers to queries sent me refer to a cow that was bought in November, and after being home about three days it got bad. The temperature was a little elevated, but I could see nothing wrong with her. I made the owner insulate her, and she was put into a stable. She had been three days in the byre along with his other cows. After the insulation she went on well. About twelve weeks afterwards one of his cows dropped a calf. She was very bad, and at the end of four months three cows out of the five showed all the symptoms of pleuro-pneumonia, and were killed, the *post-mortem* examination revealing all the symptoms of pleuro-pneumonia. No cattle, except the cow I referred to as fresh purchased, and not a week in contact with the other cows, had been brought in for two years previously. The cow was, to all appearance, the healthiest animal previous to death. She was isolated, and retained in the stable for four months and two days. The other three cows in that byre took bad, but she got through the disease. When killed, there was a patch of about 2 inches square on the lung. That was an old sort of encysted lung. She was a contaminating medium throughout. She was healthy-looking, milking, and ruminating; but still she was a source of disease in the place. She must have had the seeds of the disease when she was bought. There was a chaff barn between the common byre and the stable. She was located in the stable. She was under the same roof as the other cows, but the same atmosphere did not go through the building. There was no contamination of the air. There was no opportunity of her breathing the same air through the building. She had really been suffering from pleuro-pneumonia when she came. I took the temperature, and found it 104°·2. I went back when she was in a normal condition, and found it to be 101°. She was back to her milking. I heard nothing more about her till twelve weeks after, and I began to dread the disease. I made an examination about once a week regularly, and then she had a calf; she was in contact with those other cows for only four days previous to being insulated, and I believe that she communicated this disease without it being seen for four months. I believe that contamination is to be got by direct breathing. There was no other cow in the place that had been brought in for two years. When I came to slaughter all the herd, the owner said, "You will not kill the cow in the stable?" I said, "We will kill her;" and the *post-mortem* examination showed about 2 inches of a red encysted mark. She had got through the disease, being a strong, healthy cow; she had never been inoculated.

Mr ANDREW SPREULL, F.R.C.V.S., Dundee, called in, and examined.

I think it is scarcely possible to carry the infection of pleuro-pneumonia by litter. I do not even think it could possibly be carried by giving food that had been presented to a diseased animal and breathed over, and I know that experiments have been carried out by Dr Sanderson and Professor Duguid, which go to prove that that is so; my experience entirely corroborates that view. I think that cleansing and disinfecting is a matter of very secondary importance; but I would go on with them, as they will do no harm. I do not think it is worth while stopping the disinfecting and cleansing, as the expense is not great, and if it be an error it is on the safe side. An animal may have lived through the disease, although it is not apparently affected. These cases crop up occasionally. Animals that have had the disease in a mild form and are recovered, have a pleuro-pneumonia cyst in their lung, and may communicate it to others with which they are brought into contact. If you inoculate the animals in good time, you will neither have the disease itself, nor this encystment—I mean, if you do it before they are actually diseased, before the expiry of the incubative stage. I would not inoculate all young stock. I would inoculate in every outbreak, as soon as it occurred, but not till then. You cannot be thoroughly satisfied that the animals have not got the disease in a latent form, but you can be the next thing to it. You can do so by testing the temperature, by auscultation, percussion, and in a variety of ways. I cannot say that I would be absolutely certain in every case, but I would be as certain as it is possible for any man to be. Stamping out is a certainty. You can always kill the disease by killing out the whole stock, both of the diseased and healthy animals; but I have found that inoculation is quite as certain to exterminate the disease as the process of stamping out. On condition that it is done with good virus, and on healthy animals, there is no difficulty. Those animals that are not perfectly healthy will prove themselves to be diseased within three weeks after they are inoculated. They develop the disease. You may get concurrently the development of the inoculation with the development of the disease. If you get an encysted or diseased lung, kill the animal. There is a little difficulty, sometimes at first, in detecting the disease, or a small encystment, because you cannot get close to the lungs, seeing that there is a considerable amount of flesh, bones, and hair between the ear and the diseased structures. A small encapsuled area might escape notice. In an encapsuled case I would not expect that the inoculation would take the same effect. Early inoculation *entirely precludes* the chance of encystment of the lungs. But if the disease be present it will develop itself in a very short time after inoculation. I would not recommend inoculation of calves over the whole country, but I would strongly recommend it at any place where disease had already broken out. Indeed, for general inoculation there would be a difficulty in getting good matter to inoculate with, except when there was a fresh outbreak. The matter will keep good for about three days at the outside. If it is not fresh and good you should not inoculate with it. We do not want any lymph sealed up to keep for any length of time; we should only use it in fresh outbreaks when it is necessary. I would do my utmost to find out if the animal had an encysted lung. If I could not find that out I could not help it, and it would not matter, as no harm could ensue. That is an objection which is raised against inoculation, but there is more made of it than there is occasion for. Encystment can only occur if the animals be allowed to live on without inoculation after the outbreak of the disease, so that instead of this being an argument against the practice, it ought, if properly understood, to be the strongest of all arguments in its favour. Inoculation in the hands of one man is one thing, and inoculation in the hands of another man is another thing. I would inoculate every one of the animals on the infected place. I would unhesitatingly inoculate animals six months old or even less. I do not think there is the slightest danger in selling inoculated animals. I believe the danger is a great deal more talk than reality. There is infinitely less danger in selling animals that have been inoculated, than there is in selling out a stock that have had the disease amongst them, after the expiry of the statutory period of fifty-six days. It is in cases of the latter kind that the disease is spread by mild cases that have ended in an encystment. The statistical part of my report to the Dundee Local Authority will show the value of encystment. There is far less encysting than many people who talk learnedly on the subject imagine. The principal thing to do is to have the inoculation put into the hands of those who can manage it. There are some, I believe, who say they work at inoculation, and make a muddle of it. It is not difficult; it is neither difficult to teach it, nor to do it, but I am told that some people get bad results. From my report you will see that out of a total of 380 cows inoculated, 16 were killed diseased, and 364 remained healthy, and of those 16 there was only one that was really a healthy animal when inoculated. The animals that became diseased and had to be killed, were all previously diseased. Not a single encysted case occurred among all the remainder of them. They have mixed with other uninoculated animals ever since, and not one of them has developed the disease. I say that this disease sometimes lies latent for six or seven months when contracted in the ordinary way. I would call this the incubative stage of the disease. I know of cases that have occurred five, six, and seven months after purchase, and you cannot describe it in any other way than that it was in a state of incubation for the seven months. The case that occurred after seven months was a case that broke out among those animals that were introduced. There had been no disease in that stock before. The former stock had been brought up on the premises. I only remember one seven months' case at present. So in cases like this the fifty-six days' restrictions might be extended to seven months without absolute safety. If you do not go in for inoculation, fifty-six days is not enough; but if you go in for inoculation, you make the fifty-six days more than enough. I would not kill every animal that would not take the inoculation. I would kill all that I considered suffering from the disease in every form. If there be any risk—(which I deny, if the animals are inoculated)—I would run the risk of any little chance there is of encystment. There is not more than one in a thousand cases if inoculation be resorted to, as I have never yet met with such a case. Encystment occurs much more frequently under the system of killing the diseased and allowing the others to remain. If you were to inoculate at once, you would *absolutely prevent encystment*. There is no chance of a properly inoculated animal taking the disease. It does not take it in either an active or passive form, but if it is already there, it develops at once. I do not take a note of encystment cases, because I have not come across any of them after inoculation. In the case of a byre declared diseased quite recently there was a cow with an encysted lung brought into it, and I found that that encysted animal remained so apparently healthy that the owner would not believe that there was anything wrong with it at all. I told him it was suffering from pleuro. He resisted as far as lay in his power the killing of the animal. However, others began to drop off, one after another, and we killed them. I only left this one out to satisfy the owner until he would come to my way of thinking. I killed it too, and I found at the *post-mortem* examination that it had a very large cyst in one of the lungs. That encysted animal was probably in his byre two months before the others began to show signs of disease. Since that time I have had other two cases almost exactly identical with this one. They were all these bought from a dealer in the neighbourhood, and put among healthy cattle. I am strongly in favour of inoculating. I know that the authorities are very strongly against it; so strongly against it, that they say, if you inoculate an animal, and if there is a cyst, it becomes a centre of disease; but I contend that it won't, and that if you inoculate at once there is no danger of having any cysts. There are men who deny the power of any veterinary surgeon to say that, but if you read my report you will I think be satisfied. Professor Brown is as much against it as I am in favour of it. I would willingly agree, though I think it unnecessary, that the movements of all animals inoculated should be restricted for twelve months, or, if deemed prudent, for the remaining portion of their life; and earnestly desire that every one of them should be registered and subjected to *post-mortem* examination. I am quite sure that none of them would present a single patch of disease. I think that that would be a perfectly practicable rule. It would enable dairymen and others who complain so bitterly of the slaughter of their herds to practice inoculation, and to carry on their trade at the same time without hindrance. The local authorities would require to register them, so that the whole thing would be under their notice. I am of opinion that inoculation should be made compulsory. I do not care what restrictions there are; if inoculation be done intelligently it is bound to come to the top. To enable the local authorities to give satisfactory inoculation, they must put on good men. It is not difficult to find them, but it is not for me to suggest that. My experience is that those who have not practised inoculation are against it, and those who have practised it are uniformly in favour of it. If you had a college or school of inoculation its success would depend on who you had at the head of it. You might put an eminent surgeon at the head of it, and yet make a mistake in regard to it. Some men cannot move out of the old ruts, or stoop to get a mistake rectified. To be sure that the lesion of the tail took, I would require to see it. You may get an inflamed patch, and yet not get proper inoculation. If I saw the proper exudate of pleuro-pneumonia, I would have no difficulty in knowing it. I would not like to say anything against any inoculator, but some of them give very bad results. An animal that dies from inoculation, dies from blood-poisoning. It might be by the excessive development of the microbes of pleuro, or from their being too active, and producing too much febrile derangement, in cases where there is a development of the disease to such an extent as to involve the whole of the structures of the haunches. You may get blood-poisoning from a very pure lymph in this way, but you can easily escape from the bad effects of it by cutting off a portion of the tail as soon as it develops sufficiently. That is the common plan, and it is a very satisfactory one. I know that if it gets beyond the region of the tail, and involves the whole of the back parts, it produces death, by the animal not being able to perform the natural functions. This cannot be always prevented unless by daily and regular attendance during the currency of the inoculation, which it is seldom possible to give. In the case of one animal, I allowed it to get beyond my reach before I knew where I was. The disease had extended upwards between my weekly visits so rapidly that when it was observed it had gone too far to be stopped. That was the only death from inoculation that occurred in my hands. I have in a few cases cut the tail three or four times, and left nothing of it but the stump, and yet the animals did well. In some cases the disease goes very quickly up to the root of the tail. If you have had experience, you will have recognised how soon it goes up. You may see nothing wrong about the tip or where the inoculation has been done, but the inoculation is not there; it is further up. These are the unfortunate cases. I have had several others that threatened to go in that direction, but through taking such measures, as the early and rapid snipping off of the tail, I prevented it going too far. I have known wounds on different parts of the body, but they did not develop any serious local lesion; they had no after bad effects at all; these local swellings may take effect without any sloughing of the part, but I have often seen a small slough result from them near the root of the tail, which afterwards healed up without the slightest trouble. There seems to be a considerable amount of doubt in the public mind about the inoculated animals being able to resist the disease; I think you should test that in some way—put them amongst diseased stock. I have repeatedly inoculated portions of stock. I only inoculated three in one stock to begin with, and the others were all dropping off round about, while these three stood out healthy to the end. The result was that the owner saw that it was necessary to do something more, otherwise the whole would go. We then inoculated other fourteen; one of these fourteen died within a few days, and the remaining thirteen lived on through it to this day. The one that died within a few days of being inoculated had pleuro, but there was no more pleuro-pneumonia among them except that. I have even better cases than that; you will find them in my report.

SUMMARY OF EVIDENCE ON PLEURO-PNEUMONIA.

By Dr A. P. Aitken.

The evidence contained in the preceding pages formed only a part of the work undertaken by the Committee. It was evident to the Committee, as it must be to any one who carefully peruses the evidence, that very considerable difference of opinion prevails among members of the veterinary profession regarding many points of very great importance to stockowners and to local authorities who are entrusted with the work of suppressing the disease.

The Committee were desirous of knowing what were the opinions held by veterinary inspectors throughout the country regarding some of these disputed points, and they accordingly framed a schedule containing the following queries, and sent copies to all the local authorities in the country, with the request that they should ask their veterinary inspectors to fill them up and send them in to the Secretary of the Society:—

1. How is this disease propagated?
2. How far in your experience have you known it to be carried, and what do you consider an infected area?
3. Have you known a case wherein this disease has been communicated to a healthy animal from its having occupied such a place as a byre, truck, boat, pen, or field previously occupied by diseased animals?
4. In your experience have you known of this disease being conveyed to healthy stock by the clothes or persons of attendants or others in charge of diseased stock?
5. How long in your experience has an animal suffered from the disease without its being detected; in other words, how long have you known the disease to be latent in the stock?
6. Have you had experience of inoculation, and if so, is it such as to prove to your satisfaction that inoculation has a protective influence against the disease?
7. Have you ever known a case where animals that had been

successfully inoculated were brought into contact with diseased stock and took the disease?

8. Have you ever known a case where animals that had been successfully inoculated were brought into contact with diseased stock and remained healthy?
9. Have you ever known of an animal successfully inoculated, and yet taking the disease more than six weeks or two months thereafter?
10. In your experience have you found the fifty-six days' rule sufficiently large for perfect protection?
11. If relieved of your personal liability for the cost of the slaughter of a possibly healthy animal, would you be in better position to prevent the spread of the disease without wholesale slaughter?

About one hundred veterinary inspectors answered the queries, and the following may be accepted as a fair description of the information supplied under each head.

1. It is the almost unanimous opinion that the disease is propagated by the contact or herding together of diseased and healthy animals; and the great majority believe that it cannot be propagated in any other way. It is not necessary that a diseased animal should come into actual contact with a healthy one in order to communicate the disease. It is sufficient that the animals should be so situated that the air that has been exhaled by the diseased animal may be inhaled by the healthy one. Close, badly-ventilated byres are frequently referred to as favouring the spread of the disease. It is the common opinion that the only *certain* way of propagating the disease is by housing a diseased animal with healthy ones under the same roof.

2. There is considerable difference of opinion regarding the distance to which the infection may be carried from the body of a diseased animal in the open air. Forty reply that the animals must be herding together, and capable of coming into actual contact; fifteen consider that the infection may be carried to some distance between ten and fifty yards; twelve do not regard animals as safe from infection unless they are separated from the diseased animals by distances varying from 100 to 500 yards, and they regard these as the radius of an infected area around the seat of an outbreak; twelve are not content with so small a radius, and recommend that the infected area should have a radius varying from half a mile to four miles. No accurate observations are recorded to prove the distance to which the infection may be carried in the open air, but instances are given in which diseased animals have been separated from healthy ones by a distance of from 20 to 30 feet, such as the breadth of a road, and there was no communication of the disease from the one herd

to the other. Where it has been asserted that the infection has been carried long distances, it has not been proved that it was not imported into the herd by means of a diseased animal.

The general opinion seems to be that pleuro-pneumonia is not a very infectious disease, except where animals are actually housed together.

3. About one-fourth of the witnesses give it as their opinion that the disease may be contracted by a healthy animal by its being put into a stall or byre, or even a field, which had previously been occupied by a diseased animal. Nearly an equal number either doubt or deny the possibility of conveying the infection in that way; but it is the universal practice to act on the supposition that a place may retain the infection and be capable of communicating it, and therefore some kind of disinfecting process is had recourse to. These precautionary measures are of various kinds, and are usually so very defective that it is evidently a matter of no importance whether they are carried out or not.

4. In only five instances is the opinion expressed that the infection can be carried by the clothes or persons of attendants, or by means of dogs, rats, or other animals passing from the precincts of diseased to those of healthy animals, while the great majority are strongly of opinion that the disease cannot be propagated in that way. Instances are recorded in which the attendants passed constantly between diseased and healthy animals, feeding and milking them, without conveying the infection. It is curious to note that some of those who deny the possibility of infection being carried in the clothes of attendants, yet hold the view that the stall in which a diseased animal has been kept, and its fodder, litter, and dung may retain and convey the infection. It is scarcely necessary to say that such views are entirely at variance with all that is accurately known regarding the propagation of infectious diseases.

5. The length of time during which the disease may remain latent or undiscovered in an animal is a matter regarding which there exists very great difference of opinion, but as the opinions entertained are the product of actual experience, they are deserving of careful consideration. Twenty-two report that they have never known the disease to be latent for more than two months; twenty-six report instances in which it has been latent for about three months; and forty-two report that either in their opinion or in their experience it may be present and yet not manifest itself for four months or more. The usual term of latency, or what is called the incubative period, is regarded as from four to six weeks. When the disease does not break out in a herd until several months have elapsed, it has been found to be due to the importation into the herd of an animal that

had in its lung an encysted or encapsuled pleuro-pneumonia lesion of old standing, and it frequently happens that an animal so affected may be fat and apparently in excellent health.

This encysted form of pleuro-pneumonia is found in animals that have had the disease, and have apparently recovered, and as there is nothing about them to cause suspicion they are regarded as healthy, and passed as such, even by skilled veterinary surgeons.

6. The method of combating the disease by means of inoculation was brought prominently before the Committee by some of the witnesses examined. It has its eager advocates and also its opponents, and as it is the only kind of treatment that has been employed with any success as a palliative or preventive, if not a cure, of the disease, the Committee endeavoured to make a searching inquiry into the method and the results of the operation. This part of the inquiry is pretty fully treated in the evidence given above.

Of the hundred veterinary surgeons who were asked to express an opinion about it only thirty-five had either practised it or been witnesses of it, and had thereby the means of forming an opinion regarding its effects. Four of these are unable to say whether it has a protective influence or not; three are of opinion that it has no such influence; and twenty-eight affirm, in language more or less emphatic, that inoculation, when performed upon healthy animals, has the effect of protecting them against attacks from the disease. Six veterinary surgeons, who confess that they have no experience of the operation, hold the opinion that it has no protective influence whatever; and three believe that it has. The others reply that they have no experience of the operation, and do not venture to express any opinion regarding it. Some of those who admit the protective influence of inoculation are particular to explain that it has no curative influence, but that it prevents animals from taking the disease, if at the time of inoculation they were untainted.

7, 8. No cases are recorded in which an animal, after having been successfully inoculated, contracted the disease; but several cases are recorded in which animals, after having been successfully inoculated, resisted the infection while standing in the midst of diseased animals.

9. Some cases are recorded of animals that had been inoculated, and which had within two months exhibited symptoms of the disease, but upon *post-mortem* examination it was found that the disease had been contracted by them prior to the date of their inoculation. It is frequently asserted that an animal may be successfully inoculated although it is suffering from an old pleuro-pneumonia lesion.

10. As regards the fifty-six days' rule the veterinary inspectors

are almost unanimous in the opinion that it is not applicable to pleuro-pneumonia. It would require to be extended considerably in order to ensure that all animals remaining after exposure to an outbreak were free from the disease.

According to some a lengthened quarantine would especially be required where inoculation had been practised; but according to others it would especially be required where inoculation had not been practised. This is one of the points on which inoculators and non-inoculators contradict each other.

11. There is a very general consensus of opinion among veterinary inspectors that if they were allowed, without personal risk, to slaughter an animal suspected, they would frequently be able to nip an outbreak in the bud. Pleuro-pneumonia in its early stage exhibits no pathognomonic symptoms, and therefore veterinary surgeons have to wait until the disease has made some headway before they are sufficiently certain of its nature to justify them in ordering an animal to be slaughtered.

These are the main facts and opinions elicited by the queries, and taken in conjunction with the evidence given above they afford a fair means of estimating the extent of our knowledge regarding the infectiousness of the disease and the value of the means at present adopted to prevent its spread.

Now that the Government have taken up the matter, and have consented to appoint a committee of inquiry, it may be well to state shortly what are the points regarding which we are in doubt or in ignorance, but which it is desirable to have investigated and cleared up.

It is the opinion of many that an animal may have what might be called a slight attack of pleuro-pneumonia, which, after running a mild course, passes off without leaving any permanent lesion of the lung; while others hold that there is no perfect resolution of the lung lesion, but that there always remains some scar or encysted part which may at any time, under favouring circumstances, recrudesce, and be a source of infection.

If the former view is correct, it points to the possibility of some kind of remedial treatment being discovered which may cut short or modify the progress of the disease. If the latter view is the correct one, it points to the importance of knowing whether an animal has had the disease, or is passing through it in a mild form.

It is still doubtful if the incubative stage of the disease ever exceeds fifty days, although instances are recorded in which it has seemed to last for five or six months.

It is not known at what stage of the incubative period the disease becomes infectious, or whether it is at all infectious during that period.

It is acknowledged that it is impossible to diagnose the disease during the incubative period. It is also acknowledged that it is extremely difficult, and sometimes impossible, to diagnose it when it has assumed the chronic or encapsuled form, especially where the lesion is a small one or deeply seated.

It is generally believed to be a micro-organismal disease, and it has been asserted that the organism has been detected in the lung lesion, and that it has been cultivated in nutritive media outside of the animal body. The organism is thought to be present in the blood during the incubative period, or at least during the fever stage; and these facts point to the probability that it might be possible to diagnose the disease by making cultivations of the organism contained in the blood before it is possible to diagnose it in any other way. Whether that may be or not, it is admitted that it would be of great importance to discover a method by which the disease might be detected before it becomes infectious.

It seems to be the opinion of most veterinary surgeons that the disease is not infectious until after the incubative period, for they give it as their opinion that, in the event of their being free to slaughter a suspected, but not pronouncedly diseased, animal, they would be much better able to check the disease, and even to prevent its transmission through a herd.

It is not exactly known how the disease is transmitted, but it is suspected that the organism of infection passes directly in the air from one animal to another. No medium of transmission has been discovered, though several have been suspected.

It is not known if a place can harbour infection after the removal of the infected animal, but those who have had an outbreak in their place are prevented from re-stocking it for fifty-six days, on the supposition that it can. It is not known if any disinfection of stalls, litter, or dung is at all necessary. If necessary, it is not known what is the simplest, most effective, and least expensive method of disinfection.

It is not known that the dung or litter of a diseased animal can communicate the disease, but it is usual to consider that it is so, and therefore to burn or otherwise destroy it. The cost to the ratepayers and the inconvenience and loss to the farmer from the destruction of his dung is very great, and may be entirely unnecessary.

Regarding inoculation, much has to be discovered, so as to render it a safe and successful operation.

It is not known whether the method of seton at present employed is the best one. It has not been compared with any other good method.

It is not known why it is that inoculation is followed by serious consequences in some cases and not in others.

It is considered by many that if inoculation is to become general as a protective measure it would be necessary to secure an unlimited supply of pure and trustworthy lymph.

It is believed that, by artificial cultivation, such a supply might be had; and that it might even be attenuated so as to lessen risk of death from the operation of inoculation.

It is not known whether inoculation tends to arrest the progress of the disease in an affected animal, and so to increase the proportion of cases of encysted pleuro-pneumonia, or whether it tends to hasten and develop the progress of the disease in an affected animal, and so to diminish the number of encysted cases.

It is not known if inoculation gives an animal absolute immunity from the disease, or for how long it does so.

It is sincerely to be hoped that the policy of universal slaughter at present being carried out will rid the country of the disease; but, lest it should be found incapable of permanently doing so, or lest the cost of carrying out the policy may be too great, it is most desirable that, in the meantime, every opportunity of investigating the disease should be taken advantage of.

A probable result of the investigation will be to find that many of the present restrictions are unnecessary, and that the policy of wholesale slaughter pure and simple is needlessly expensive, and that certain modifications of the system of suppression may be introduced with great economy, and with perfect efficacy.

PLEURO-PNEUMONIA.

REPORT BY DEPUTATION TO PRIVY COUNCIL, 18TH NOVEMBER 1887.

At a Meeting of the Directors of the Society held on the 7th of December 1887, Mr F. N. Menzies reported that, according to previous arrangement, the Deputation appointed at the Board Meeting on the 2nd of November, viz., Mr Stirling of Kippendavie, Mr Paterson of Birthwood, Mr Marr, Cairnbrogie, and himself, waited on Viscount Cranbrook and Lord John Manners at the Privy Council Office, on Friday 18th November, to lay before their Lordships representations on the subject of pleuro-pneumonia. There were also present Mr C. Lennox Peel, C.B., Clerk of the Council, and Professor Brown of the Agricultural Department.

Mr Menzies read the Memorial adopted by the Board on the 2nd of November, as follows:—

That your Memorialists, as representing the landed proprietors, tenant farmers, and others in Scotland, have a very deep interest in the preservation from disease of the farm live stock of the kingdom, and have viewed with dismay the yearly increasing losses which are occurring from pleuro-pneumonia.

That your Memorialists believe that the approaching winter months (when stocks being adjusted for the winter, the movement of cattle, with the exception of those intended for immediate slaughter, is greatly restricted) would afford a favourable opportunity for uniform and stringent measures being taken to stamp out the disease with the least inconvenience and loss to all parties concerned.

That to protect the herds of Great Britain from the danger of having the disease reintroduced from Ireland, it is extremely important that the disease should be stamped out there also.

Your Memorialists therefore beg humbly to request your Lordships to exercise the powers your Lordships possess to compel local authorities to slaughter, during the approaching winter months, all animals affected with pleuro-pneumonia, and also all cattle that have been in contact with them; and to use your Lordships' influence to get the same policy carried out in Ireland.

And your Memorialists will ever pray.

Sealed with the Corporate Seal of the Society, and signed on its behalf, by Victor Alexander, Earl of Elgin and Kincardine, this 2nd of November 1887.

(Signed) ELGIN, *Vice-President.*

Mr STIRLING, in supporting the memorial, said that the Directors of the Highland Society felt that pleuro-pneumonia had got such a hold on the country that it was absolutely necessary that most energetic steps should be taken in order to stamp it out effectively. Several counties, including Perth and Aberdeen, had enforced the compulsory slaughter of diseased animals with very great success. Their success had, however, been limited, owing to this course not being adopted universally. The deputation asked that the compulsory slaughter of infected animals should be made universal, because it was hardly fair to expect the north of Scotland to carry out these restrictions, and to pay a heavy price for compensation, if in other parts of the country the door was to be left open for the reintroduction of the disease into the northern counties by the action of authorities over whom they had no control. The action of the Irish authorities had been very much criticised, and Mr Fletcher Menzies had reported to the Secretary for Scotland upon the crowded way in which the cattle are shipped in Belfast and Dublin.

Mr JOHN MARR believed it was unanimously desired to enforce compulsory slaughter, and the National Society of Scotland, he believed, for the first time were now recommending it. Past experience had led the advocates of compulsory slaughter to suppose that it would effectually stamp out the disease if carried out universally. It had not succeeded at present, because only the more energetic authorities had put into operation the full powers which they possessed in this direction. The disease was such a subtle one that it was impossible to eradicate it efficiently by any other means than killing all the animals which had contracted the disease, and also all those animals which had come in contact with the infected cattle. It had been fully proved that an animal might have a pleuro lesion in its lung which could not be detected except upon a *post-mortem* examination. The dairymen were opposed to the slaughter, but surely it was inconceivable that the interests of the whole stock of the country and its owners should be made to suffer in order to avoid loss or inconvenience to a few dairymen. In the opinion of many, the compulsory slaughter would prove the cheapest in the end.

Mr Paterson said that in Lanarkshire they had killed cattle worth £13,000; they had got £3000 for the carcasses, and had assessed the county at £10,000. Credit should be given to the county for having blotted out the whole pleuro-pneumonia cases within its limits. With the exception of two cases, in which they had adopted inoculation, they had killed every animal; but they did not know what further suffering was in store for them, because pleuro-pneumonia was in their immediate neighbourhood. In Lanarkshire, for every unhealthy beast they had killed fifteen healthy ones, and they asked the Government to put very strongly in force their existing powers and clear the whole of Scotland from the disease.

Lord Cranbrook.—The great difficulty appears to be that, unless Ireland is included, the peremptory order for Scotland would become inoperative, because the importation from Ireland is so very large that it is almost impossible, if there is disease in Ireland, that it should not be communicated to the countries to which they export cattle.

Mr Paterson said that was so. The cattle were sent from Dublin to Glasgow; they were sometimes sold at Glasgow, but were often sent on to Edinburgh, and sometimes sent back to Glasgow to be sold again. Lanarkshire was between two fires, having Glasgow on the one hand and Edinburgh on the other.

Mr Stirling said he had now to present a resolution passed unanimously by the Highland Society, to the effect that a thorough investigation should be instituted into the nature of pleuro-pneumonia, and requesting the Government either to undertake such an investigation, or to provide a sum in aid to enable the Society to do so. That resolution in no way interfered with the memorial, because it dealt with the future, whereas the memorial dealt with the present. It was given in evidence before the Highland Society that veterinary surgeons were utterly at variance on certain very important points—amongst others, on the question of inoculation. On the one hand, it was said that the inoculated animals became living centres of disease, and conveyed the disease to all animals with which they came in contact. On the other hand, it was alleged that even if the animal was diseased to such an extent that the veterinary surgeons could not detect it before inoculation, the effect of inoculation would rapidly develop the latent disease and bring it to a head, but that inoculation would render a healthy animal innocuous, and would have the same effect as vaccination in relation to smallpox. In his county 348 animals were successfully inoculated in September and November last year, and they had not been able to trace a single further outbreak to any one of those animals, and they had not found that any animals brought in contact with them had had pleuro-pneumonia in consequence. These 348 animals were still living, and were perfectly healthy and sound. The total loss to the county had been £1240. Had the animals been slaughtered they would have had to pay over £2000 in further compensation. Mr Spreull, of Dundee, had carried on similar experiments.

Lord Cranbrook said he would like Professor Brown, of the Agricultural Department, to deal with this point, as that gentleman could speak with a technical knowledge to which he himself could not pretend.

Professor Brown said that an investigation into the nature of pleuro-pneumonia had been carried on by all the scientists in Europe for something like thirty years, and there were certain points upon which the authorities were diametrically opposed. For example, they had not discovered the particular microbe on which pleuro-pneumonia could be proved to depend. Mr Poels, in Rotterdam, had recently published a paper stating that he had discovered it, and giving a description of it. He had requested that gentleman to send him some preparations that he might examine it, but Mr Poels replied regretting that he had not kept any. The Department had been carrying on cultivations for some time, but they had altogether failed to detect any organisms which produced the results which followed from the organism discovered by Mr Poels. In regard to inoculation, the evidence was by no means precise on certain points. It was proved that inoculation gave a certain amount of immunity against the actual disease, but that it was not a sure protective was a fact which he could assert from his own observations during the last twenty-five years. He had seen cattle inoculated by one of the best operators in this country, which had been attacked two or three months after a successful inoculation. In fact, there was no method of vaccination or inoculation against any disease which was an absolute protection. But there was no question of the fact that it was protective to a certain extent; and if an arrangement could be made by which all inoculated animals should be treated as suspected animals, and not allowed to be moved out of the premises where the inoculation is performed, except to go to the butcher, his objections would be removed. But it was a palpable fact within the knowledge of a large number of men who had worked at the subject thoroughly, that there were certain limited cases of pleuro-pneumonia which could not be detected by any known means. Such animals were apparently in perfect health, and the inoculation ran its course in them exactly as if they were perfectly healthy. The absence or presence of disease in the lungs made no difference whatever in the progress of the inoculation in the tail. Those animals might go on for six months and show no sign. In Cumberland, in an inoculated herd, after six months, three animals out of sixteen were found to have pleuro-pneumonia well developed in the lungs, of which nobody had suspected the existence. In the Netherlands, for something like ten years they pursued the policy of inoculation, but they failed by that means to eradicate the disease, and they adopted the policy of slaughter without interfering with the inoculation, which was still carried on. After some six or seven years of the slaughtering policy, they got rid of the disease. Throughout Europe, and in nearly the whole of the colonies, inoculation had been practised for a long period, and in no case had the disease been stamped out or got rid of by those means. Where inoculation had been practised most regularly there the disease was most rife. Those were the facts. He was not opposed to the inquiry—in fact, he devoted nearly the whole of his spare time to the subject; but to be done effectually it must be done upon a large scale, and they would want about £40,000 to start with for the first year.

Mr Paterson stated that if any inquiry was entered on it would require the protection of Government, so as to place experimenters beyond the risk of interference from local authorities.

Lord John Manners, in reply, said he had intended drawing the attention of the deputation to the fact that, by the last Act passed, the Privy Council had been deprived of the power of protecting any such inquiry, and that for Government to do so it would be necessary to get the sanction of Parliament.

Mr Menzies said they had a correspondence about eighteen months ago with the Irish Privy Council on the subject of the disease, and they promised to give the Highland Society satisfaction, but they never got any. There was great cruelty shown in the way the Irish cattle were packed on board ship.

In reply to Mr Paterson, Lord CRANBROOK said he should be glad if the Society would send a digest of the evidence taken before the Highland Society's Committee.

Mr PATERSON said it would be prepared, and sent to his Lordship.

Mr STIRLING said that, as Chairman of the Perth Local Authority, he went to Ireland with a deputation some years ago, and Lord Spencer was most kind to us. He certainly took very active steps to carry out our wishes, in the way of drawing cordons round different places; but, since then, the whole thing has lapsed again, and nothing is being done as it then was.

Lord CRANBROOK, in reply, said the Department was not gifted with money, and had as much trouble in getting hundreds from the Treasury as the deputation seemed to have in getting thousands from their counties. The question of inoculation was clearly one upon which there was a good deal of difference of opinion, but experiments were going on both abroad and at home, and progress was being made in the inquiry. The Government would take into consideration the representation the deputation had made, and would see whether anything further could be done by the Privy Council. With regard to the memorial dealing with the existence of pleuro-pneumonia, they would explain to the Irish Government the forcible remarks that had been made upon the condition of things in Scotland, and see whether they could obtain from the Irish authorities any security against the importation of unsound cattle into Scotland and England. He would communicate with the deputation in writing upon the subject after they had carefully considered the reply from Ireland.

The deputation then withdrew.

THE CEREAL AND OTHER CROPS OF SCOTLAND FOR 1887, AND METEOROLOGY OF THE YEAR RELATIVE THERETO.

THE CROPS.

THE following comparison of the cereal and other crops of 1887 with the previous year, has been prepared by the Secretary of the Society from answers to queries sent to eminent agriculturists in different parts of the country.

The meteorology of the year has been furnished by Mr Alexander Buchan, Secretary of the Meteorological Society of Scotland.

The queries issued by the Secretary were in the following terms:—

1. What was the quantity, per imperial acre, and quality of grain and straw, as compared with last year, of the following crops? The quantity of each crop to be stated in bushels. What quantity of seed is generally sown per acre?—(1) Wheat, (2) Barley, (3) Oats.
2. Did the harvest begin at the usual time, or did it begin before or after the usual time? and if so, how long?
3. What was the quantity, per imperial acre, and quality of the hay crop, as compared with last year, both as regards ryegrass and clover respectively? The quantity to be stated in tons and cwts.
4. Was the meadow hay crop more or less productive than last year.
5. What was the yield of the potato crop, per imperial acre, as compared with last year? The quantity to be stated in tons and cwts. Was there any disease, and if so, to what extent, and when did it commence? Were any new varieties planted, and with what result?
6. What was the weight of the turnip crop, per imperial acre, and the quality as compared with last year? The weight of the turnip crop to be stated in tons and cwts. How did the crop braird? Was more than one sowing required? and why?
7. Were the crops injured by insects? State the kinds of insects. Was the damage greater or less than usual?
8. Were the crops injured by weeds? State the kinds of weeds. Was the damage greater or less than usual?
9. Were the pastures during the season of average growth and quality with last year?
10. How did stock thrive on them?
11. Have cattle and sheep been free from disease?
12. What was the quality of the clip of wool, and was it over or under the average?

From the answers received, the following statistics have been compiled:—

EDINBURGHSHIRE.—Wheat, 56 bushels; quality of grain and straw better than last year; about $3\frac{1}{2}$ bushels sown. Barley, 47 bushels; quality of grain and straw about the same as last year; $3\frac{1}{2}$ bushels sown. Oats, 48 bushels; quality of grain and straw worse than last year; 4 bushels sown. Harvest commenced three weeks earlier than usual. Hay, 2 tons 15 cwt.; quality of both clover and ryegrass very good, and much the same as former years; meadow hay much less than former years. Ten tons Regent potatoes and Magnum Bonums and 8 tons Champions; no disease; crop superior to the former year. Sold all my turnips by auction, average price £17; same as former years; brairded well; only once sown. No damage by insects, and none by weeds. Pasture very poor compared with the former year; season too dry. Stock did not fatten, but were free from disease. Clip of wool much the same as the former year.

LINLITHGOWSHIRE.—Wheat about the same in quantity, but better in quality of both grain and straw, as compared with last year; from 30 to 40 bushels; seed, $2\frac{1}{2}$ to 3 bushels. Barley about the same in quantity, but much better in quality of both grain and straw, as compared with last year; from 30 to 40 bushels; seed, from $2\frac{1}{2}$ to 3 bushels. Oats, straw much less in quantity, but better in quality; grain better in both quantity and quality; from 30 to 40 bushels; seed, 4 to 6 bushels. Harvest began and ended a month earlier than last year. Hay about the same in quantity and quality as compared with last year—from $1\frac{1}{2}$ to 2 tons. No meadow hay. Potatoes better in quantity and quality, as compared with last year; from 6 to 12 tons; almost no disease. Turnips less in quantity, but about the same in quality as compared with last year; brairded well; no second sowing required; from 12 to 25 tons. No damage by insects. Crops not injured by weeds. Pastures under average growth and quality with last year; in many cases much burned up, by the long-continued dry weather during June and July. Stock did not thrive well. Cattle and sheep free from disease. An average clip of wool.

HADDINGTONSHIRE (Upper District).—Wheat none. Barley varying from 28 to 40 bushels; average about 32 bushels, weighing 57 and 58 lbs.; grain good quality, but much discoloured by wet weather in harvest; straw average; seed, $3\frac{1}{2}$ bushels. Oats, from 37 to 44 bushels; average 42 bushels, weighing $43\frac{1}{2}$ lbs.; grain good; straw short; seed, 5 bushels. Harvest begun 15th August—a month earlier than last year. Hay, $1\frac{1}{2}$ to 3 tons; well got, and of excellent quality. Meadow hay small crop, but fine quality. Potatoes, 6 tons; good quality; no disease; no new variety. Turnips, 16 to 19 tons, good quality; brairded well, and no resowing. Some damage caused by green fly, but not of great extent. No injury by weeds. Pastures on gravelly land much burned from drought, otherwise good. Stock throve very well, and were free from disease. Clip of wool good, and above average.

HADDINGTONSHIRE (Lower District).—Wheat, 46 bushels, good quality; straw equal to last year; 3 bushels seed sown. Barley, 46 bushels; average weight 58 lbs.; extra fine quality; straw shorter than last year; $2\frac{1}{2}$ bushels sown. Oats, 46 bushels, good quality; straw short, and under the average; 4 bushels seed sown. Harvest commenced 28th July, three weeks earlier than last year, owing to the extremely dry and warm summer. Hay, 2 tons; quality fine; fair mixture of ryegrass and clover. No meadow hay.

Potatoes, 9 tons; yield rather over last year; quite free from disease; some parts of the earlier kinds showed a little second growth. Turnip crop, 18 tons; quality equal to last year; brairded well; only one sowing; bulbs smaller, owing to extreme drought. Some places were affected with mildew and green fly; damage rather more than usual. Some parts showed a considerable quantity of yellow weeds. Pastures under the average. Stock did rather indifferently, owing to dry season, but were quite free from disease. Average clip of wool; quality good.

Berwickshire.—Wheat, 33 bushels; 250 stones straw; grain above average in quality; straw rather over average in quality; seed, 3 bushels. Barley, 42 bushels; 140 stones straw; grain and straw of good quality; seed, $2\frac{1}{2}$ to 3 bushels. Oats, 45 bushels; 150 stones straw; grain fine quality, straw good quality; seed, $4\frac{1}{2}$ bushels. Harvest a week earlier than usual. Hay, 210 stones of 14 lbs.; well harvested, and quality extra good. Meadow hay, very little grown. Potatoes, large crop, say 8 tons; no disease. Turnips, 16 tons; swedes a good crop; green top yellow rather a poor crop, owing to drought; only one sowing required. No injury by insects or weeds. The pastures were considerably affected by the drought, and were under average growth, but the quality was good. Stock throve well, and were free from disease; wool, quality good; quantity about average.

Roxburghshire.—Wheat, 28 bushels, fine quality; above average in straw and grain. Barley, about 32 bushels; a large proportion deficient in colour, but good weight; straw about average bulk. Oats deficient both in straw and grain; about 27 bushels; the season too dry for oats. Harvest about ten days earlier than average of seasons. Hay, the crop scarcely so good as last year, but very well got; about 1 ton 7 cwt. Meadow hay scarcely so bulky as last year, but generally well got. Potatoes, a large crop, good quality; free of disease; ranging from 4 to 10 tons. Turnips fully an average crop; brairded well; almost no second sowing; about 18 tons. A little damage caused by wet at the latter end of harvest, but no insects. Little damage by weeds; pastures quality good, but quite under average quantity. Cattle did badly. Sheep were very healthy during the summer months, but a considerable loss among hoggs after put on turnips. Wool, quality good, and about average clip.

Selkirkshire.—Wheat, none grown. Barley, 26 to 28 bushels; good quality, and an average quantity of straw; crop well secured; 3 to 4 bushels sown. Oats, 26 to 28 bushels; quality good, and in most cases well secured; straw fine quality, but under an average in quantity; 4 to 5 bushels sown. Harvest began early in August—fully ten days before the usual time. The quantity of ryegrass hay was a full average in quantity, and well made; 1 to $1\frac{1}{2}$ tons. Meadow hay was under an average, owing to the continued dry weather. Potato crop was a full average in quantity, and almost free of disease; fine quality; 6 tons. Turnips—this was the most disappointing crop of the year, as on gravelly soils it was much injured by the dry weather, and in such cases will not yield one-third of a crop, but on deep soils the crop will be an average; the crop on gravelly soils will yield from 8 to 10 tons, on deep soils from 18 to 20 tons; the crop brairded very well, and no resowing. No injury by insects. No extra damage by weeds. The pastures during the earlier part of the year were a full average, but when the dry weather set in were completely burnt up. Stock, as can be easily understood, did not thrive after the pastures were damaged by the dry weather; there has been no disease in the county. The wool was a full average both in quantity and quality; but the price, although a little higher, is still low.

Peeblesshire.—No wheat grown. Barley, rather a light crop, averaging about 24 bushels, but heavier per bushel than last year, and secured in fine condition. Oats also were decidedly a light crop, averaging say 28 bushels; straw very short on most farms, and occasionally under an average. Harvest began about three weeks before the usual time. Hay crop was considerably lighter than last year, and would in very few cases exceed 1½ tons; it was also very deficient in clover. The meadow hay crop was much lighter as compared with last year, but was secured in very fine condition. The potato crop was one of the finest we have had in this county for many years; it would average from 8 to 10 tons; there was almost no disease. Turnips were a good crop, generally equal to last year, averaging about 20 tons; they brairded well, and required no resowing. There was little damage done to crops by insects or weeds. The growth of the pastures was at no time during the season very great; they suffered very considerably from drought. Stock throve fairly well, and were free from disease. The clip of wool was about an average, and very much better than the previous one.

Dumfriesshire (Upper Nithsdale).—Wheat, none grown. Barley, very little grown. Oats, 25 bushels; 5½ bushels sown; crops grown 500 feet above sea-level, fully an average; while those on light soils in the valley suffered extremely from the dry weather in June and July; in many cases the crop would not pay labour and seed. Harvest began quite a fortnight earlier than usual; it was protracted, owing to bad weather, and the crop was secured in very indifferent condition. Hay, a ton; a light crop, but good quality. Meadow hay fully an average, especially in the higher districts. Potatoes, 6 to 7 tons; an exceptionally fine crop, but lifted in a green condition, and not keeping well. Turnips, 25 to 30 tons; much better crop than last year; brairded well, and no resowing necessary. Not more than usual damage by insects, and not materially damaged by weeds. Pastures on heavy cold lands were very good, while on light soils much burned. Where not overstocked, cattle and sheep throve well; sheep stock good on hill pastures; have been very free from disease, with the exception of sheep on turnips. Quality of wool good; clip above the average of the last six years.

Kirkcudbrightshire.—Wheat, last year 29 bushels, this year 32 bushels. Barley, last year 30 bushels, this year 29 bushels. Oats, last year 32¼ bushels, this year 29½; quality excellent. Harvest about two weeks earlier than usual. Hay, quantity less than last year; quality better than last year. Meadow hay about equal to last year. Potatoes, last year 4 to 5 tons, this year 8 to 12 tons; no disease; Magnum Bonums largely grown, excellent results. Turnips, last year 16 to 17 tons, this year 18 to 24 tons; quality good; good braird; no resowing. No injury by insects, and less weeds than usual. Pastures under average growth, but better quality. Stock throve well, and were free from disease. Clip of wool, fully average quality, slightly less quantity.

Bute.—Wheat, none grown this year. Barley a light crop, owing to the dry season; yield about 27 bushels; quality of grain and straw inferior, particularly on light sandy soil; seed sown, about 4 bushels. Oats, a good average crop generally; good deep land producing an extra heavy crop and light land a very inferior crop; yield about 37 bushels; quality of grain and straw good; seed sown, from 5 to 6 bushels. Harvest commenced about ten days earlier than usual, where crops lighter; where crops heavier, about usual time. The crops cut early badly harvested, as a rule, owing to wet weather; the late heavy crops secured in excellent condition. Rye-grass, about 1¾ tons; average crop. Clover good. Timothy hay, a good heavy crop; above 2 tons. Little meadow hay; fair crop. Potatoes, above an average; from 7 to 10 tons; little if any disease this year; the bulk of the crop was sold for the early market, and realised higher prices than usual; no new varieties this year. Turnips, much above the average; from 20 to 34 tons; brairded well; no resowing; prices from 9s. to 12s. per ton. No injury to crops by insects. Green crops never easier managed, on account of the fine dry season. Pastures, extra good till July, and continued so, unless where injured by the drought. Stock throve well, but prices very low for fat cattle, at the end of the season scarcely realising the May prices. No disease amongst cattle; sheep also free from disease, except braxy amongst hogs at wintering, the deaths from this cause being about an average. Wool, of good quality; about an average.

Arran.—Wheat and barley, none. Oats, quantity about 30 bushels; about average weight; straw about average in quantity; quality good; about 6 bushels seed. Harvest about two weeks earlier than usual time. Hay crop lighter; would average about 1 ton 2 cwt. Meadow hay, none. Potatoes, better than last year; about 7 tons 10 cwt.; little disease; no new varieties. Turnips better than last year; about 28 tons; brairded well; no resowing. No injury by insects or weeds. Pastures better this year. Stock throve well. Cattle and sheep free from disease. Clip of wool, above average; quality better.

Lanarkshire (Upper Ward).—Wheat, none grown. Barley, very little grown; from 24 to 32 bushels; better than last year. Oats, from 24 to 50 bushels; good crop on all heavy land; light land short of straw, but corn of good quality when not heated in stack; thrashes well off the straw, and should say better than last year; seed, 5 bushels. Harvest about twelve days before the usual time. Hay, from 1 to 2 tons; quality good—better than last year. Meadow hay scarcely so good, but quality better. Potatoes, from 8 to 12 tons—at least 4 tons better than last year; Regents the prevailing kind in this quarter; a few Magnums and Champions; no disease. Turnips, from 25 to 35 tons; fully better than last year; brairded well; no second sowing. Insects less than usual. Wild mustard or wild-kail, but not so bad as last year. Pastures, at first long in coming, but good until end of July, after that very bare, on account of the drought; some fields badly burnt up; not so good as last year. Stock throve fairly well; one or two cases of pleuro in the district, but free for some time. Clip of wool, about average.

Lanarkshire (Middle Ward).—Wheat, about 34 bushels; quality very fair—fully better than last year; quantity of seed, 3 to 4 bushels, according to depth of soil. Barley, very little sown in this ward; about 36 bushels; quality fair; seed, $3\frac{1}{2}$ bushels. Oats, about 40 bushels; quality good, although straw short; seed, 3 to 4 bushels. Harvest from one to two weeks earlier than usual. Hay, quantity $2\frac{1}{4}$ tons; quality good, but little clover. Meadow hay, quantity $2\frac{1}{2}$ tons; quality good. Potatoes, about 9 tons on an average; very little disease; no new varieties, so far as known. Turnips, about 20 tons; good braird; no second sowing. No injury by insects or weeds. Owing to drought, pastures under usual quality. Stock throve middling, extra feeding being required; pleuro-pneumonia being prevalent. Clip of wool, above average.

Lanarkshire (Lower Ward).—Wheat, generally a good crop; yield about 38 bushels; seed, from 3 to 4 bushels; straw, 150 stones. Barley, none grown in this district that I know of. Oats, a good crop, especially on stiff land; light soil much hurt by the drought in June; average yield, from 32 to 38 bushels; seed, about 5 bushels; where good, yield of straw 150 stones. Harvest three weeks earlier than last year. Hay a good crop, and well secured; yield from 1 to 2 tons. Clover extra good crop—better than last year; some very heavy meadows, from 2 to 3 tons much better than last year. Potatoes, quite an extra crop; disease in some of the earlier sorts; where free from disease, yield from 7 to 8 tons; did not hear of any new varieties being planted. Turnips, a heavier crop than last year; yield from 18 to 23 tons; good quality, and kept well; brairded well, and no second sowing required. Did not hear of any crops hurt by insects. Damage much less than usual by weeds; in some fields of oats a tall weed with white head (known here by the name of horse gowans), was very plentiful, and hurt the crops considerably. Grass good all the season. Stock throve well; a good deal of pleuro in district; sheep free, except a few cases of braxy. Clip of wool, about an average.

Renfrewshire (Middle Ward).—Wheat has been one of the most abundant crops, particularly as regards grain, for many years; the breadth sown is, however, very much less; 50 bushels, which I should say is the average, is by no means the maximum; 4 bushels is the usual quantity of seed sown. There is so very little barley sown in this district that it is scarcely worth noticing it, as where sown it is pretty often on headriggs or some plot which it is too late to sow oats upon; what little there was would be about an average crop. Oats, as a rule, have been a good crop as regards grain; straw in light early soils short, but in coldish soils and later districts straw has been the opposite; about 42 bushels; grain will be a fair average; seed sown, about 6 bushels. Harvest, as a rule, was from three to four weeks earlier than last season. Ryegrass hay, in light dry soils, unless where dressed with light manure, was a lightish crop; in cold soils, the opposite was the case; average might be about 1 ton 15 cwts. Timothy, of which there is a large breadth grown, was an excellent crop; average, 2 tons 5 cwt. Meadow hay was about an average; about $1\frac{1}{2}$ tons. Potatoes were an extra fine crop; in some districts disease did prevail to the extent of at least one-fourth among Regents and early varieties; later soils, especially Magnums, were an extraordinary crop all over—would average fully 9 tons. Turnips, an extraordinary crop; of superior quality; I believe this is the best and heaviest crop of turnips for the last thirty years, at least; average would be about 28 tons. None injured by insects so far as I am aware, nor by weeds. Pastures on light soils were somewhat deficient, in later districts were considerably better than last season. Stock throve fairly well; in some cases not so well as last season, on cold-bottomed land very much better; as a rule, they have been free from disease. Clip of wool, quality good; rather over average.

Renfrewshire (Upper Ward).—Wheat, none grown. Barley, none grown. Oats was a good crop; fair quantity of straw; oats better quality than has been for a number of years; 30 to 40 bushels. Harvest two weeks earlier; the beginning was wet, and not good for the corn; but came in good, and a splendid finish. Ryegrass hay was fully a better crop than last year; from 30 to 40 cwt., and very well got. Meadow hay was a fully better crop than last year, and was well got, also Timothy. Mostly Champion potatoes grown in this district; and a very good crop, and good quality; 6 tons; the early ones was an extra crop, and very free of disease, and would be 8 tons. Turnips, a splendid crop; no second sowing; they brairded well, and a heavy crop, but none sold, and cannot state the weight. No insects. It being a very dry season, no weeds. Pastures were good. Cattle did well, it being a good warm season, and had plenty of grass. No disease in this district, and less abortion amongst cows, but consumption amongst cows getting more common. Few sheep kept.

RENFREWSHIRE (Lower Ward).—No wheat and no barley grown in the district. Oats, owing to the exceptionally dry weather, was an irregular crop; on the dry and early land straw was very short, and the yield under the average, but on the later lands the crop, both of grain and straw, was excellent; the yield of grain would vary from 27 to 30 bushels; the quantity of seed sown, from 4 to 5 bushels. Harvest began about a fortnight earlier than usual, and in some cases three weeks, but the weather broke about the second week of August, and the crops sustained considerable injury, both from heavy rain, dull weather, and the heating of stacks. Ryegrass hay was not a heavy crop; the clover was deficient, the weight of crop varying according to the nature of the soil and locality; the best crops would not exceed 1½ tons, and the average 15 cwt.; the quality throughout the district was excellent, the weather being exceptionally favourable for securing the crop. Meadow hay on dry meadows was less plentiful than last year, but where water for irrigating was in sufficient volume, the crop was heavier, and all over the quality good. Potatoes, the yield of early varieties was good, but there was no breadth of them planted, and for a time the price was more encouraging than in former years, this however, did not continue, and the late kinds met with dull sales; the average yield was somewhat better than last year, exceeding it by about 1 ton; disease appeared about the 26th of August, and where the land was suitable to the crop was moderate in its damaging effects,—on stiff land it made more havoc, and some crops suffered to fully one-third or more; about 5 to 7 tons would be the average yield. The turnip crop was throughout an abundant one, and the average yield would be from 16 to 25 tons. There was no trouble from the fly. Pastures were good except in places which, from the dry weather, became burnt, but refreshing showers remedied this drawback to a great extent. The rainfall has been 51·50 inches as against an average of 65·37 inches.

ARGYLLSHIRE (District of Oban).—No wheat grown. Very little barley grown. Oats, the quantity is much above that of last year; the quality is good; between 5 and 6 bushels is usually sown. The harvest was about two weeks earlier than last year. Ryegrass was light, being much about the same as last year's bulk; it was well secured; the clover was above the average. Meadow hay much about the same as last year; was well secured. Potatoes, the yield was the heaviest for a good number of years, being about 2 tons more than last year; the disease did not show itself till late in the season, and did not get at the roots; the "Champion" is the principal potato sown in this district. The turnip crop was much the same as last year; brairded well, and there was no second sowing. No injury by insects. Less weeds than usual, on account of the dry season. Pasture poor in the beginning of the season, improved, and towards the end of the season was good. Stock throve well, especially towards the end of the season, and were free from disease. Clip of wool, quality good; quantity about the average.

ARGYLLSHIRE (District of Lochgilphead).—Wheat, none grown in the district. Barley, scarcely any grown in the district. Oats, about an average; the season was rather too dry for some of the lighter soil; 6 bushels sown; crop 35 to 40 bushels. An early harvest, about ten days before the usual time. Hay crop good, both in quantity and quality; about same bulk as last year; average crop in the district, 1½ tons. Meadow hay, about the same. Potato crop good; 7 tons; some disease in earliest, but it was late setting in—it did not appear until September. Turnips, weight not recorded; quality good, and much the same as last year; crop brairded well; only one sowing required. No injury by insects. Wild buck wheat, the most common weed in the district; damage (if any), less than usual. Pastures of average growth and quality. Stock throve well; cattle and sheep free from disease, always excepting braxy. Clip of wool good in quality, and over the average in weight.

Argyllshire (District of Cowal).—Wheat, none. Barley, none. Oats, a fairly good crop, and generally got in good condition; yield quite an average, and weight of corn show the ordinary range—easily 40 lbs. to the bushel; seed about 6 bushels. Harvest finished somewhat early. Ryegrass hay was decidedly under an average, but most of it got in good condition; 2 tons was scarcely reached in the best crops. Meadow hay as above, but less in weight. Potatoes, a very heavy crop for this district, but as a rule the quality inferior; in some cases, owing to excessively rapid growth, fully one-third were hollow; but almost free from disease. The average weight of turnips is greater than has probably been known in this district for twenty years. No damage to any crops from insects. Weeds easily kept under; crops were cleaner this season than for the last ten years. Growth of pastures was deficient, and what was somewhat disappointing, though we had more than average sunshine. Stock did not come off the grass so well as expected. Cattle and sheep quite free from all disease. Quality of wool excellent, and quantity a full average; if any difference, a little more than an average clip.

Argyllshire (District of Inveraray).—No wheat. No barley. Oats an unusually good crop, and well saved; about 30 bushels; straw scarcely so heavy as usual; but quality of both straw and grain very good; seed, 6 bushels. Harvest rather earlier, say eight or ten days, than usual. Clover does not grow on many farms in this district; when it does it is grown with ryegrass; crop under usual weight, say 28 or 30 cwt.; quality, owing to good weather, very good. Meadow hay up to last year's crop, particularly on damp meadow land. Potatoes an unusually good crop, owing to the dry warm weather, both as to weight and quality; very little disease, except in the earlier kinds, and some new kinds tried. Turnips best crop for many years, and grew well in this district always; average from 12 to 15 tons; quality sound and good; brairded well. No injury by insects; but chaffinches and sparrows are becoming more numerous and destructive to oats. Not much injury by weeds; mustard weeds, henbane, flowering nettle, and dockens less than usual. Pastures quite as good and nutritious as last year. Stock throve well, and were free from disease. Clip of wool, quality good, and rather heavier than ordinary.

Dumbartonshire.—Wheat, about 30 to 35 bushels; say about 8 to 12 bushels more than in 1886; quality much better; straw about same quantity as last year, quality better; seed sown, $2\frac{1}{2}$ to 3 bushels. Barley, very little grown; 35 to 38 bushels; quality very good; seed sown, 3 bushels. Oats, 30 to 36 bushels; smaller crop than 1886, owing to season being so dry; straw said to be shorter than any year since 1826; a considerable quantity injured by bad weather in harvest; seed sown, $3\frac{1}{2}$ bushels. Harvest about a fortnight earlier than usual. Hay about 30 cwt. to 2 tons, according to soil and locality; quality excellent. Meadow hay about same as last year, and well got. Potatoes, quantity similar to last year; quality very fine; little disease; no new varieties. Turnips, crop better than last year; about 20 to 22 tons, in some districts much more, and the finest crop experienced for many years; quality fine; brairded well; no resowing. No damage by insects; fewer weeds than usual, owing to unusually dry season. Pastures, growth not very luxuriant, owing to drought, but quality superior. Stock throve on dry land moderately, on wet or cold land better than usual; some stocks affected by pleuro; the county local authority adopted inoculation, with the most satisfactory results; in sheep stock braxy more prevalent than usual among hoggs. Clip of wool, quality excellent, and quantity above average.

STIRLINGSHIRE (Western District).—Wheat, none grown. Barley, 33 bushels. Oats, 34 bushels; straw rather short; some heating in the stack, from the weather being close and damp; seed sown, 4 bushels. Harvest began about 24th August, or three weeks earlier than last year. Hay, $1\frac{1}{2}$ tons; fine quality, secured in good condition. Meadow hay about the same as last year, and well secured. Potatoes, 8 tons; excellent quality, and little disease; not aware of any entirely new varieties having been planted. Turnips, 18 tons; brairded well, and a fine crop generally; good quality. No damage by insects, and little or none by weeds. Pastures much the same as last year, except on light soil, where it was injured by the drought. Stock throve very well towards the end of the season; no disease. Clip of wool quite up to the average, both in quantity and quality.

STIRLINGSHIRE (Eastern District).—Wheat, 36 bushels; the quality of both grain and straw is superior to last year, and the quantity a little over last year on carse land, and about the same on dry fields; 3 bushels is the quantity generally sown. Barley, 36 bushels; quality better than last year; but owing to the warm foggy weather after it was harvested, a considerable number of stacks were slightly heated, which has deteriorated the quality; straw about the same in quantity, and superior in quality to last year; 3 bushels are generally sown. Oats, 27 bushels: quality inferior, owing to being prematurely ripened; straw shorter than it has been for many years; in several cases it was with difficulty that it could be bound into sheaves, on account of its shortness; in the later districts the crop was fully better than last year; 4 bushels are generally sown. Harvest began about ten days earlier than usual. Hay, 27 cwt.—about the same as last year; it was secured in fine condition; there was a good proportion of clover on carse land, on dry land it was rather deficient; the dry weather reduced the quantity of the aftermath very much. No meadow hay grown. Potatoes—Regents, 9 tons; much superior to last year; Champions suffered from the continued drought, and may be estimated about 6 tons; there was no disease; no new varieties were planted to any extent. Turnips—swedes fully 18 tons—very fine quality; yellows—about 15 tons; the latter suffered considerably from the dry weather; the crop brairded well, and no resowing was required. No injury by insects or weeds. On dry bottom soils, pastures were much burned up, on deep land there was an average growth. Stock did very well on land where there was a full bite. Cattle and sheep were free from disease, with the exception of some cases of pleuro amongst dairy cows. Clip of wool, about an average.

FIFESHIRE (Eastern District).—Wheat, 38 bushels; straw, $1\frac{1}{2}$ tons; 3 bushels sown; quality of grain and straw better than last year. Barley, 36 bushels; straw, 1 ton; seed, 3 bushels; quality of grain and straw better than last year. Oats, 34 bushels; straw, 18 cwt.; crop suffered from drought, but secured in better condition than last year. Harvest about fourteen days before the usual time. Hay, $1\frac{1}{2}$ tons, well mixed with clover; quality good—about the same as last year. Meadow hay, scarcely any grown. Potatoes, 6 tons; much better than last year; no disease; no new varieties planted. Turnips, 18 tons; better quality than last year; crop brairded well; no resowing required. No injury by insects. In some fields of oats and barley the crop was injured by "skellochs," but generally no damage was done. Pastures, growth under an average; quality good. Stock throve well, with the exception of three or four outbreaks of pleuro-pneumonia; generally free from disease. Clip of wool, quality good, under an average.

Fifeshire (Middle District).—Wheat, yield of this crop would be 32 bushels; quality rather better than last year; weight of straw about $1\frac{1}{8}$ tons; seed, 3 bushels. Barley, on good soils there would be 36 bushels; on thin, rocky, or with a gravel subsoil, the yield would not be above 28 bushels; weight of straw very various, according to kind of soils—from 1 ton down to not more than $\frac{1}{2}$ ton; quality of grain excellent, but a considerable quantity much discoloured by rain during harvest; seed, 3 bushels. Oats, crop very various, according to kind of soil; yield of grain from 38 to 48 bushels; straw, weight from 10 to 20 cwt.; quality of grain very good; straw, on account of drought, very short generally; seed, 4 bushels. The harvest may be said to be an early one—about two weeks before the usual time. Both ryegrass and clover shorter than last year; would not average above 25 cwt.; it was well got, and is fine quality. Meadow hay not grown in the district. Potatoes very much superior to last year, both in size of tubers and in weight per acre; weight about $6\frac{1}{2}$ tons; no disease; no new varieties planted. Turnips, yellows about 12 tons; a very considerable number of fields very much diseased; quality not so good as last year; swedes about 16 tons—quality very good; brairded fairly well, but some fields late in brairding on account of drought; on some fields in the north of the county they were entirely eaten up by Aphidæ. Hessian fly did considerable damage to the barley especially, and the aphus fly destroyed whole fields of yellow turnips in the extreme north of the county. No injury by weeds. Pastures not so abundant as last year, having been much burnt up by the extreme heat and great drought. Stock throve very well; there was some pleuro in the district, but the stock otherwise healthy. Clip of wool, the quality was good, and it was up to the average.

Fifeshire (Western District).—Wheat, 36 bushels; straw, $1\frac{1}{2}$ tons; superior in quantity and quality of both grain and straw to last year—indeed crop much above average; seeding, 3 bushels. Barley, 34 bushels; both grain and straw short in quantity, but much the same as to quality as last year; dry season told much on bulk of straw; later harvesting got rain, and somewhat discoloured; seeding, 3 to 4 bushels. Oats, 40 bushels; early harvested in fine order, later had damp weather and some sprout; straw, except on deep land, not more than half usual bulk, owing to very dry season; seeding, 4 bushels. Harvest ten days earlier than usual; exceptionally fine weather, but damp towards the finish, and some sprout on late farms. Hay crop, $1\frac{1}{4}$ tons; excellent quality; crop light, owing to dry season; late cut hay got some rain. No meadow hay. Potato crop, 6 tons; excellent quality, and crop in some places very heavy, and superior to last year; no disease; among new varieties, Beauty of Hebron attracts most attention. Turnip crop, 17 tons; quality very fine; superior in quantity to last season; some very heavy crops on fine land; good braird, except later sowings on strong land; almost no resowing. No injury from insects or weeds. Pastures, average growth and quality, though during the season dry weather prevented luxurious growth. Stock getting a full bite throve extra well, on account of the warm, comfortable, dry season. Cattle and sheep free from disease. Clip of wool, average.

Perthshire (South-West District).—Wheat, very fine quality, and greater weight than usual per bushel; return, 30 bushels; seed, 3 to 4 bushels; straw fair in bulk and quality. Barley, a stunted short crop; straw inferior; return about 20 bushels; seed 4 bushels. Oats, a very inferior crop; straw extremely short, some farmers employing the scythe instead of the reaping machine; not more than half a crop; weight per bushel, 40 lbs. and under, except in deep mossy land, such as the Blackford District, where the yield of both straw and grain was beyond an average. Harvest commenced a fortnight earlier than usual, and crop well got in early situations, but suffered from weather where late and exposed. Hay a light crop, average about 100 stones; quality good. Meadow hay good and abundant in marshy situations, but short in the uplands; quality fine. Beyond an average crop of potatoes, and no disease; all kinds grew well, but it is thought Champions are declining in quality, while Regents and Magnums do not. Turnips, a very good crop; average 20 tons; little resowing required; but the green-fly damaged some fields later on, when the evil could not be remedied. Crops did not suffer from vermin, except in dry thin lands, where the green-fly did considerable damage to turnips after the plants were advanced, but this was exceptional. Season very suitable for killing down weeds, and keeping land in good order. Pastures shorter than usual during the summer, but they thickened and improved in the autumn. Stock throve very well, considering the deficiency in quantity of grass, and were very free of disease. A fair yield of wool, and quality good.

PERTHSHIRE (District of Coupar-Angus).—Wheat, 35 and 40 bushels; weight from 62 to 68 lbs.; average crop, the best of the cereals, especially in straw; seed from 3 to $3\frac{1}{2}$ bushels. Barley, 32 and 40 to 48 bushels, weighing from 53 to 57 lbs.; straw, deficient in bulk; seeds from 2 to 3 bushels, and when sown broadcast $3\frac{1}{2}$ bushels. Oats, 32 bushels, 41 to 45 lbs.; straw very light and short; exceptional fields, where early sown, 52 bushels with fair crops of straw. Harvest commenced 1st August, general about 3rd August, one month earlier than last year. Hay, very light crop; quality good; $1\frac{1}{2}$ tons. No meadow hay. Potato crop from 4 to 10 tons; nothing of disease; Beauty of Heborns were planted successfully in a few places; fine crop of 8 tons, but liable to go in pits, being of fine quality and soft. Turnips, 18 to 24 tons, fine quality; a difficulty in brairding when land was stiff; when resown from dry weather did no good. No damage by insects. No injury by weeds. Pastures not so good as last year; very good in earlier part of season, but entirely burnt up towards harvest time. Stock throve very indifferent towards back of season. Cattle and sheep free from disease. Clip of wool, average.

PERTHSHIRE (Western District).—No wheat or barley. Oats, average crop. Harvest began usual time. Meadow hay, very good crop. Potato crop same as last year. No damage by insects or weeds. Stock throve first class, and were free from disease. Clip of wool, above the average.

PERTHSHIRE (District of Strathearn).—Wheat, fully an average crop; 32 to 36 bushels, and of fair quality, but very little grown in the district; 3 bushels sown. Barley, 30 bushels under an average crop, but of fair quality; $3\frac{1}{2}$ to 4 bushels sown. Oats, this crop was exceedingly light, indeed so much so that on many farms it would hardly cut so as to be put into stooks; quantity about 25 bushels; 4 to 5 bushels sown. Harvest began about the 10th of August, or nearly three weeks earlier than usual, with fine weather at commencement, but broken towards the end; crops on the whole, however, well secured. The hay crop was lighter than last year; quality good, and well secured, and quantity about 1 ton per acre; where top dressing was adopted it proved so far a failure on light land, in consequence of the severe drought, but on heavy soil it increased the quantity of hay considerably. Meadow hay was light—less than an average; it was generally well secured. The potato crop was much above an average in the district; early sorts averaged about 8 to 10 tons, later kinds slightly more; no disease. The turnip crop brairded well with the first sowing generally, and very little second sowing was required; weight about 20 tons, though in some cases 25 to 30 tons were grown. There was little damage by insects. The crops were generally free of weeds, and no damage done. Pasture grass was bare in the first part of the season, in consequence of the dry weather, but ultimately improved considerably. Stock did uncommonly well on pastures, considering the scarcity of grass. Cattle and sheep were free from disease on the whole, and no case of pleuro occurred in the district. The wool clip was about an average, and quality fairly good, with a slight improvement in price.

Perthshire (Highland District).—No wheat. Barley, 24 bushels; grain good; straw short; from 52 to 55 lbs.; seed, 4 bushels. Oats (lea), 28 to 30 bushels; straw short, but good; from 40 to 42 lbs.; red land much the same; straw better; grain sown, 5 bushels. Harvest—a month earlier than usual. Clover hay burnt up, and deficient—15 cwt.; both ryegrass and clover were burnt up; meadow hay was also burnt up—16 cwt.; the grass on the "hill" was excellent. Potatoes good crop, and free from disease; 6 tons; no new varieties sown. Average weight for turnips, 23 to 25 tons; crop good; thin land burnt up, but deep land very good; some second sowing where burnt up. No damage by insects; land very easily kept clean. Pasture at first good was later altogether burnt up, and cattle had to be moved to the "hill." The stock were healthy, and considering the season did wonderfully well. Cattle and sheep free from disease. Wool clip was up to the average, quality good.

Perthshire (Dunkeld and Stormont District).—Very little wheat sown, what is sown is chiefly red Awny; crop very good; 28 bushels; dry season in favour of wheat; average 62 bushels; straw average; seed from 3 to 4 bushels, according to soil. Barley, a deficient crop in general, some exceptions on deep loam; 25 bushels; weight 54 lbs.; straw short, owing to the very dry season; seed, 4 bushels. Oats a miserable crop, the most deficient I have ever seen, owing to the extreme drought; very little rain during the summer; 22 bushels; weight 40 lbs.; straw very short, but good; seed, 5 bushels. The harvest began four weeks before the usual time, namely, the second week in August. The hay crop was deficient for want of rain, both ryegrass and clover; weight, 1 ton 5 cwt., very well secured. Very little meadow hay, but good crop, and well secured. Potatoes turned out an excellent crop; average 6 tons; no disease; some of them too large and coarse; no new varieties—Regents, Magnums, and Champions. Turnip crop good; weight 16 tons; the crop did not braird well on stiff land, for want of moisture, and were therefore a failure; resowing was of no use, as no rain fell. Turnips were injured to a small extent by green-fly, but more so in other districts. Barley was considerably damaged by Hessian-fly for the first time that I have seen. Corn was also covered at harvest by a small brown fly clustered on the grain, and considered to reduce the weight. Weeds were not injurious to any extent; the damage was less than usual. The pastures were very short, and much of them burnt up; the growth was not an average quality, where there was growth it was good. The stock throve remarkably well, considering the shortness of grass; but many were taken off the pastures very lean for want of grass, and some had to be fed on the grass for want; and were free from disease, except one or two cases of pleuro and some cases of sheep scab. The quality of the clip of wool was good, about an average.

Forfarshire.—Wheat, 36 bushels; seed sown about $3\frac{1}{2}$ bushels; straw about an average. Barley, about 5 quarters; straw, very deficient in quantity but good in quality along by the railway side, but on getting towards the mountains, crops were all very good. Oats, about 4 quarters in this neighbourhood, but like the barley on nearing the mountains were very good, and it would be very difficult to say what the average might be; straw about half crop in this neighbourhood, but good in quality. The harvest of 1887 was about one month earlier. The quantity of hay would be about 1 ton 10 cwt., and was got very good. No meadow hay in this neighbourhood. Potato crop would average about 8 tons—about 30 cwt. over last year; no disease; no new varieties planted to any extent. Turnip crop about same as last year; weight of crop about 22 tons; the braird was very irregular as the ground was very dry, and some of the heavier fields had to be sown two or three times. No injury by insects or weeds. Pastures were very short, and some fields was completely burned up, and water in several places was very difficult to get. Stock throve fairly well, and were comparatively free from disease, with the exception of some outbreaks of pleuro. The quality of wool clip was good, and would be a full average.

Aberdeenshire (District of Buchan).—Wheat not grown. Barley and bere a good crop; the yield exceeds that of last year by about 4 bushels, with straw in proportion; the weight a little over that of last year; about 44 bushels would be an average; quantity sown, from 3 to $4\frac{1}{4}$ bushels. Oats are considerably above the average in quantity, both of straw and grain, and when secured, unless in some early parts, in fairly good condition; the quantity is about 42 bushels; the weight from 40 to 42 lbs., and the price is about the lowest on record for a number of years; about 6 bushels sown. Harvest commenced about the last week of August, being a fortnight earlier than last year. Hay crop good, better than last year, and well secured; the quantity would be about $1\frac{3}{4}$ tons on good land. Meadow hay not much grown in this district. Potatoes only a fair crop, but of good quality; free from disease; not much grown, principally for home use; the yield would be about from 5 to 6 tons. The turnip crop is better than that of last year, good as it was; it is seldom such a superior crop of turnips is obtained. The swedes are not so large, but close and equal; the different varieties of yellow have been a splendid crop, and an extra heavy one; the average will be about 25 tons; very little resowing was required. No injury was done to the crops by insects this season. The land was pretty well cleaned, and the crops fairly free from weeds. The pastures during the season stood out well as to growth, and afforded a nutritious bite, and stock improved very much upon them. Cattle and sheep did remarkably well on the grass, and were almost free from infectious disease. The clip of wool was scarcely equal in quantity to that of last year.

Aberdeenshire (District of Formartine).—Wheat not grown to any extent in this district. Barley and bere much cultivated; this crop started with much promise, and up to the first of June it was uncommonly vigorous; the long spell of dry weather in June and July completely altered the prospect, the growth of the stalk being checked on all but the heavy moist-retaining soils. Along the seaboard, north of Aberdeen, this crop is about an average crop, but on thin, gravelly, and retentive soils it is under an average, especially in straw; the quantity will be under last year; 34 bushels; and the weight exceeds last year by 2 lbs. per bushel; 54 to 56 lbs. per bushel; quantity sown, 4 bushels barley, and 3 bushels bere. Oats after lea are the best crop, and as a rule turned out best, although there are exceptions. Oats after turnips are the worst that have been seen in this district for years; the effects of the drought told on this crop, being very short in straw; the long tract of dry weather came to an end after the oat crop was about half cut, and frequent heavy showers, followed by mild muggy weather, then prevailed; dry winds were altogether wanting, and a good deal of the crop was carried to the stack-yard in middling condition; a third of this crop in this district may be described as fairly good, another third as very middling, and the other third as very bad; the gross yield being below average, especially as regards fodder; quantity, 30 to 38 bushels, and the weight 42 lbs. to 45 lbs. per bushel; quantity sown, 6 bushels. Harvest commenced last year on 16th September, this year on the 9th of August. The hay crop was deficient to the extent of a third, in consequence of the drought; it was, however, secured in first class order; weight about 1 ton. No meadow hay. Potatoes at one time were not expected to be a very prolific crop; fortunately, the rain came in time to save them; the mild forcing weather that followed the breaking up of the drought, and lasted till the close of the autumn, stimulated a rapid growth among the tubers, which continued till unusually late in the season; as a consequence, the crop all over is a very satisfactory one, and the quality excellent; about 6 to 7 tons, and not a larger proportion of small than usual. The turnip crop is uniformly good; there are some failures on stiff clay land. The Swedish are not so large, owing to the drought, but are very close crop, which gives the weight per acre; the yellow variety is also a good crop; the weight of the swedes 20 to 23 tons—the yellows about 19 to 20 tons. No damage to any of the crop this year by insects. The crops were free from weeds, and the land well cleaned. The pasture season was of short duration, owing to the dry season, and there was a great scarcity of pasture grass until the autumn, when the rain came, it then got freshened up, but never was abundant. Cattle and sheep only did middling on the pastures; the cattle had to be housed earlier than usual, and supplied with tares or green oats and cake, until the turnips were ready for use, or sold at a heavy loss. Cattle and sheep have both been free from all infectious diseases; no cases of pleuro-pneumonia or sheep-scab have been in this district. The clip of wool was above an average in quantity and quality.

Aberdeenshire (District of Garioch).—No wheat grown. The yield of barley is similar to that of last year, both in grain and straw; the average weight of the grain would be 54 lbs., and quantity 38 bushels; 4 and $4\frac{1}{2}$ bushels are generally allowed for seed. The oat crop, although short in straw, is yielding well to the bulk; but not equal to the quantity per acre of last year, the straw being much longer, and capable of carrying a larger head; the grain is particularly good, well harvested, and weighs generally 43 lbs., and showing an out-turn of 38 bushels; the quantity allowed for seed is 6 bushels. Harvest was commenced about the 19th of August, or about a week earlier than usual. The quantity and quality of the hay crop would be similar to last year, both as regards ryegrass and clover, and the yield would be equal to $1\frac{1}{2}$ tons. No meadow hay grown. The yield of the potato crop would also be similar to that of last year, both as regards quantity and quality, which may be stated at 6 tons; there was no disease, and no new variety was cultivated to any extent—the Champion sorts take the precedence of all others. The Garioch Turnip-Growing Association report a superior crop of turnips, and free from disease; only on two or three different occasions for the last twenty-eight years have the same weight been exceeded, and doubtless a similar result must be recorded for the district, which may be put down at 21 tons; and no second sowing required. No loss was sustained by insects, and no loss by weeds. The pastures during the season were less than average growth, owing to excessive drought and heat; but the stock throve well, which is usual in a dry season; and disease of all kinds reduced to a minimum. The quantity of the clip of wool was an average.

Aberdeenshire (District of Strathbogie).—There is no wheat grown in this district. The barley crop was good, but the grain was in several cases discoloured, owing to the harry warm weather during the first week of harvest; the quantity of grain would be about 40 bushels, and the weight would vary from 54 to 56 lbs.; owing to the early part of the grain growing season being unusually dry, the oat crop was generally short of straw; when straw is short it follows that the ear is also short, and the return of grain deficient; the return of grain would be about 42 bushels, where the crop was fair; of course there were many instances where the crop was short, that the yield would not be even half that quantity; the quality of the grain is good, and the average weight would be about 42 lbs. The harvest began about the end of the first week of September, or nearly three weeks before the commencement of harvest of 1886; except during the first week, the weather was good, and rapid progress was made with the cutting down and stacking the crop. Owing to the drought, the hay crop was rather poor, but it was well mixed with clover, and cured and stacked in good condition; the quantity might be close upon 1 ton. There is no meadow hay in the district. Potatoes would have yielded 6 tons; the quantity is remarkably good, and the roots are perfectly sound, being quite free of disease. The turnip crop has matured to be a good full one, and the weight would be 18 to 20 tons; the crop brairded well where the soil was at all free of clay, but where the clay soil was, brairding was very slow and unsatisfactory; resowing had to be resorted to in only two instances—the fields were both stiff clay; brairding was remarkably slow, but after all, when the rains came, the plants came forward fast, and on the whole the crop is better than could have been looked for. None of the crops were in any way damaged by insects. None of the crops suffered any serious damage from weeds. The pastures were very good during the early part of the grazing season; but after the excessive drought set in, the fields got very parched and dry, and as a consequence, grass soon got scarce, and cattle did little good upon the pastures; the herds and flocks have been unusually free of disease. The wool clip would be over an average.

BANFFSHIRE (Lower District).—Wheat, none sown. Barley, 40 bushels; less straw than last year. Oats, 44 bushels; one-third less straw than last year Harvest fifteen days earlier than previous year. Hay, 14 cwts.; meadow hay, none. Potatoes, 3 tons; no disease; chiefly Champions. Turnips—yellow, 14 tons; swedes, 16 tons; all were most promising until the long-continued drought began; the swedes recovered in a great measure from the effects of it, but the yellows became mildewed and stunted. No injury by insects or weeds. Pastures much less abundant from the long drought. Stock made comparatively little progress on the grass during the season. Cattle and sheep free from disease; few sheep kept. Wool clip, average quantity.

BANFFSHIRE AND MORAYSHIRE (Upper District).—Wheat, grain and straw both a full crop and good quality, but slightly discoloured by rain in harvest; quantity about $4\frac{1}{2}$ quarters. Banffshire—no wheat grown; 4 bushels seed. Barley, full crop of good grain, but colour darkened by rain, affecting value possibly about 4s. per quarter on the average in Morayshire; quantity, 36 bushels in Morayshire, and 40 in Banff; Banff, 4 bushels seed; Moray, 3 bushels or thereby. Oats, light crop both grain and straw in Morayshire; full crop in Banffshire; relative quantities, 30 and 38 bushels; in neither case was the berry of the grain so well developed as usual, and in both counties the colour was darkened; Moray, 5 bushels seed; Banff, 6 bushels seed. Harvest about fourteen days earlier than ordinary. Grasses fairly mixed on good land, but deficient of clover on light soils; average weight about 1 ton. No meadow hay in either district. Potatoes full crop, and free from disease; about 5 tons of dressed potatoes. Turnips fair crop in Morayshire; full crop in Banffshire—say 16 and 20 tons respectively; brairding deficient on stiff land, but this in most cases was owing to neglect. No injury by insects, and none by weeds. Pastures good in the early summer, but deficient in August, after which they recovered and continued good through the autumn. Stock throve well, and were free from disease. Clip of wool average.

Morayshire (Lower District).—Wheat was the best of the grain crops in Morayshire, both as to quantity and quality; the winter was favourable to it, and it was well forward when the great drought began in the month of June, and stood it well; the quantity would average 5 quarters; the quality was very good, with fully an average quantity of straw; the dry weather was favourable to the crop; seed used, 3 to 4 bushels. Barley was a very light crop, except on heavy damp land; it would be 1 quarter below the average all over the county; the extremely dry weather came too early for the crop; on the lighter soils a portion did not fully come out of the short blade; the quality was good, but the colour very much injured by the wet weather during harvest; straw very short, and quantity about $3\frac{1}{2}$ quarters; weight good; seed used, 3 to 4 bushels. Oats were a very light crop, dry weather being very unfavourable to the growth of oats; straw was very short in general, except on heavy soils; the quantity of grain would be 1 quarter below the average, varying from 2 quarters to 6 quarters according to soil; the bulk of straw deficient by one-third of average, and a good deal injured by wet weather; seed used from 3 to $4\frac{1}{2}$ bushels. Harvest began about two weeks before the usual time. There was a great deal of rain fell, which made the work rather tedious, injuring considerably the quality of both grain and straw. The hay crop as to quality was unusually good, the drought being favourable for harvesting; the crop came well forward in the early part of the season, and on good land would be an average and from 1 to $2\frac{1}{2}$ tons. Little or no meadow hay. Except on very light soils, the potato crop was fully an average, the quality was very good; there was no disease; and the quantity would be from 4 to 6 tons; no new varieties in particular. The turnip crop was rather under the average; the dry weather injured the crops considerably, ripening the crops prematurely; there was a good deal of canker among the common varieties, especially globes; the quality of swedes is good, but yellows very inferior; weight from 12 to 20 tons; no second sowing. No particular injury from insects, with the exception of some patches of turnips from green fly. No unusual damage from weeds, the dry season being unfavourable to the growth of weeds. The pastures were unusually rich and full till about the beginning of July, when the extreme heat and want of moisture burned them up fearfully, making keep very scarce. Stock throve very well, so long as keep was abundant, but rather fell off afterwards; there was no special disease, stock being very healthy. The clip of wool was an average, both as to quantity and quality.

Nairnshire.—Wheat, none. Barley, 10 to 12 bushels less than last year; straw nearly one half less; 4 bushels sown. Oats, 6 to 8 bushels less; straw nearly one half less; 5 to 6 bushels sown. Harvest ten days earlier. Hay crop light. No meadow hay. Potatoes, earlier sorts rather poor crop; later sorts an average; no disease. Turnips, weight of crop fully over last year; brairded well; only once sown. No injury by insects or weeds. Pastures much affected by early drought. Stock throve fairly well, and were free from disease.

Inverness-shire (District of Inverness).—Wheat, about 34 bushels; quality of grain and straw alike good, but the latter was short compared with former years; from 3 to 4 bushels of seed is generally sown. The return of barley was very much less on most farms than anticipated from the appearance of the growing crop, but the grain was well-matured and early ripened, and consequently generally of heavy weights, but the dull and showery weather experienced during the end of harvest discoloured the grain, which affected prices; quantity usually sown from 3 to 4 bushels; the average yield on the best land from 26 to 40 bushels. The yield of oats was fair upon well-farmed lands, but disappointing upon light sandy and ill-conditioned soils; the quality of straw was good, but small in quantity; from 24 to 40 quarters on good land, but on light land some 16 to 20 bushels would be an average return; from 4 to 5 bushels are usually sown. Harvest began somewhat earlier than usual, but it was interrupted by inclement weather, and much delayed upon the higher altitudes. The hay crop was lighter than last year's crop, but the quality was good; about 1½ (30 cwt.) would be a full average in the district. No meadow hay grown. The potato crop was a very good one, some fields having yielded about 8 and 10 tons; while the average would be about 7 tons; there was no disease; some new varieties have been grown with promising results. The turnip crop was an average one, some fields of from 25 to 30 tons, being not uncommon upon the best farms; while 18 to 22 tons would be grown upon lighter farms, if well manured; the braird comes all right, but second sowing had to be resorted to upon some sandy soils, in consequence of high winds after sowing. Less than usual damage by insects. Charlock was pretty common, as it always is in dry seasons. Pastures were drier than usual, but the quality was equal to 1886. Stock throve very well. Cattle and sheep have been free from disease since spring, but considerable loss was experienced through the introduction of pleuro from the south among several dairy stocks around Inverness. The clip of wool was an average one, and the quality fair.

INVERNESS-SHIRE (District of Beauly).—Wheat, none. Barley, 26 bushels of ordinary quality; quantity of straw below last year; and quality of grain and straw inferior. Oats, 32 bushels, or about 8 bushels less than last year; straw one-third less, and inferior quality. Harvest about the same date as 1885, or fourteen days earlier than 1886. Hay much about the same as last year; for quantity and quality say 1 ton 2 cwt. Meadow hay none. Potatoes, about 7 tons as compared with 6 tons last year; the quality very superior, and no disease. Turnip crop much about last season's—weight and quality say 18 tons; brairded very even on friable soils; but second and third sowing was resorted to on stiff clay soil. No injury by insects or weeds. Pastures, good land well watered, fair average, and stock did well, but light land on gravel subsoil was burnt, and next to useless, and stock did no good until autumn. Cattle and sheep free from disease. Clip of wool quality only fair, and light in quantity.

INVERNESS-SHIRE (Skye).—Wheat, none grown. Barley, none. Oats are far in advance of last year's crop, and will give a third more meal. The harvest started two weeks earlier. Hay, the quantity much the same as former season, but quality better. Meadow hay about the same as last year. The potato crop has been exceptionally good, as to quantity and quality, and free of disease; the yield would be about a third more; some fresh seed is imported, which is of great benefit to the people. The turnip crop was about the same as last year; the crop brairded well, and did not require a second sowing. No damage done by insects. The damage from weeds was not worse than usual. The pastures were much better than last year. Stock has been doing well all the season, and perfectly free from all diseases. The clip of wool has been very good, and fully above an average as to quality.

INVERNESS-SHIRE (Lochaber).—Wheat, none grown. Barley, scarcely any grown. Oats, as compared with 1886, about 6 bushels to acre more grain;

straw about same as last year; in this naturally humid district the crops did not suffer much from the long drought, elsewhere so general and severe. Harvest early—commenced about a fortnight before average time. Hay, quantity about equal to 1886, quality better. Meadow hay more productive, and well saved. Potato yield about same as in 1886; about one-tenth diseased of early sorts; no new varieties. Turnip crop rather inferior; would be about 6 tons under average; weight probably 16 to 20 tons; no second sowing required. No injury by insects, and none by weeds. Pastures, growth and quality below average. Stock did well, and were free from disease. Clip of wool over average, and quality excellent.

Ross-shire (Western District).—Wheat, none. Barley, little or none. Oats, 22 bushels of grain; quality good; seed sown, 6 bushels. Harvest about the usual time. Hay crop about 13 cwt.; quality good. Meadow hay less about one-fourth. Potatoes, yield about 8 tons; very little disease, and quality good; where Magnum Bonums have been planted the results were good. Turnips, weight about 14 tons; quality good in general; brairded well, and only one sowing required. In some localities finger-and-toe appeared in turnip crop. Not to any great extent damaged by weeds. Pastures of average growth and quality with last year. Stock throve well, and were free from disease. Clip of wool about an average, and quality good.

Ayrshire.—Wheat, an abundant crop; a comparatively small extent is now grown in Ayrshire, and of course it is sown on suitable land; on some farms the average returns have been very high; over all the yield may be put at 44 to 48 bushels per acre; weight of straw $1\frac{1}{2}$ to 2 tons; about 3 bushels seed used in broadcast sowing. Barley better than crop of 1886 by from 6 to 8 bushels; from 42 to 44 bushels was a very general crop; straw bulkier than in previous year—say $1\frac{1}{2}$ to $1\frac{3}{4}$ tons. Oats, crop small on light early lands; but good on heavier inland soils, and very superior in upland districts; over all, the estimate may be 48 to 52 bushels. Reaping was begun from ten to fourteen days earlier than in 1886. Hay a fair crop in the lower and middle districts, and superior in the uplands; about 30 cwt.; not much clover. Meadow hay mostly grown in the uplands, very good and fine. Potatoes, the early crops yielded rather better than in 1886, and crops that grew till August gave good returns; disease appeared on heavy inland soils after the middle of September, and took nearly one-fourth of Regents; little disease, and big crops on open land. Turnips brairded well, and became a fine crop throughout Ayrshire; estimates 25 to 30 tons. Some complaint of Hessian fly in Girvan district; little loss from insects in other parts of the county. Charlock injurious on light lands. Fair growth of grass in lower and middle districts; abundant in the uplands. Stock did well, especially on upland pastures, and on the whole were free from disease. Clip of wool good quality, and over average.

Ross-shire (Districts of Dingwall and Munlochy).—Wheat, breadth grown larger than last season; quality of grain good, quantity average; quantity of straw 20 per cent. below average; quality good; quantity of grain, 32 bushels; seed, 3 to 4 bushels. Barley, quality of grain good; colour spoiled by showery weather during harvest; quantity of grain and straw very much less, particularly on light soils, owing to severe drought; quantity of grain, 34 bushels; seed, $3\frac{1}{2}$ to 4 bushels. Oats, a very light crop; April was a cold month, and drought afterwards was severe; quality of grain fair; only straw 50 per cent. below average quantity; grain about 30 bushels; seed, $3\frac{1}{2}$ to 5 bushels. Harvest began on 8th August, about ten days earlier than usual. The weather was rainy and broken. Hay was secured in fine order; quality not so fine; crop was light—not over 1 ton. No meadow hay. Potatoes, yield about average—say 7 tons, quality fine; very little disease. Turnips are variable; some fields fine, some very light; brairded irregularly, owing to the drought; not very much second sowing; average weight, 15 tons. Damage by insects not more than usual. Hessian fly showed in most fields of barley and wheat, but has not affected samples of grain. No injury by weeds. Pastures were of stunted growth all season, chiefly owing to very dry weather, which lasted from 1st June till 10th August. Stock throve well; were free from disease. Clip of wool very much of an average. The drought was general over all the district.

Ross-shire (Tain, Cromarty, and Invergordon Districts).—Wheat, 32 bushels; quality not quite so good; straw shorter. Barley, 28 bushels; quality not nearly so good; straw very short. Oats, 32 bushels; very irregular; straw exceedingly short. Harvest ten to fourteen days earlier. Hay one-third less; quality good; not quite 1 ton. Meadow hay, none grown. Potatoes better—about 8 tons; no disease; one or two new varieties, but not enough of them to justify giving an opinion. Turnips, about 18 tons swedes, 14 tons yellows; brairded very well; only one sowing; quality as good as last year, but not quantity. Crops injured very slightly; a little Hessian fly. Crops injured by weeds greatly; couch greater, owing to drought. Pastures not average growth; quite average quality. Stock throve well. Perfectly free from disease in cattle; a considerable death in sheep, after being put on turnips. Clip of wool, average.

Sutherlandshire.—Wheat, none grown. Barley, about 4 bushels less than last year, caused by the dry weather in June and July; the straw bulks about one-third less. Oats similar to barley. Harvest about ten days earlier than usual, and in some districts two weeks earlier. The hay crop was of fair quality, both as regards ryegrass and clover; the quantity was below the average, and not better than last year. Meadow hay same as above. Potatoes are not grown for the market; the crop was good, except where destroyed by early frosts. The turnip crop brairded well, and there was very little second sowing required; it is a heavier crop than last year, and quite out of proportion to the amount of shaw. No injury by insects, unless in very exceptional cases. In some places turnips got choked with weeds, when heavy rains came on early in August; this, however, was not general, and only applies to late sown fields. Less grass, owing to dry weather; hill pastures were good. Cattle did not improve rapidly; sheep on hill farms throve well. Cattle and sheep free from disease. A good clip of wool; weighed better than last year, and rather above the average.

Caithness-shire.—Wheat, none grown in the county. Barley is little grown, the hardier variety "bere" being more reliable; of this the crop is good; weight fully 1 lb. per bushel over last year; produce, 36 bushels; seed sown, 4 bushels. Oats a very good crop, especially on the better lands; the produce 36 bushels, or perhaps 2 bushels more, and the weight 1 lb. per bushel over the previous crop; straw also abundant, at least 15 per cent. over average; thrashes well to bulk, and proportion of light corn less than last year. The harvest up to the end of July promised to be unusually early, but August was generally cloudy, without much sun; harvest, however, was begun about the usual time, and was an extremely favourable one throughout. Hay rather a light crop, mostly from want of clover; weight about 1 ton. Meadow hay, not much grown. Potatoes a remarkably good crop, and quality excellent, being only grown for home use in the county; weight per acre not ascertained, but an equally good crop has seldom been grown in the county. Turnips not so good a crop as last year; the plant came away well, but finger-and-toe began to appear in many cases, and later in the season dry-rot prevailed to a considerable extent; the weight on an average will not probably exceed 15 tons. No special injury by insects; very little damage done by the oat grub. Weeds seemed to do less harm than usual. Pastures were generally good during the season. Live stock throve very fairly during the season, and better than usual towards the autumn, probably owing to fine weather; the county has been entirely free from disease. The clip of wool was an average in quantity and quality; there was nothing in any way specially to affect it. Generally the season was an extremely favourable one in the county; there was enough of moisture for the crops, and not too much at any time; in many cases the crops of grain were unusually good, but the thin and inferior lands reduce the average; had it not been that the weather of August retarded the ripening of these crops, harvest would have been unusually early.

Orkney.—Wheat, none. Barley, seed $3\frac{1}{2}$ to $4\frac{1}{2}$ bushels; barley is a much better crop than last year, and none shaken; about 50 per cent. better than than last year, when a good deal was shaken. Bere is principally grown in Orkney, and the average quantity of it this year is about 36 bushels, of 49 lbs.; last year the average was about 24 bushels of 47 lbs. Oats, seed 4 to 6 bushels; last year a good deal was shaken, and also heated in the stack; this year there was little or none shaken or heated; the average per acre this year, 32 bushels, 39 lbs.—last year, 24 bushels, 37 lbs.; straw, more bulk and better quality than last year. The harvest began about usual time, but two weeks earlier than last year. The hay crop was rather lighter this year than last, owing to the dry weather; the average quantity this year, 1 ton 5 cwt.—last year, 1 ton 10 cwt. Meadow hay crop, only a little coarse stuff grown here. The potato crop was heavier this year than last; but there was a good deal of disease, especially among the earlier varieties; Champions withstood the disease best; the disease commenced a few weeks before the potatoes were lifted; the average yield this year, 5 tons—last year, 6 tons. The turnip crop brairded well; with the exception of the last sown, which lay dry in the ground for three weeks, when heavy rains caused it to braird; very little second sowing was necessary; the crop is a good deal diseased this year, which is the cause of the reduction in weight, as compared with last year; the average weight this year, $8\frac{1}{2}$ tons—last year, 10 tons. The crops were not injured by insects; the crops were less injured by weeds than usual, owing to dry sunny weather. Pastures were much better than last year. Stock throve well; cattle and sheep were free from disease. The clip of wool was a good average, and about 1 lb. per sheep more than last year.

Shetland (District of Lerwick).—Wheat, none grown. Barley, quantity and quality better than last year. Oats about equal to last year. Harvest about the usual time. Ryegrass and clover rather better in quantity and quality than last year. Meadow hay not so good as last year. Potatoes rather larger crop, and sound. Turnip crop better than last year; only one sowing. No damage by insects; damage less than usual by weeds. Pasturage, a good average—better than last year. Stock throve very fairly, and were free from disease. Clip of wool, quality good, and about an average.

THE METEOROLOGY OF 1887.

The following Table gives a comparison of the prevalence of winds during 1887 with the averages of previous years, from which it is seen that E., S.E., S., and S.W. were 30 days fewer, and W., N.W., N., and N.E. winds 27 days more than usual, and calms 3 days more than usual. The wind force, though above the average, was considerably stronger than in 1886.

Table showing for Wind Direction and Force, and for Sunshine, the excess above, or the defect from, the averages of previous years:—

	Direction of Wind—Days.								Calm or Var.	Force.	Hours of Sunshine.
	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.		Lbs.p.sq.ft.	
January, .	−1	−1	0	−1	0	+3	+1	−1	0	+0·72	−13
February, .	0	−1	0	−1	0	+2	+1	−1	0	+0·26	+4
March, . .	+1	−1	−1	0	−1	0	0	0	+2	−0·29	+8
April, . .	+2	0	−2	−2	−1	0	+2	+1	0	+0·24	−2
May, . . .	+1	0	0	−1	−1	−1	+1	+1	0	+0·48	0
June, . .	−1	+1	0	−1	0	−1	+1	0	+1	+0·02	+19
July, . . .	0	−1	−2	−1	−1	+2	+3	0	0	+0·34	−4
August, . .	+1	0	0	−1	0	−1	0	+1	0	−0·08	+3
September,	+2	+1	+2	−2	−1	−3	0	0	+1	+0·17	−17
October, .	+4	+1	−2	−2	−3	−1	+2	+2	−1	+0·47	+2
November, .	0	+2	+1	−1	0	0	−1	−1	0	+0·30	−35
December, .	+2	0	0	−2	−1	−2	+1	+2	0	+0·12	−11
Year, . . .	+11	+1	−4	−15	−9	−2	+11	+4	+3	+0·23	−46

Accompanying this rather unusual deficiency of southerly and easterly winds there was, taking Scotland as a whole, a marked deficiency in the rainfall throughout the year, the means of each month being under the averages of previous years, except in September, when it was slightly above it. So widespread was this low rainfall, that nowhere in the United Kingdom was the average reached. In several districts in the south-east of Ireland, and the south-west of Scotland, the deficiency exceeded 40 per cent., and over very large portions of Great Britain and Ireland not more than two-thirds of the average amounts of rain were collected. On the other hand, in the extreme north and north-west of these islands, the average rainfall was nearly reached. The obvious result of this state of things was a threatened water famine in many parts of the country, and much loss was sustained by the agricultural interest.

During 1886 the sunshine was 199 under the average, but in 1887 only 46 hours. As regards, however, the growing months of the year, from April to October, the contrast these years offer was much more striking. Thus, while in 1886 there was a deficiency during these seven months of 140 hours of sunshine, in 1887 the sunshine slightly exceeded the average.

The temperature of the year was about, and in some districts slightly above, the average over a rather broadish tract extending in a south-westerly direction from Buchanness to the Mull of Kintyre. To the north of this temperatures steadily fell from the averages till in Shetland the deficiency was about a degree; and to the south temperatures also fell, but to a much greater degree, below the average over England and Ireland. In central and south-eastern Ireland the deficiency was a degree and a half; and in England, south of the Trent, the deficiency over large breadths amounted to two degrees and a half.

JANUARY.—The mean temperature of the month was 37°·5 or half a degree above the mean, the excess being chiefly occasioned by the relatively milder nights. To the north of the Forth and Clyde, temperature was everywhere above the average, the excess, particularly in inland districts, rising to 1°·5 and 2°·0; whereas in the south, temperature was under the average, the deficiency on the Solway coasts amounting to, or even exceeding, 1°·5. Thus Dunrobin, on the Moray Firth, was 3°·7 relatively warmer than Wolfelee on the Cheviot Hills.

The rainfall was 3·25 inches, being 0·81 inch less than the average. Its distribution was very unequal. In Skye, the Long Island, Orkney, and Shetland, it was generally from a fourth to a third above the average. On the other hand, in the east, from Cromarty to the Grampians, and over the whole of Scotland south of the Grampians, it was under the average, the deficiency being greatest from Inverness to the Spey, and from the Tay to the Cheviots. At Stobo, the defect from the average was 71 per cent.; at Leith, 64; at North Esk Reservoir, 63; and at Culloden, 62.

FEBRUARY.—The mean temperature was 39°·7, or 1°·3 above the average, the days being 2°·0 and the nights 0°·6 warmer than usual. Except the district in the south marked off by a line passing from Wolfelee round by Drumlanrig, Glenlee, and Dumfries, where the means were about half a degree under the average, temperatures were everywhere in excess of the mean, the greatest excess being at stations near the Grampians, where it amounted to 3°·6. This high temperature was continued northward through Orkney and Shetland. The lower temperatures which ruled in Galloway were continued southward, and in the Isle of Wight the month was 2°·0 under the average.

The rainfall was 2·46 inches, or a fourth of an inch under the average. Over that part of Scotland marked off by a line passing from West Perthshire to Inverness, then to Stornoway, and thence to Oban, the rainfall was above the average, in several cases amounting to a third more; but over the rest of the country the rainfall was markedly deficient. Over a wide district not more than a fourth of the average of the month was collected.

MARCH.—The mean temperature was 38°·6, being a degree less than the average, the deficiency being wholly occasioned by the colder nights. This increased cold was accompanied by 10 per cent. less cloud than the average of March and eight hours' more sunshine. The temperature of this month had a singular distribution. Over the extreme western districts, from the Mull of Kintyre northwards, and to the north of a line passing through the north of Skye, Inverness, and Aberdeen, temperature was above the average, the excess in Orkney and Shetland exceeding a degree. Elsewhere, however, temperatures were under the average, the greatest deficiency being in the extreme south, where it fully exceeded 2°·0. This diminution of temperature increased southward through England; in London temperature was 4°·0 under the average.

The rainfall was 1·88 inch, or nearly an inch less than the average. Except in a few isolated points in the south-eastern counties and in Aberdeen, the rainfall was everywhere under the average, the greatest deficiency, amounting in many places to upwards of 60 per cent., being in the central districts from the Solway to the Pentland Firth.

APRIL.—The mean temperature was 42°·3, or 2°·0 under the average, the days being 1°·2 and the nights 2°·9 colder than the means. This depression of temperature was accompanied by a higher atmospheric pressure in the west than in the same latitudes in the east, and a prevalence of easterly winds five days above the average of April. This defect of temperature was distributed over Scotland in an unusually equable manner, being however slightly greatest in the extreme south.

The rainfall was 2·05 inches, or 0·19 inch under the average. Its distribution over the country was very irregular. It was above the average in Ayrshire, in the extreme west from Islay northwards, to the north of Ross-shire, and on the south shore of the Moray Firth it was above the average. In the north of the Lews it was about the mean. In other districts it was under the average, the greatest deficiency, a half of the usual fall, being in the south-eastern counties, and in the inland parts of Galloway.

MAY.—The mean temperature was 48°·9, being the average of the month, the days, however, being half a degree warmer and the nights half a degree colder than usual. In no district did the temperature differ much from the mean, being however uniformly but slightly lower in the northern and southern districts, and generally higher in intermediate districts, from the Grampians to the Lammermoor and Leadhill ranges.

The rainfall was 1·39 inch, or 0·91 inch under the average. Over a broad belt, stretching from Berwickshire in a west-south-west direction to Ayrshire, it was slightly above the average, but everywhere else below it, the deficiency from the mean being at least 80 per cent. at Stronvar, Ochtertyre, Inverness, and Lairg.

JUNE.—The mean temperature was 57°·6, or 2°·8 above the average, the days being 4°·6 and the nights 1°·1 warmer than usual. Since the Scottish Meteorological Society was founded this is the warmest June recorded, except the June of 1858, whose mean temperature was 58°·9. In June 1887, cloud was considerably under the mean, and sunshine 19 hours above it, and along with this dryness of the air the range of temperature for the month was unprecedented. In Orkney and Shetland temperature was under the average, the defect at North Unst being 1°·1; but everywhere else it was above the mean, the greatest excess, fully 4°·0, being over the district lying between the Caledonian Canal and Buchanness. An equally large excess of temperature appears to have been continued through Ireland from Donaghadee to Valencia; but, on the other hand, in London, Oxford, and Cambridge, the temperature was but little above the means of these towns.

The rainfall was 0·96 inch, or 1·62 inch under the average. It was everywhere less than the mean. In some places in the West Highlands, and in the western and northern outlying islands, the average was closely approximated to; but over extensive districts in the east and south, the deficiency exceeded 80 per cent.

From the middle to the end of the month there occurred a fortnight of perhaps as choice summer weather as any experienced during the present century in Scotland, characterised by strong sunshine and heat during the day and clear cool nights. On the 18th, a remarkable thunderstorm broke over the greater part of the central and northern districts, which in the great majority of cases was unattended by rain. At Lednethie, however, during the forty minutes ending 1·30 P.M. there fell 2·24 inches, the appearance of the rain when falling being like bright small streams falling straight down, resembling in this respect the heaviest rains of tropical regions.

JULY.—The mean temperature was 59°·3, or 1°·9 above the average, the days being 2°·6 and the nights 1°·1 above it; the high temperature being thus, as in the preceding month, occasioned chiefly by the strong sunshine that prevailed. In Shetland, temperature was nearly a degree under the average, but everywhere else above it; the greatest excess, fully 2°·0, being in the middle latitudes of Scotland, from Ardnamurchan to Montrose in the north, to the Mull of Kintyre and Berwick on the south. This higher temperature was associated with a deficiency of easterly, and an excess of southerly, winds: and a distribution of atmospheric pressure, diminishing much more rapidly than usual, from south-east to north-west.

The rainfall was 2·97 inches, which is but slightly above the July average. It was above the average from Wick round by the north and west coasts as far as Islay, and in South Ayrshire and the counties of Wigtown, Kirkcudbright, and Dumfries, the greatest excess above the average being 54 per cent. at Glenquoich and Wick, 40 at Cape Wrath, Kyleakin, and the Rhinns of Islay. In other parts of the country the rainfall was under the average, the greatest defect being 73 per cent. at the Mull of Kintyre, 54 at Campbeltown, 65 at Montrose, and upwards of 40 at Dundee, Fettercairn, Braemar, Logie Coldstone, Gordon Castle, and Lairg.

August.—The mean temperature was 56°·4, or 0°·4 less than the average, the days being 0°·8 warmer and the nights 1°·6 colder than usual. Thus the type of weather of the previous month, when the days were relatively much warmer than the nights, still held good, a point of no small moment to agriculture at this season of the year. At North Unst, temperature was 2°·6 and at stations on the Solway Firth 1°·5 below the average; but in the intermediate region higher temperatures ruled, and from Skye to Montrose on the north, to Islay and Berwick on the south, temperature varied from about the average to 0°·6 above it. It deserves to be particularly noted that this is now the fourth month, when higher temperatures prevailed over this part of Scotland than to the north and south of it, at this critical time of the year.

The rainfall was 2·72 inches, or 0·70 inch under the average. Except in a few widely-scattered districts in the counties of Sutherland, Ross, Inverness, Forfar, Lanark, and Edinburgh, the rainfall was everywhere under the average. The greatest excess above the mean was 31 per cent. at Scourie, and the greatest deficiency, about 60 per cent. or upwards, in the extreme south of Argyll and of Ayr, and in the counties of Wigtown, East Lothian, and towards the head of the Moray Firth.

September.—The mean temperature was 51° 5, or 1°·5 under the average, the deficiency being nearly equally distributed between the days and the nights. Everywhere the temperature was under the average, the defect being greatest in the extreme south, from Berwick to Wigtown, where it fully exceeded 2°·0.

The rainfall was 3·83 inches, or very slightly above the average. It was generally above the mean to the north of a line drawn from Aberdeen to the Butt of Lewis, and to the south of a line from Arbroath to the Mull of Kintyre, the greatest excess, about half more, being in the counties of Mid- and East-Lothians, Peebles, and Selkirk. In the intermediate districts of Scotland, the rainfall was less than the average, the amount being only about half the average towards the head of Loch Linnhe.

OCTOBER.—The mean temperature was 44°·1, or 2°·6 under the average, the days being 2°·0 and the nights 3°·1 colder than usual. This depression of temperature was attended with a remarkable prevalence of northerly winds, which was the inevitable result of the prevalence of a much higher atmospheric pressure at western than at eastern stations. At all Scottish stations temperature was unseasonably low, the greatest defect from the October averages, 3°·3, being in the extreme south-west. The low temperature was continued southward over the British Islands in even a greater degree, so that at Osborne it was 5°·5 under the average of October.

The rainfall was 2·39 inches, or 1·69 inch less than the mean. In a few scattered districts on the south of the Moray Firth, along the Minch, and in Orkney, the rainfall was above the average, but only slightly so; but elsewhere, particularly to the south of the Grampians, it was under it, where only about half the average was collected, and over great breadths in the counties of Forfar, Perth, Fife, Argyll, Arran, Ayr, Wigtown, and Dumfries, only a fourth of the average fell.

NOVEMBER.—The mean temperature was 39°·6, or 0°·9 under the average, the days being 1°·2 and the nights 0°·6 under it, the deficiency being pretty evenly distributed over the country.

The rainfall was 3·76 inches, being very nearly the average, but its distribution was very unequal. In the more strictly eastern districts it was above the mean, the amounts at several places in the south-eastern counties being fully double the average. On the other hand, in the south-west and to the north of the Grampians, it was little more than half the average.

DECEMBER.—The mean temperature was 36°·2, being 1°·8 under the average, the distribution being about equal between the days and the nights, the deficiency being on the whole, as in November, pretty evenly distributed over the country.

The rainfall was 3·30 inches, or 0·79 inch under the average.

The harvest of 1887 was an early one, being in some districts, such as parts of the counties of Forfar, Perth, and Stirling, where higher temperatures ruled, as stated above, from three to four weeks earlier than the harvest of 1886. On the other hand, in Shetland cutting was not commenced till the usual time.

The wheat crop was nearly everywhere above the average, and, owing to the high temperature, the quality was generally fine. Over considerable breadths barley was a good full average, but in many places it suffered from the drought, and was an inferior crop, particularly as regards the yield of straw. In one or two isolated districts the rains of autumn darkened the colour. Oats were, as regards quality, a good crop; but over large districts, particularly in the counties of Perth, Aberdeen, Moray, Inverness, and Sutherland, the crop suffered much, in some cases disastrously, from the severe drought.

Potatoes were everywhere a large, fine crop, except where the drought seriously damaged them; and the crop was almost in all districts free from disease. In almost all parts of the country turnips was an exceptionally large crop, the only exception being a few places where the drought appears to have been most severely felt.

AGRICULTURAL STATISTICS OF SCOTLAND.—RETURNED UPON 4TH JUNE 1887.—(*Extracted from the Government Returns.*)

TABLE No. 1.—TOTAL ACREAGE UNDER EACH KIND OF CROP, BARE FALLOW, AND GRASS, IN EACH COUNTY OF SCOTLAND.

COUNTIES.	Total Acreage under Crops, Bare Fallow, and Grass.	CORN CROPS.							GREEN CROPS.							Clover, Sanfoin, and Grasses under Rotation.	Permanent Pasture (exclusive of Mountain Land).	Flax.	Bare Fallow or Uncropped Arable Land.
		Wheat.	Barley or Bere.	Oats.	Rye.	Beans.	Peas.	Total.	Potatoes.	Turnips.	Mangold.	Carrots.	Cabbage, Kohl-Rabi, and Rape.	Vetches, &c.	Total.				
	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
1. Aberdeen	612,724	6	14,840	198,663	446	315	372	214,642	8,413	90,396	3	71	74	2,778	101,735	266,977	28,744	111	515
2. Argyll	128,258	2	1,748	19,613	417	189	6	21,975	6,085	5,436	47	38	118	57	11,781	25,261	68,668	...	573
3. Ayr	316,838	1,883	1,595	51,773	252	980	4	56,487	8,033	7,474	524	398	341	156	16,926	136,138	107,059	...	228
4. Banff	173,002	153	7,011	56,915	214	150	48	64,494	2,571	24,884	3	10	9	1,074	28,551	67,877	11,887	8	185
5. Berwick	197,005	3,512	17,112	38,079	80	1,822	170	60,775	2,418	28,614	116	3	431	1,256	32,838	60,923	42,286	1	182
6. Bute	25,169	...	50	5,317	46	80	11	5,504	1,048	1,416	8	4	13	97	2,586	6,725	10,113	...	241
7. Caithness	107,805	5	1,104	34,274	83	1	38	35,505	1,779	14,087	...	...	50	476	16,392	29,465	25,973	...	470
8. Clackmannan	15,803	236	596	3,744	...	687	8	5,271	295	929	10	1	42	55	1,332	4,296	4,630	...	274
9. Dumbarton	47,611	627	251	7,558	32	164	1	8,633	2,288	1,499	21	7	116	114	4,045	16,695	18,151	8	79
10. Dumfries	242,450	27	604	48,966	31	54	15	49,697	4,731	19,918	50	39	439	237	25,414	69,481	97,665	...	193
11. Edinburgh	139,037	3,456	6,837	24,685	8	491	77	35,554	5,458	11,855	38	20	511	1,137	19,019	36,166	48,132	1	165
12. Elgin	102,478	2,049	12,068	23,925	997	77	14	39,130	2,103	16,494	7	7	9	464	19,084	38,891	5,298	2	73
13. Fife	252,470	9,438	23,789	42,436	1580	1,683	22	78,948	15,933	26,615	9	21	118	1,120	43,816	69,818	57,934	477	1,477
14. Forfar	254,309	7,929	26,480	54,778	637	814	50	90,688	14,944	33,642	17	56	101	958	49,718	86,527	26,917	119	340
15. Haddington	117,321	6,785	14,062	17,935	23	1,854	80	40,739	7,378	15,788	58	149	372	638	24,383	31,746	20,122	8	323
16. Inverness	150,417	2	7,484	32,129	829	2	79	40,525	7,602	11,510	3	3	27	206	19,351	30,502	59,098	1	940
17. Kincardine	122,702	620	10,323	32,714	114	636	43	44,450	3,463	17,971	25	34	17	652	22,162	46,315	9,545	15	215
18. Kinross	32,316	8	419	5,871	63	10	...	6,371	636	2,558	...	2	67	48	3,311	10,491	12,140	3	...
19. Kirkcudbright	186,609	92	79	30,917	22	127	6	31,243	2,082	13,775	40	45	517	69	16,528	71,994	66,451	1	392
20. Lanark	255,305	1,617	416	43,586	87	1,138	24	46,868	5,509	9,377	27	55	911	836	16,715	105,118	86,128	1	475
21. Linlithgow	59,369	850	2,784	11,106	12	678	5	15,435	1,745	4,035	8	2	99	366	6,255	19,130	18,298	2	249
22. Nairn	25,886	1	2,733	6,193	230	...	5	9,162	411	4,183	...	...	1	43	4,638	9,800	2,255	8	23
23. Orkney	113,699	...	5,397	32,925	130	...	31	38,483	3,074	14,405	7	1	71	315	17,873	32,283	24,006	1	1,053
24. Shetland	58,641	...	2,108	7,965	...	...	...	10,073	3,300	1,375	...	...	387	...	5,062	1,084	41,707	...	715
25. Peebles	42,714	3	386	9,498	...	1	7	9,895	503	4,701	...	...	291	125	5,620	12,438	14,746	...	15
26. Perth	347,723	5,131	15,147	74,275	399	2,686	67	97,705	15,920	30,592	13	25	188	984	47,722	111,227	88,953	114	2,002
27. Renfrew	95,702	1,500	204	13,637	12	433	14	15,800	3,490	2,262	35	14	239	184	6,224	26,365	47,130	...	183
28. Ross & Cromarty	134,870	1,437	12,332	32,778	888	23	51	47,509	9,472	16,490	5	1	12	689	26,669	40,951	19,329	1	411
29. Roxburgh	184,350	788	11,798	34,054	34	493	85	47,252	1,640	24,436	32	5	551	622	27,286	59,448	50,321	7	36
30. Selkirk	24,340	...	175	4,338	...	...	21	4,534	186	2,426	...	...	137	33	2,782	8,050	8,967	...	7
31. Stirling	115,809	1,436	4,007	20,056	45	3,065	31	28,640	3,488	4,685	3	3	140	525	8,844	33,793	42,594	10	1,928
32. Sutherland	32,302	8	1,862	8,218	68	...	21	10,177	1,939	3,026	—	1	88	35	5,089	8,218	8,616	1	201
33. Wigtown	147,063	736	796	35,511	38	310	1	37,392	1,902	15,678	229	100	153	135	18,197	69,326	21,883	...	265
Total,	4,862,097	50,337	206,600	1,064,432	7,817	18,963	1,407	1,349,556	149,839	482,532	1,338	1,115	6,640	16,484	657,948	1,643,519	1,195,746	900	14,428

TABLE No. 2.—ESTIMATED TOTAL PRODUCTION OF WHEAT, BARLEY, AND OATS in 1887, ACREAGE under these Crops, Estimated Average YIELD per Acre, and Estimated Yield per Acre ABOVE or BELOW an Ordinary Average Crop, in each of the COUNTIES of SCOTLAND.

COUNTIES.	WHEAT.						BARLEY, INCLUDING BERE.						OATS.					
	Total Produce in 1887.	Acreage in 1887.	Average Yield per Acre. 1887.	Ordinary Average.*	1887 compared with Ordinary Average. Above.	Below.	Total Produce in 1887.	Acreage in 1887.	Average Yield per Acre. 1887.	Ordinary Average.*	1887 compared with Ordinary Average. Above.	Below.	Total Produce in 1887.	Acreage in 1887.	Average Yield per Acre. 1887.	Ordinary Average.*	1887 compared with Ordinary Average. Above.	Below.
	Bush.	Acres.	Bush.	Bush.	Bush.	Bush.	Bush.	Acres.	Bush.	Bush.	Bush.	Bush.	Bush.	Acres.	Bush.	Bush.	Bush.	Bush.
Aberdeen,	180	6	30·00	36·92	...	6·92	471,161	14,840	31·75	32·41	...	0·66	6,634,620	198,663	33·40	33·05	0·35	...
Argyll,	80	2	40·00	...	...	...	58,814	1,748	33·65	37·52	...	3·87	636,031	19,613	32·43	32·96	...	0·53
Ayr,	71,585	1,883	38·02	31·89	6·13	...	61,477	1,595	38·54	40·34	...	1·80	2,410,704	51,773	46·56	46·29	0·27	...
Banff,	4,548	153	29·73	35·77	...	6·04	242,702	7,014	34·60	35·43	...	0·83	1,851,396	56,915	32·53	32·70	...	0·17
Berwick,	119,385	3,512	33·99	30·34	3·65	...	642,020	17,112	37·52	36·32	1·20	...	1,345,528	38,079	35·34	39·56	...	4·22
Bute,	...	...	...	...	...	...	1,957	50	39·14	34·11	5·03	...	217,003	5,317	40·81	31·12	9·69	...
Caithness,	135	5	27·00	21·14	5·86	...	30,759	1,104	27·86	29·96	...	2·10	1,023,938	34,274	29·88	30·73	...	0·85
Clackmannan,	8,496	236	36·00	30·85	5·15	...	18,219	596	30·57	33·50	...	2·93	111,450	3,744	29·77	33·74	...	3·97
Dunbarton,	21,329	627	38·80	30·72	8·08	...	10,746	251	42·81	33·21	9·60	...	273,451	7,558	36·18	35·66	0·52	...
Dumfries	917	27	33·96	33·56	0·40	...	17,943	604	29·71	36·16	...	6·45	1,391,351	48,966	28·41	35·76	...	7·35
Edinburgh,	139,493	3,456	40·36	36·71	3·65	...	277,049	6,837	40·52	39·60	0·92	...	911,944	24,685	36·94	39·75	...	2·81
Elgin or Moray,	71,081	2,049	34·69	30·99	3·70	...	381,753	12,068	31·63	35·48	...	3·85	726,695	23,925	30·37	35·09	...	4·72
Fife,	327,441	9,438	34·69	30·16	4·53	...	813,605	23,789	34·20	34·00	0·20	...	1,382,899	42,436	32·59	36·87	...	4·28
Forfar,	299,613	7,929	37·79	33·45	4·31	...	964,392	26,480	36·42	35·26	1·16	...	1,845,740	54,778	33·69	40·70	...	7·01
Haddington,	259,889	6,785	38·30	35·16	3·14	...	578,499	14,062	41·14	40·64	0·50	...	728,668	17,935	40·63	44·44	...	3·81
Inverness,	50	2	25·00	26·00	...	1·00	224,616	7,484	30·01	30·95	...	0·94	924,673	32·129	28·78	29·81	...	1·03
Kincardine,	19,971	620	32·21	34·12	...	1·91	359,664	10,323	34·84	32·16	2·68	...	1,209,697	32,714	36·98	35·86	1·12	...
Kinross,	249	8	31·12	28·85	2·27	...	41,742	419	35·18	29·82	5·36	...	185,432	5,871	31·58	32·13	...	0·55
Kirkcudbright,	2,940	92	31·96	33·31	...	1·35	2,369	79	29·99	31·92	...	1·93	930,133	30,917	30·08	34·23	...	4·15
Lanark,	60,357	1,617	37·33	35·95	1·38	...	14,930	416	35·89	34·21	1·68	...	1,460,167	43,586	33·50	35·03	...	1·53
Linlithgow,	32,613	850	38·40	34·71	3·69	...	117,999	2,784	42·38	42·65	...	0·27	393,610	11,106	35·44	42·13	...	6·69
Nairn,	28	1	28·00	...	...	...	70,287	2,733	25·72	34·81	...	9·09	164,424	6,193	26·55	35·25	...	8·70
Orkney,	...	...	...	...	...	...	158,148	5,397	29·30	36·13	...	6·83	1,052,703	32,925	31·97	34·42	...	2·45
Peebles,	96	3	32·00	...	...	...	12,867	386	33·33	31·28	2·05	...	320,411	9,498	33·73	34·02	...	0·29
Perth,	178,498	5,131	34·79	33·80	0·99	...	431,319	15,147	28·48	34·13	...	5·65	2,048,937	74,275	27·59	36·30	...	8·71
Renfrew,	61,019	1,500	40·68	33·64	7·04	...	7,914	204	38·79	37·57	1·22	...	575,359	13,637	42·19	42·09	0·10	...
Ross & Cromarty,	40,104	1,437	27·91	34·34	...	6·13	357,390	12,332	28·98	31·95	...	2·97	947,036	32,778	28·89	36·17	...	7·28
Roxburgh,	30,148	788	38·26	30·77	7·49	...	439,862	11,798	37·28	35·51	1·77	...	1,042,099	34,054	30·60	37·02	...	6·42
Selkirk,	...	...	...	26·00	...	...	6,390	175	36·51	29·11	7·40	...	132,158	4,338	30·47	29·67	0·80	...
Shetland,	...	...	...	...	...	...	42,031	2,108	19·94	20·47	...	0·53	155,695	7,965	19·55	20·29	...	0·74
Stirling,	47,596	1,436	33·14	30·17	2·97	...	127,317	4,007	31·77	31·32	0·45	...	587,963	20,056	29·32	31·95	...	2·63
Sutherland,	192	8	24·00	...	...	...	52,495	1,862	28·19	30·33	...	2·14	270,615	8,218	32·93	36·96	...	4·03
Wigtown,	24,825	736	33·73	30·11	3·62	...	22,847	796	28·70	30·57	...	1·87	1,033,671	35,511	29·11	36·42	...	7·31
Total,	1,825,888	50,337	36·27	...	...	...	7,034,283	206,600	34·05	...	...	...	34,926,201	1,064,432	32·81	...	...	...

* As computed from Returns furnished by Estimators in 1885.

TABLE No. 3.—ESTIMATED TOTAL PRODUCTION OF BEANS, PEAS, AND POTATOES in the Year 1887, ACREAGE under these Crops, Estimated Average YIELD per Acre, and Estimated Yield per Acre ABOVE or BELOW an Ordinary Average Crop in each of the COUNTIES of SCOTLAND.

COUNTIES.	BEANS.						PEAS.						POTATOES.					
	Total Produce in 1887.	Acreage in 1887.	Average Yield per Acre.				Total Produce in 1887.	Acreage in 1887.	Average Yield per Acre.				Total Produce in 1887.	Acreage in 1887.	Average Yield per Acre.			
			1887.	Ordinary Average.*	1887 compared with Ordinary Average.				1887.	Ordinary Average.*	1887 compared with the Ordinary Average.				1887.	Ordinary Average.*	1887 compared with the Ordinary Average.	
					Above.	Below.					Above.	Below.					Above.	Below.
	Bush.	Acres.	Bush.	Bush.	Bush.	Bush.	Bush.	Acres.	Bush.	Bush.	Bush.	Bush.	Tons.	Acres.	Tons.	Tons.	Tons.	Tons.
Aberdeen, . .	7,489	315	23·77	28·26	...	4·49	8,134	372	21·87	23·27	...	1·40	46,942	8,413	5·58	5·40	0·18	...
Argyll, . . .	4,534	189	23·99	35·13	...	11·14	158	6	26·33	37·62	...	11·29	39,258	6,085	6·45	5·47	0·98	...
Ayr, . . .	31,793	980	32·44	34·47	...	2·03	123	4	30·75	34·96	...	4·21	57,910	8,033	7·21	7·03	0·18	...
Banff, . . .	4,129	150	27·53	27·29	0·24	...	1,185	48	24·69	23·02	1·67	...	13,096	2,571	5·09	4·62	0·47	...
Berwick, . .	43,889	1,822	24·09	33·91	...	9·82	3,553	170	20·78	24·75	...	3·97	15,329	2,418	6·34	5·92	0·42	...
Bute, . . .	2,190	80	27·37	30·96	...	3·59	300	11	27·27	27·83	...	0·56	7,697	1,048	7·34	6·41	0·93	...
Caithness, . .	† 23	1	...	...	...	...	† 741	38	...	...	...	...	8,839	1,779	4·97	5·52	...	0·55
Clackmannan, .	8,287	687	12·06	26·97	...	14·91	113	8	14·12	...	...	...	1,931	295	6·55	5·43	1·12	...
Dumbarton, . .	4,014	164	24·48	27·74	...	3·26	28	1	28·00	27·24	0·76	...	19,162	2,288	8·37	6·70	1·67	...
Dumfries, . .	1,481	54	27·48	29·97	...	2·49	451	15	30·07	33·73	...	3·66	39,690	4,731	8·39	6·24	2·15	...
Edinburgh, . .	14,484	491	29·50	35·58	...	6·08	1,862	77	24·18	27·51	...	3·33	41,259	5,458	7·56	5·89	1·67	...
Elgin or Moray, .	2,460	77	31·95	31·93	0·02	...	313	14	22·36	22·06	0·30	...	9,344	2,103	4·44	3·99	0·45	...
Fife, . . .	45,187	1,683	26·85	34·45	...	7·60	510	22	23·18	30·12	...	6·94	91,573	15,933	5·75	4·45	1·30	...
Forfar, . . .	22,904	814	28·14	33·85	...	5·71	1,212	50	21·24	25·97	...	4·73	92,586	14,944	6·20	5·74	0·46	...
Haddington, . .	51,994	1,854	28·04	33·54	...	5·50	1,689	80	21·11	25·89	...	4·78	51,694	7,378	7·01	6·39	0·62	...
Inverness, . .	46	2	23·00	35·50	...	12·50	2,043	79	25·86	27·31	...	1·45	38,287	7,602	5·04	4·90	0·14	...
Kincardine, . .	7,933	636	28·20	31·33	...	3·13	1,020	43	23·72	24·00	...	0·28	22,759	3,463	6·57	6·46	0·11	...
Kinross, . .	234	10	23·40	23·00	0·40	...	...	...	...	...	...	...	3,591	636	5·65	5·90	...	0·25
Kirkcudbright, .	3,806	127	29·97	31·26	...	1·29	173	6	28·83	31·00	...	2·17	15,504	2,082	7·45	6·10	1·35	...
Lanark, . . .	35,360	1,138	31·07	33·60	...	2·53	591	24	24·62	26·00	...	1·38	40,956	5,509	7·43	6·52	0·91	...
Linlithgow, . .	18,731	678	27·63	34·07	...	6·44	110	5	22·00	...	...	...	12,619	1,745	7·23	4·95	2·28	...
Nairn, . . .	..	...	...	28·00	...	...	71	5	14·20	12·44	1·76	...	1,894	411	4·61	5·09	...	0·48
Orkney, . . .	...	...	...	...	...	...	† 366	31	...	...	...	...	29,592	3,074	9·63	7·54	2·09	...
Peebles, . .	26	1	26·00	30·00	...	4·00	160	7	22·86	27·39	...	4·53	3,890	503	7·73	5·82	1·91	...
Perth, . . .	60,201	2,686	22·41	28·12	...	5·71	1,484	67	22·15	24·76	...	2·61	104,143	15,920	6·54	5·55	0·99	...
Renfrew, . .	17,096	433	39·48	40·15	...	0·67	467	14	33·36	36·00	...	2·64	33,747	3,490	9·67	7·24	2·43	...
Ross and Cromarty,	532	23	23·13	23·42	...	0·29	1,156	51	22·67	21·71	0·96	...	66,380	9,472	7·01	6·55	0·46	...
Roxburgh, . .	10,632	493	21·57	33·03	...	11·46	1,798	85	21·15	24·96	...	3·81	9,469	1,640	5·77	5·78	...	0·01
Selkirk, . . .	...	...	...	..	...	...	426	21	20·29	24·00	...	3·71	1,141	186	6·13	5·13	1·00	...
Shetland, . .	...	...	...	...	...	...	...	...	...	...	...	...	13,358	3,300	4·05	6·16	...	2·11
Stirling, . .	43,296	3,065	14·13	28·96	...	14·83	449	31	14·48	22·04	...	7·56	26,803	3,488	7·68	5·60	2·08	...
Sutherland, . .	...	...	...	...	...	..	248	21	11·81	...	...	...	9,538	1,939	4·92	5·00	...	0·08
Wigtown, . .	8,257	310	26·64	27·96	.	1·32	22	1	22·00	26·33	...	4·33	12,307	1,902	6·47	6·98	...	0·51
Total, . .	461,011	18,963	21·31	...	...	..	30,936	1,407	21·99	...	...	...	982,288	149,839	6·56	...	...	...

* As computed from Returns furnished by Estimators in 1885.

† Computed.

TABLE No. 4.—ESTIMATED TOTAL PRODUCTION of TURNIPS and MANGOLDS in the Year 1887, ACREAGE under these CROPS, Estimated Average YIELD per Acre and Estimated YIELD per Acre ABOVE or BELOW an Ordinary Average Crop, in each of the COUNTIES of SCOTLAND.

COUNTIES.	TURNIPS.						MANGOLDS.					
	Total Produce in 1887.	Acreage in 1887.	Average Yield per Acre.				Total Produce in 1887.	Acreage in 1887.	Average Yield per Acre.			
			1887.	Ordinary Average.*	1887 compared with Ordinary Average.				1887.	Ordinary Average.*	1887 compared with Ordinary Average.	
					Above.	Below.					Above.	Below.
	Tons.	Acres.	Tons.	Tons.	Tons.	Tons.	Tons.	Acres.	Tons.	Tons.	Tons.	Tons.
Aberdeen,	1,400,321	90,396	15·49	15·13	0·36	...	30	3	10·00	14·00	...	4·00
Argyll,	81,474	5,436	14·99	15·23	...	0·24	619	47	13·17	15·49	...	2·32
Ayr,	143,871	7,474	19·25	16·61	2·64	...	10,438	524	19·92	16·32	3·60	...
Banff,	405,085	24,884	16·28	14·58	1·70	...	61	3	21·33	...	...	...
Berwick,	471,496	28,614	16·48	17·06	...	0·58	2,072	116	17·86	21·02	...	3·16
Bute,	28,352	1,416	20·02	10·55	9·47	...	147	8	18·37	6·50	11·87	...
Caithness,	227,203	14,087	16·13	15·83	0·30	...	...	...	...	...	...	...
Clackmannan,	12,665	929	13·63	14·54	...	0·91	110	10	11·00	10·50	0·50	...
Dumbarton,	26,374	1,499	17·59	10·96	6·63	...	366	21	17·43	7·11	10·32	...
Dumfries,	360,436	19,918	18·10	17·13	0·97	...	1,170	50	23·40	24·93	...	1·53
Edinburgh,	186,906	11,855	15·77	14·92	0·85	...	553	38	14·55	16·00	...	1·45
Elgin or Moray,	278,227	16,494	16·87	15·94	0·93	...	131	7	18·71	19·89	...	1·18
Fife,	341,171	26,615	12·82	13·44	...	0·62	85	9	9·44	10·00	...	0·56
Forfar,	522,561	33,642	15·53	17·41	...	1·88	305	17	17·94	17·13	0·81	...
Haddington,	262,081	15,788	16·60	17·49	...	0·89	900	58	15·52	15·31	0·21	...
Inverness,	172,590	11,510	14·99	14·82	0·17	...	71	3	23·67	23·50	0·17	...
Kincardine,	256,576	17,971	14·28	14·37	...	0·09	408	25	16·32	...	...	...
Kinross,	37,920	2,558	14·82	13·54	1·28	...	...	...	...	...	...	...
Kirkcudbright,	261,676	13,775	19·00	17·92	1·08	...	691	40	17·27	20·76	...	3·49
Lanark,	183,792	9,377	19·60	17·07	2·53	...	398	27	14·74	13·06	1·68	...
Linlithgow,	61,191	4,035	15·17	15·29	...	0·12	101	8	12·62	11·00	1·62	...
Nairn,	60,480	4,183	14·46	14·41	0·05	...	...	...	...	18·00	...	...
Orkney,	216,893	14,405	15·06	16·81	...	1·75	70	7	10·00	...	...	...
Peebles,	75,712	4,701	16·11	16·16	...	0·05	...	...	...	...	...	...
Perth,	410,962	30,592	13·43	16·78	...	3·35	296	13	22·77	12·00	10·77	...
Renfrew,	43,939	2,262	19·42	17·67	1·75	...	614	35	17·54	15·07	2·47	...
Ross and Cromarty,	243,397	16,490	14·76	14·91	...	0·15	120	5	24·00	24·18	...	0·18
Roxburgh,	394,655	24,436	16·15	16·23	...	0·08	618	32	19·31	23·91	...	4·60
Selkirk,	33,534	2,426	13·82	15·93	...	2·11	...	...	...	...	...	...
Shetland,	17,875	1,375	13·00	13·75	...	0·75	...	...	...	...	...	...
Stirling,	75,836	4,685	16·19	14·55	1·64	...	33	3	11·00	11·33	...	0·33
Sutherland,	50,801	3,026	16·79	17·30	...	0·51	...	...	...	...	...	...
Wigtown,	251,492	15,678	16·04	19·91	...	3·87	4,121	229	18·01	22·73	...	4·72
Total,	7,597,544	482,532	15·75	...	...	...	24,543	1338	18·34	...	...	—

* As computed from Returns furnished by Estimators in 1885.

TABLE No. 5.—ESTIMATED TOTAL PRODUCTION OF HAY from Clover, Sainfoin, and Grasses under Rotation, also Total from Permanent Pasture, in the Year 1887, ACREAGE under that Crop, Estimated Average YIELD per Acre, and Estimated YIELD per Acre ABOVE or BELOW an Ordinary Average Crop, in each of the COUNTIES of SCOTLAND.

COUNTIES.	From Clover, Sainfoin, and Grasses.						From Permanent Pasture.					
	Total Produce in 1887.	Acreage in 1887.	Average Yield per Acre.				Total Produce in 1887.	Acreage in 1887.†	Average Yield per Acre.			
			1887.	Ordinary Average.*	1887 compared with Ordinary Average.				1887.	Ordinary Average.*	1887 compared with Ordinary Average.	
					Above.	Below.					Above.	Below.
	Tons.	Acres.	Tons.	Tons.	Tons.	Tons.	Tons.	Acres.	Tons.	Tons.	Tons.	Tons.
Aberdeen,	57,500	46,743	1·23	1·46	...	0·23	2,601	2,401	1·08	1·13	...	0·05
Argyll,	15,501	11,666	1·33	1·54	...	0·21	15,553	12,190	1·28	1·32	...	0·04
Ayr,	53,177	32,367	1·64	1·53	0·11	...	32,792	17,926	1·83	1·75	0·08	...
Banff,	21,113	16,825	1·25	1·42	...	0·17	2,632	2,339	1·13	0·99	0·14	...
Berwick,	20,318	11,094	1·83	1·95	...	0·12	3,730	2,731	1·37	1·75	...	0·38
Bute,	3,975	2,572	1·55	1·67	...	0·12	1,247	927	1·35	1·72	...	0·37
Caithness,	10,553	11,110	0·95	1·63	...	0·68	2,080	2,544	0·82	—	...	—
Clackmannan,	2,342	1,587	1·48	1·55	...	0·07	775	638	1·21	1·19	0·02	...
Dumbarton,	10,409	6,744	1·54	1·70	...	0·16	2,956	1,887	1·57	1·34	0·23	...
Dumfries,	20,445	18,296	1·12	1·75	...	0·63	23,636	17,760	1·33	2·05	...	0·72
Edinburgh,	29,025	14,147	2·05	1·88	0·17	...	4,531	2,890	1·57	1·71	...	0·14
Elgin or Moray,	10,841	9,274	1·17	1·44	...	0·27	598	507	1·18	1·00	0·18	...
Fife,	40,733	29,099	1·40	1·57	...	0·17	8,180	6,529	1·25	1·41	...	0·16
Forfar,	30,256	23,773	1·27	1·64	...	0·37	5,571	3,714	1·50	1·07	0·43	...
Haddington,	20,201	10,913	1·85	1·89	...	0·04	1,701	1,095	1·55	1·63	...	0·08
Inverness,	11,501	12,394	0·93	1·09	...	0·16	2,936	4,261	0·69	0·66	0·03	...
Kincardine,	17,162	13,259	1·29	1·37	...	0·08	1,351	1,385	0·98	0·80	0·18	...
Kinross,	3,607	2,874	1·26	1·59	...	0·33	1,845	1,306	1·41	1·49	...	0·08
Kirkcudbright,	9,847	9,376	1·05	1·42	...	0·37	9,842	9,868	1·00	1·43	...	0·43
Lanark,	50,516	32,646	1·55	1·56	...	0·01	23,702	13,054	1·82	1·90	...	0·08
Linlithgow,	12,259	7,414	1·65	1·75	...	0·10	1,523	979	1·56	1·69	...	0·13
Nairn,	2,212	2,854	0·78	1·40	...	0·62	31	39	0·79	1·00	...	0·21
Orkney,	11,510	11,063	1·04	1·69	...	0·65	3,118	2,612	1·19	1·42	...	0·23
Peebles,	3,894	2,879	1·35	1·44	...	0·09	2,439	1,865	1·31	1·71	...	0·40
Perth,	50,441	35,870	1·41	1·69	...	0·28	11,843	12,062	0·98	1·06	...	0·08
Renfrew,	24,808	14,499	1·71	1·68	0·03	...	13,888	6,168	2·25	2·29	...	0·04
Ross and Cromarty,	17,431	15,179	1·15	1·40	...	0·25	1,414	2,185	0·65	0·72	...	0·07
Roxburgh,	18,755	10,509	1·78	1·89	...	0·11	8,829	5,984	1·48	1·82	...	0·34
Selkirk,	2,327	1,358	1·71	1·89	...	0·18	2,010	1,565	1·28	1·52	...	0·24
Shetland,	684	681	1·00	2·00	...	1·00	732	1,463	0·50	1·00	...	0·50
Stirling,	18,503	12,553	1·47	1·48	...	0·01	7,119	6,628	1·07	0·98	0·09	...
Sutherland,	4,211	4,034	1·04	1·00	0·04	...	1,021	1,718	0·59	0·46	0·13	...
Wigtown,	9,943	5,465	1·82	1·91	...	0·09	4,093	2,856	1·43	1·64	...	0·21
Total,	616,137	441,120	1·40	...	...	...	206,319	152,076	1·36	...	...	...

* As computed from Returns furnished by Estimators in 1886.

† Exclusive of Heath and Mountain Land.

TABLE No. 6.—NUMBER OF HORSES, CATTLE, SHEEP, AND PIGS IN EACH COUNTY OF SCOTLAND.

COUNTIES.	HORSES (including Ponies).			CATTLE.				SHEEP.			PIGS.
	Used solely for Agriculture, &c.	Kept solely for Breeding.	Total.	Cows and Heifers in Milk or in Calf.	Other Cattle. 2 years of Age and above.	Other Cattle. Under 2 Years of Age.	Total.	1 Year Old and above.	Under 1 Year.	Total.	
1. Aberdeen,	20,935	5,829	26,764	42,442	45,467	77,573	165,482	106,802	42,030	148,832	8,896
2. Argyll,	4,418	2,480	6,898	23,138	15,543	21,389	60,070	688,214	292,404	980,618	4,421
3. Ayr,	6,432	2,317	8,749	47,407	15,661	30,505	93,573	206,709	124,162	330,871	14,219
4. Banff,	6,573	1,980	8,553	13,799	7,790	23,004	44,593	34,537	21,299	55,836	4,133
5. Berwick,	4,149	1,127	5,276	3,555	3,635	6,943	14,133	151,725	126,443	278,168	3,976
6. Bute,	846	358	1,204	3,590	1,767	3,305	8,662	29,220	15,021	44,241	775
7. Caithness,	4,167	1,095	5,262	7,168	3,313	10,284	20,765	69,557	38,531	108,088	1,341
8. Clackmannan,	502	174	676	1,431	788	1,306	3,525	6,420	3,203	9,623	1,684
9. Dumbarton,	1,253	580	1,833	7,581	2,363	3,584	13,528	47,482	24,023	71,505	965
10. Dumfries,	5,404	1,843	7,247	18,386	13,297	23,244	54,927	309,825	176,524	486,349	11,653
11. Edinburgh,	3,430	757	4,187	12,264	2,921	3,591	18,776	94,587	65,613	160,200	5,389
12. Elgin,	3,706	1,117	4,823	6,519	4,159	11,866	22,544	32,642	17,964	50,606	2,562
13. Fife,	7,587	2,432	10,019	9,581	14,350	16,424	40,355	51,766	32,155	83,921	5,551
14. Forfar,	8,073	1,591	9,664	11,765	17,015	17,225	46,005	87,009	44,584	131,593	6,368
15. Haddington,	3,119	485	3,604	1,761	3,965	3,019	8,745	73,836	53,476	127,312	1,970
16. Inverness,	6,559	2,371	8,930	20,673	10,242	20,825	51,740	463,050	186,595	649,645	2,996
17. Kincardine,	3,827	931	4,758	6,808	5,613	11,856	24,277	23,305	8,998	32,303	2,322
18. Kinross,	642	287	929	1,070	1,245	2,647	4,962	17,627	11,141	28,768	403
19. Kirkcudbright,	3,891	1,770	5,661	13,876	12,721	15,017	41,614	239,489	120,517	360,006	7,058
20. Lanark,	5,696	2,216	7,912	37,023	11,387	19,790	68,200	131,582	79,409	210,991	6,638
21. Linlithgow,	1,503	645	2,148	4,318	2,811	3,576	10,705	13,325	6,011	19,336	1,427
22. Nairn,	856	310	1,196	1,756	667	3,336	5,759	12,333	4,151	16,484	586
23. Orkney,	4,858	1,270	6,128	9,574	3,701	12,940	26,218	15,863	14,900	30,763	3,956
24. Shetland,	940	4,448	5,388	8,509	7,037	6,359	21,905	52,868	36,582	89,450	3,277
25. Peebles,	877	255	1,132	1,949	1,225	2,447	5,621	108,340	75,308	183,648	860
26. Perth,	10,262	3,112	13,374	18,997	21,774	32,515	73,286	463,754	208,622	672,376	8,006
27. Renfrew,	2,313	1,028	3,341	16,067	3,664	5,710	25,441	19,403	11,915	31,318	1,505
28. Ross and Cromarty,	5,855	1,584	7,439	17,851	9,156	16,494	43,501	200,653	92,369	293,022	5,217
29. Roxburgh,	3,704	637	4,341	4,781	4,501	6,596	15,878	270,927	212,328	483,255	3,701
30. Selkirk,	474	108	582	1,011	557	1,132	2,700	90,319	68,199	158,518	408
31. Stirling,	3,195	1,509	4,704	10,524	8,629	9,200	28,353	74,399	41,309	115,708	2,025
32. Sutherland,	1,958	674	2,632	5,559	2,604	4,248	12,411	151,061	55,222	206,283	978
33. Wigtown,	4,079	1,620	5,696	21,197	6,681	14,184	42,062	72,436	43,828	116,264	10,300
Total,	142,083	48,970	191,053	411,930	266,252	442,134	1,120,316	4,411,065	2,354,836	6,765,901	135,646

TABLE No. 7.—QUANTITIES AND VALUES OF THE IMPORTS OF LIVE CATTLE, SHEEP, AND SWINE, 1885 AND 1886.

	Quantities.		Values.	
	1885.	1886.	1885.	1886.
	No.	No.	£	£
Live Cattle,	373,078	319,622	7,046,477	5,068,846
Live Sheep,	750,866	1,038,965	1,625,029	2,010,194
Live Pigs,	16,522	21,351	63,248	63,357
Total,	1,140,466	1,379,938	8,734,754	7,142,397

TABLE No. 8.—QUANTITIES AND VALUES OF THE IMPORTS OF BEEF, MUTTON, PORK, BACON, HAMS, FISH, EGGS, BUTTER, &c., 1885 AND 1886.

	Quantities.		Values.	
	1885.	1886.	1885.	1886.
Meat—	Cwts.	Cwts.	£	£
Beef, fresh,	902,951	806,867	2,345,415	1,862,284
Beef, salted,	238,915	190,723	452,635	316,393
Mutton, fresh,	572,868	653,447	1,486,317	1,405,383
Unenumerated, salted or fresh,	27,776	41,528	80,156	111,468
,, preserved other than by salting,	527,759	431,992	1,549,796	1,169,777
Pork, salted and fresh,	383,636	371,696	689,731	631 538
Bacon and Hams,	4,058,454	4,210,829	8,685,668	8,402,828
Total,	6,712,359	6,707,082	15,289,718	13,899,671
Fish,	1,520,570	1,679,197	1,994,614	2,158 323
Rabbits,	. .	104,322	. .	287,816
Poultry and Game (see Value),	. .	. .	655,397	351,888
Butter,	2,401,373	1,543,566	11,563,508	2,962,264
Margarine,	. .	887,974	. .	8,141,438
Cheese,	1,833,832	1,734,890	4,069,344	3,871,359
Lard,	871,210	895,463	1,606,485	1,544,632
Eggs, Thousands	1,002,788,160	1,035,171	2,931,237	2,884,063
Total,	. .	. .	22,820,585	22,201,783

TABLE No. 9.—QUANTITIES AND VALUES OF THE IMPORTS OF WHEAT AND WHEAT FLOUR, 1885 AND 1886.

	Quantities.		Values.	
	1885.	1886.	1885.	1886.
	Cwts.	Cwts.	£	£
Wheat,	61,498,864	47,435,806	24,085,913	17,909,630
Wheat Flour,	15,832,843	14,689,560	9,650,445	8,228,051
Total,	77,331,707	62,125,366	33,736,358	26,137,681

TABLE No. 10.—QUANTITIES AND VALUES OF THE IMPORTS OF BARLEY, OATS, INDIAN CORN, RYE, MEAL, &c., 1885 AND 1886.

	Quantities.		Values.	
	1885.	1886.	1885.	1886.
	Cwts.	Cwts.	£	£
Barley,	15,366,160	13,713,637	4,532,386	3,962,041
Oats,	13,057,189	13,485,233	4,250,707	3,973,783
Indian Corn,	31,526,735	31,011,565	8,488,695	7,617,470
Peas and Beans,	5,539,983	4,856,485	1,762,228	1,514,697
Rye,	341,195	296,941	105,749	83,766
Buckwheat,	82,565	104,109	26,692	31,494
Total,	65,913,827	63,467,970	19,166,457	17,183,251
Oatmeal,	485,697	337,153	268,512	182,702
Indian Meal,	13,722	10,065	18,811	12,540
Barley Meal, Rye Meal, Pea Meal and Bean Meal, Buckwheat Meal, Meal unenumerated,	267,510	120,714	70,717	32,005
Total,	766,929	467,932	358,040	227,247

Table No. 11.—Average Prices of various kinds of Animals, Dead Meat, and Provisions, 1885 and 1886.

Kinds of Animals, Dead Meat, &c.		1885.	1886.
Animals—Oxen and Bulls from all countries,	each	£21 2 10	£18 1 2
,, Sheep, including lambs, from all countries,	,,	2 3 3	1 18 8
Bacon—From all countries,	per cwt.	2 0 6	1 17 8
Hams—From all countries,	,,	2 10 10	2 7 5
Beef, salted—From all countries,	,,	1 17 10	1 13 2
,, Admiralty prices { American,	,,	—	—
,, Admiralty prices { Deptford,	,,	—	—
Pork, salted—From all countries,	,,	1 12 2	1 9 8
,, Admiralty prices,	,,	—	—
Butter—From all countries,	,,	4 16 3	5 5 5
Margarine,	,,	—	3 6 8
Cheese—From all countries,	,,	2 4 4	2 4 7
Potatoes—From all countries,	,,	0 6 3	0 5 10
Eggs—From all countries,	per 120	0 7 0	0 6 8
Lard—From all countries,	per cwt.	1 16 10	1 14 5
Milk—Bethlehem Hospital prices,	per gallon	—	—

Table No. 12.—Return of the Average Prices of Wool in the Years 1885 and 1886.

Years.	Australian.	South African.	English Fleeces.
	Per lb.	Per lb.	Per lb.
	s. d.	s. d.	s. d. s. d.
1885, . .	0 10½	0 9½	0 8½ to 1 0¼
1886, . .	0 9¼	0 9¼	0 9 ,, 1 0½

Average Prices (per Imperial Quarter) of Home-Grown Wheat, Barley, and Oats in the Weekly Market of Edinburgh, for the Years 1886 and 1887.

Weekly Market day, Wednesday.		Wheat. 1886.	Wheat. 1887.	Barley. 1886.	Barley. 1887.	Oats. 1886.	Oats. 1887.
		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
January	1	29 10	29 5	26 6	26 7	22 3	20 3
	2	28 11	31 11	26 4	23 11	22 3	20 6
	3	31 0	30 1	26 6	24 0	22 8	20 8
	4	28 11	28 5	25 11	25 10	21 11	20 7
	5	.	.	.	.	.	.
February	1	29 4	25 7	23 4	26 6	22 1	20 0
	2	28 4	31 4	24 0	24 6	22 4	19 10
	3	27 5	28 6	25 2	21 9	22 3	20 10
	4	28 9	29 9	24 7	22 0	22 7	20 0
March	1	28 3	30 9	24 6	27 0	23 1	20 2
	2	29 5	32 6	24 6	24 8	23 6	20 11
	3	29 1	30 11	25 1	24 0	24 0	19 11
	4	28 3	31 4	24 9	29 5	24 9	18 9
	5	29 4	28 8	24 2	29 5	23 10	20 7
April	1	29 5	28 2	23 2	27 1	24 6	18 10
	2	31 0	28 0	24 4	22 8	24 11	18 11
	3	31 3	32 10	24 0	24 11	25 1	20 1
	4	30 7	30 5	24 7	21 11	24 7	19 1
	5	.	.	.	.	.	.
May	1	31 0	31 0	25 6	25 0	25 4	20 2
	2	31 8	31 10	23 5	27 7	24 1	19 11
	3	32 6	34 7	23 11	24 1	24 5	19 4
	4	31 0	30 6	24 4	20 2	23 8	18 11
	5	.	.	.	.	.	.
June	1	30 6	33 8	23 1	22 5	25 1	19 7
	2	27 4	35 0	23 8	20 9	24 11	19 3
	3	29 2	.	21 9	24 3	23 1	19 3
	4	29 2	29 5	22 6	22 0	23 1	19 9
	5	.	.	23 7	20 10	24 3	19 7

Weekly Market day, Wednesday.		Wheat. 1886.	Wheat. 1887.	Barley. 1886.	Barley. 1887.	Oats. 1886.	Oats. 1887.
		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
July	1	.	32 9	23 6	20 5	24 10	19 0
	2	29 11	34 0	24 0	21 9	23 6	19 10
	3	31 3	32 5	.	21 10	23 7	19 7
	4	.	28 4	.	22 0	23 5	24 0
	5	.	.	.	.	.	.
August	1	32 6	28 4	23 0	22 3	23 9	19 4
	2	24 0	28 11	.	19 7	24 1	20 3
	3	32 3	28 3	.	.	25 0	19 7
	4	32 7	31 1	.	21 8	25 2	20 5
	5	.	.	.	.	.	.
September	1	30 4	.	25 1	24 5	25 0	19 8
	2	31 11	27 6	23 0	26 5	25 3	19 8
	3	31 8	30 8	25 9	25 5	24 10	19 3
	4	33 6	30 0	25 8	23 11	23 3	18 5
	5	.	27 10	28 5	24 3	22 6	17 11
October	1	26 8	31 1	25 0	24 7	22 11	17 11
	2	.	28 2	28 4	23 1	22 6	17 9
	3	31 1	29 2	28 0	22 4	22 5	16 5
	4	33 8	30 8	26 2	20 7	22 2	15 11
	5	.	.	.	.	.	.
November	1	29 7	28 3	26 11	26 5	21 0	17 9
	2	25 10	29 10	25 9	26 6	22 2	18 3
	3	26 1	29 7	27 5	27 3	21 4	17 5
	4	28 4	29 11	23 9	28 3	20 2	17 6
	5	.	.	.	.	.	.
December	1	30 2	30 10	24 7	25 6	20 6	18 10
	2	34 0	30 0	26 11	28 3	20 2	17 9
	3	34 6	30 2	22 3	27 6	20 2	17 5
	4	35 0	29 1	23 2	27 6	20 4	16 8
	5	28 10	.	25 3	27 11	20 9	17 8

PRICES OF SHEEP SINCE 1818. TABLE No. 1.—CHEVIOT SHEEP.

Year.	Wethers.	Ewes.	Lambs.
1818	28s 0d to 30s 0d	not quoted.	8s 0d to 10s 0d
1819	25 0 ,, 27 0	15s 0d to 17s 0d	10 6 ,, 12 0
1820	20 0 ,, 25 0	16 0 ,, 17 0	10 0 ,, 11 0
1821	18 0 ,, 20 0	14 0 ,, 16 0	7 6 ,, 8 0
1822	12 6 ,, 13 0	8 0 ,, 8 6	4 6 ,, 0 0
1823	13 6 ,, 18 0	7 0 ,, 10 6	5 6 ,, 6 0
1824	14 0 ,, 19 0	7 0 ,, 9 0	4 6 ,, 6 0
1825	29 0 ,, 32 0	15 0 ,, 19 0	9 0 ,, 10 6
1826	17 6 ,, 21 6	13 0 ,, 15 0	7 0 ,, 7 6
1827	15 0 ,, 24 0	not quoted.	7 0 ,, 8 0
1828	18 0 ,, 27 6	12 0 to 15 0	7 0 ,, 8 3
1829	18 0 ,, 24 0	12 6 ,, 14 0	7 0 ,, 8 6
1830	15 0 ,, 21 0	8 0 ,, 11 0	6 0 ,, 6 9
1831	18 0 ,, 25 0	9 0 ,, 13 0	7 0 ,, 8 0
1832	19 0 ,, 24 0	11 0 ,, 16 0	7 0 ,, 9 0
1833	22 0 ,, 31 0	13 6 ,, 20 0	8 0 ,, 11 3
1834	22 0 ,, 31 0	13 6 ,, 21 0	9 0 ,, 11 6
1835	22 0 ,, 27 6	18 0 ,, 20 6	18 0 ,, 11 0
1836	24 0 ,, 31 6	16 0 ,, 19 0	10 0 ,, 14 0
1837	19 0 ,, 28 0	14 0 ,, 19 0	10 0 ,, 13 0
1838	23 0 ,, 30 6	17 0 ,, 22 0	12 0 ,, 14 0
1839	23 0 ,, 31 0	14 0 ,, 19 0	0 0 ,, 13 0
1840	24 0 ,, 33 0	15 0 ,, 23 0	7 0 ,, 11 6
1841	23 0 ,, 30 0	14 0 ,, 22 0	8 0 ,, 12 0
1842	22 6 ,, 28 0	13 0 ,, 17 0	7 6 ,, 10 0
1843	19 0 ,, 25 0	8 0 ,, 12 0	5 0 ,, 8 0
1844	21 0 ,, 59 0	10 0 ,, 16 0	8 0 ,, 10 6
1845	23 0 ,, 33 0	13 0 ,, 20 0	8 0 ,, 13 0
1846	24 0 ,, 33 6	14 6 ,, 21 6	10 0 ,, 14 6
1847	24 0 ,, 35 0	13 0 ,, 24 0	11 6 ,, 15 0
1848	23 0 ,, 34 6	13 0 ,, 28 0	11 6 ,, 15 0
1849	21 0 ,, 30 2	12 0 ,, 21 0	0 0 ,, 14 0
1850	20 6 ,, 29 6	12 0 ,, 20 0	8 0 ,, 13 0
1851	21 6 ,, 31 0	13 0 ,, 21 0	8 9 ,, 14 0
1852	21 0 ,, 32 0	15 0 ,, 23 0	8 0 ,, 14 0
1853	26 6 ,, 38 0	17 0 ,, 28 6	9 0 ,, 17 0
1854	25 0 ,, 36 0	17 0 ,, 26 0	9 0 ,, 16 6
1855	23 6 ,, 36 0	16 0 ,, 25 0	10 0 ,, 17 0
1856	22 0 ,, 35 6	15 6 ,, 24 0	10 0 ,, 15 0
1857	24 0 ,, 36 0	14 6 ,, 26 0	10 6 ,, 14 6
1858	24 0 ,, 34 6	14 0 ,, 24 6	10 6 ,, 14 0
1859	25 0 ,, 34 6	16 0 ,, 25 0	10 3 ,, 14 9
1860	26 0 ,, 38 0	17 6 ,, 27 6	12 6 ,, 17 6
1861	25 0 ,, 38 6	16 0 ,, 28 0	9 0 ,, 16 0
1862	27 0 ,, 37 6	17 6 ,, 28 0	10 0 ,, 16 0
1863	25 0 ,, 38 6	19 0 ,, 28 6	10 6 ,, 16 0
1864	31 0 ,, 41 0	21 0 ,, 31 6	14 0 ,, 18 0
1865	32 6 ,, 44 0	22 6 ,, 33 6	14 6 ,, 20 0
1866	37 0 ,, 50 0	29 0 ,, 42 6	15 0 ,, 26 0
1867	26 0 ,, 58 0	18 0 ,, 25 6	12 0 ,, 16 0
1868	30 0 ,, 32 0	15 6 ,, 21 0	7 6 ,, 13 0
1869	28 0 ,, 38 0	15 0 ,, 22 6	7 6 ,, 14 0
1870	35 6 ,, 43 0	18 0 ,, 28 0	10 0 ,, 17 0
1871	36 6 ,, 49 0	22 0 ,, 33 6	14 0 ,, 20 0
1872	45 0 ,, 56 0	32 0 ,, 42 0	16 0 ,, 22 0
1873	42 0 ,, 51 0	25 0 ,, 42 0	15 6 ,, 22 0
1874	33 6 ,, 44 6	21 0 ,, 36 0	12 0 ,, 17 0
1875	33 0 ,, 48 6	21 0 ,, 34 0	13 6 ,, 23 6
1876	40 0 ,, 52 6	23 0 ,, 30 0	13 6 ,, 25 0
1877	41 0 ,, 51 0	25 0 ,, 37 0	15 0 ,, 24 0
1878	35 6 ,, 48 0	23 6 ,, 35 0	14 0 ,, 22 0
1879	34 0 ,, 44 0	21 0 ,, 34 0	14 0 ,, 20 0
1880	30 0 ,, 43 6	20 0 ,, 30 0	12 6 ,, 20 0
1881	32 0 ,, 45 6	29 0 ,, 34 0	14 0 ,, 20 0
1882	40 0 ,, 51 0	30 0 ,, 40 0	14 0 ,, 20 6
1883	44 0 ,, 55 6	34 6 ,, 46 6	15 6 ,, 23 0
1884	36 0 ,, 47 6	29 6 ,, 41 6	12 6 ,, 20 0
1885	30 0 ,, 38 0	24 0 ,, 31 0	12 0 ,, 18 0
1886	32 0 ,, 40 0	21 0 ,, 29 0	12 6 ,, 19 0
1887	29 0 ,, 36 0	18 0 ,, 26 0	11 0 ,, 16 6

Table No. 2.—BLACKFACED SHEEP.

Year.	Wethers.	Ewes.	Lambs.
1819	22s 0d to 24s 0d	12s 0d to 15s 0d	8s 0d to 9s 0d
1820	20 0 ,, 23 3	15 6 ,, 17 0	7 0 ,, 8 6
1821	18 0 ,, 20 0	12 0 ,, 13 0	6 0 ,, 7 0
1822	11 6 ,, 13 6	5 6 ,, 6 0	4 6 ,, 0 0
1823	12 0 ,, 16 0	5 0 ,, 6 6	4 0 ,, 5 3
1824	9 6 ,, 13 6	6 0 ,, 7 0	4 0 ,, 5 0
1825	22 0 ,, 26 0	11 0 ,, 13 6	6 0 ,, 9 0
1826	15 0 ,, 17 0	8 0 ,, 9 0	4 6 ,, 6 0
1827	14 0 ,, 18 6	7 0 ,, 10 0	6 0 ,, 7 6
1828	15 0 ,, 10 0	8 0 ,, 11 0	5 0 ,, 7 6
1829	14 0 ,, 18 0	9 0 ,, 10 0	6 0 ,, 7 0
1830	9 6 ,, 13 0	4 0 ,, 6 0	4 6 ,, 6 0
1831	13 0 ,, 17 0	5 0 ,, 7 6	5 0 ,, 6 6
1832	14 0 ,, 18 0	7 0 ,, 11 6	6 0 ,, 7 8
1833	16 0 ,, 24 0	7 6 ,, 12 0	6 6 ,, 9 6
1834	16 0 ,, 22 0	10 0 ,, 13 0	6 0 ,, 8 6
1835	15 0 ,, 18 9	10 0 ,, 13 0	7 0 ,, 8 0
1836	15 0 ,, 21 0	9 0 ,, 12 0	8 6 ,, 11 0
1837	13 0 ,, 16 0	8 0 ,, 12 0	8 0 ,, 9 6
1838	15 0 ,, 20 6	10 0 ,, 13 0	not quoted.
1839	15 0 ,, 22 0	10 0 ,, 12 0	7 0 to 8 3
1840	15 0 ,, 22 6	11 0 ,, 12 0	7 0 ,, 9 3
1841	16 0 ,, 20 0	9 0 ,, 11 0	6 0 ,, 8 0
1842	14 0 ,, 19 0	7 6 ,, 8 0	5 6 ,, 7 0
1843	not quoted.	4 9 ,, 6 6	not quoted.
1844	15 0 to 21 0	6 6 ,, 10 0	5 0 to 8 0
1845	14 0 ,, 23 0	8 0 ,, 12 0	6 0 ,, 8 0
1846	13 0 ,, 24 0	10 0 ,, 13 0	8 0 ,, 9 0
1847	20 6 ,, 25 0	10 0 ,, 14 0	8 6 ,, 9 6
1848	20 0 ,, 24 0	11 3 ,, 12 0	8 6 ,, 10 0
1849	not quoted.	not quoted.	7 0 ,, 7 6
1850	...	...	7 0 ,, 0 0
1851	17 6 to 23 0	9 0 to 12 0	6 6 ,, 8 0
1852	18 6 ,, 22 0	9 6 ,, 12 0	4 6 ,, 7 9
1853	23 0 ,, 27 0	14 6 ,, 16 6	8 0 ,, 11 6
1854	20 0 ,, 26 0	11 0 ,, 16 6	8 0 ,, 10 6
1855	23 6 ,, 26 6	14 0 ,, 16 0	10 0 ,, 11 0
1856	17 0 ,, 24 0	10 0 ,, 20 0	7 6 ,, 10 0
1857	20 0 ,, 29 0	10 6 ,, 15 0	9 3 ,, 11 0
1858	20 0 ,, 27 6	9 9 ,, 18 9	8 3 ,, 10 6
1859	20 0 ,, 25 0	10 0 ,, 14 0	8 9 ,, 11 0
1860	21 0 ,, 27 3	11 0 ,, 16 0	10 0 ,, 13 6
1861	21 0 ,, 29 0	12 0 ,, 22 0	6 3 ,, 14 0
1862	16 9 ,, 27 0	12 0 ,, 18 8	6 0 ,, 12 0
1863	20 0 ,, 30 6	13 0 ,, 16 0	8 0 ,, 11 6
1864	25 0 ,, 30 0	15 0 ,, 19 0	10 0 ,, 13 6
1865	15 6 ,, 32 6	15 0 ,, 25 0	10 0 ,, 17 0
1866	31 6 ,, 40 0	20 0 ,, 36 0	13 6 ,, 22 6
1867	20 0 ,, 30 6	14 0 ,, 22 0	7 6 ,, 13 6
1868	20 0 ,, 26 0	10 6 ,, 13 6	7 0 ,, 13 0
1869	22 0 ,, 28 0	11 0 ,, 14 0	6 9 ,, 9 0
1870	27 0 ,, 32 6	13 0 ,, 22 0	8 0 ,, 14 6
1871	23 0 ,, 37 0	13 0 ,, 23 0	11 0 ,, 16 3
1872	31 6 ,, 45 0	18 0 ,, 32 0	12 6 ,, 18 0
1873	28 0 ,, 39 0	16 6 ,, 27 0	7 0 ,, 16 0
1874	25 0 ,, 35 0	13 0 ,, 20 0	7 0 ,, 14 0
1875	26 6 ,, 37 6	15 0 ,, 21 3	9 6 ,, 17 6
1876	30 0 ,, 40 0	19 0 ,, 24 0	13 0 ,, 20 6
1877	35 0 ,, 38 9	18 0 ,, 25 0	13 6 ,, 23 0
1878	30 0 ,, 36 0	17 0 ,, 23 0	12 0 ,, 22 0
1879	25 0 ,, 35 9	16 0 ,, 24 0	10 6 ,, 20 0
1880	25 0 ,, 38 0	16 6 ,, 22 6	10 0 ,, 17 0
1881	30 0 ,, 39 0	15 0 ,, 23 0	10 0 ,, 15 0
1882	33 0 ,, 46 0	20 0 ,, 28 0	12 6 ,, 18 6
1883	36 0 ,, 50 6	24 6 ,, 33 0	14 0 ,, 21 6
1884	29 0 ,, 43 6	19 6 ,, 28 0	12 0 ,, 19 6
1885	24 0 ,, 34 0	13 0 ,, 22 6	10 0 ,, 15 0
1886	25 0 ,, 34 0	12 0 ,, 22 0	10 6 ,, 16 0
1887	22 0 ,, 30 0	11 0 ,, 19 0	8 0 ,, 13 0

Table No. 3.—PRICE of WOOL, per stone of 24 lbs. since 1818.

Year.	Laid Cheviot.	White Cheviot.	Laid Highland.	White Highland.
1818	40s 0d to 42s 2d	...	20s 0d to 22s 6d	...
1819	21 0 ,, 22 0	...	10 0 ,, 10 3	...
1820	20 0 ,, 22 0	...	9 0 ,, 10 0	...
1821	18 0 ,, 20 0	...	9 0 ,, 10 0	...
1822	12 6 ,, 14 6	...	5 0 ,, 6 6	...
1823	9 0 ,, 10 6	...	5 0 ,, 5 9	...
1824	13 6 ,, 15 0	...	6 0 ,, 6 3	...
1825	10 6 ,, 22 0	...	10 0 ,, 10 6	...
1826	11 0 ,, 14 0	...	5 0 ,, 5 6	...
1827	11 0 ,, 14 0	...	5 6 ,, 6 9	...
1828	8 0 ,, 11 0	...	5 6 ,, 6 0	...
1829	8 6 ,, 11 0	...	4 3 ,, 0 0	...
1830	9 6 ,, 11 0	...	4 6 ,, 5 0	...
1831	17 0 ,, 20 0	...	7 6 ,, 8 6	...
1832	14 0 ,, 16 0	...	7 0 ,, 7 6	...
1833	18 0 ,, 20 7	...	10 0 ,, 11 0	...
1834	21 0 ,, 24 6	...	5 6 ,, 7 0	...
1835	19 0 ,, 20 6	...	9 6 ,, 10 8	...
1836	21 0 ,, 25 0	...	10 0 ,, 14 0	...
1837	12 0 ,, 14 0	...	7 0 ,, 7 8	...
1838	19 0 ,, 22 6	...	6 0 ,, 10 0	...
1839	18 0 ,, 20 0	...	8 0 ,, 12 0	...
1840	15 0 ,, 0 0	...	7 0 ,, 0 0	...
1841	15 0 ,, 16 9	...	6 0 ,, 7 5	...
1842	12 6 ,, 14 0	...	not quoted.	...
1843	9 0 ,, 11 6	...	5 0 to 6 0	...
1844	15 0 ,, 18 0	...	not quoted.	...
1845	14 6 ,, 17 6	...	7 6 to 8 6	...
1846	12 0 ,, 14 6	...	8 0 ,, 8 6	...
1847	12 6 ,, 14 0	...	not quoted.	...
1848	9 6 ,, 11 0	...	4 9 to 0 0	...
1849	12 0 ,, 16 6	...	6 0 ,, 6 3	...
1850	15 0 ,, 17 6	...	8 0 ,, 8 6	...
1851	12 0 ,, 16 0	...	8 0 ,, 9 3	...
1852	13 0 ,, 15 0	...	8 0 ,, 9 0	..
1853	19 0 ,, 22 0	...	11 0 ,, 12 6	...
1854	12 0 ,, 15 0	...	7 6 ,, 8 6	...
1855	14 6 ,, 19 0	...	8 6 ,, 9 0	...
1856	19 0 ,, 21 6	...	11 0 ,, 0 0	...
1857	19 0 ,, 24 0	...	13 0 ,, 14 3	...
1858	15 0 ,, 17 0	...	8 9 ,, 10 0	...
1859	18 6 ,, 24 0	...	10 9 ,, 11 6	...
1860	22 0 ,, 32 0	37s 0d to 38s 0d	10 0 ,, 11 3	...
1861	19 6 ,, 27 0	from 30s upwards.	not quoted.	...
1862	18 6 ,, 26 0	30 0 to 37 0	11 6 to 16 0	...
1863	25 6 ,, 31 0	38 0 ,, 42 0	15 3 ,, 17 6	...
1864	31 0 ,, 39 0	47 0 ,, 54 0	17 6 ,, 20 0	...
1865	23 0 ,, 30 0	44 0 ,, 45 0	15 0 ,, 17 0	...
1866	24 0 ,, 30 6	30 0 ,, 38 0	14 0 ,, 16 0	...
1867	16 0 ,, 21 6	not quoted.	not quoted.	...
1868	19 0 ,, 26 0	28 0 to 32 0	8 6 to 9 0	...
1869	18 0 ,, 26 6	not quoted.	8 6 ,, 10 0	...
1870	15 0 ,, 23 6	25 0 to 26 0	9 6 ,, 0 0	...
1871	20 0 ,, 26 6	30 0 ,, 34 6	12 0 ,, 15 0	...
1872	26 0 ,, 37 6	40 0 ,, 48 0	18 0 ,, 21 0	...
1873	17 0 ,, 18 0	34 0 ,, 40 0	9 0 ,, 12 0	...
1874	18 6 ,, 26 6	30 0 ,, 34 0	9 6 ,, 13 0	...
1875	25 0 ,, 32 0	34 6 ,, 36 0	12 6 ,, 16 0	...
1876	20 0 ,, 24 0	30 0 ,, 34 6	9 6 ,, 12 0	...
1877	20 9 ,, 26 0	28 0 ,, 30 0	10 0 ,, 12 0	...
1878	18 9 ,, 25 0	27 0 ,, 32 0	8 6 ,, 11 6	...
1879	15 0 ,, 17 0	prices very low.	7 0 ,, 0 0	...
1880	20 0 ,, 24 0	30 0 to 32 0	10 6 ,, 11 6	14s 0d to 15s 0d
1881	17 0 ,, 21 0	27 0 ,, 30 0	5 0 ,, 9 6	12 0 ,, 13 0
1882	14 0 ,, 18 0	27 6 ,, 28 0	7 6 ,, 9 0	13 0 ,, 14 0
1883	13 0 ,, 18 0	26 0 ,, 28 0	6 6 ,, 8 6	11 6 ,, 12 6
1884	13 0 ,, 18 0	26 0 ,, 28 0	6 6 ,, 8 6	11 6 ,, 12 6
1885	12 0 ,, 17 0	22 6 ,, 26 0	6 0 ,, 8 0	11 6 ,, 12 0
1886	13 0 ,, 18 0	23 0 ,, 27 6	6 6 ,, 8 6	11 6 ,, 12 0
1887	14 0 ,, 22 0	23 0 ,, 28 0	7 0 ,, 9 0	11 6 ,, 13 0

ONTARIO AGRICULTURAL COLLEGE AND EXPERIMENTAL FARM.

By the Rev. JOHN GILLESPIE, A.M., Mouswald Manse, Dumfriesshire.

THE writer visited the above institution during the autumn of 1887. He spent considerable portions of two days in the college buildings and on the farm, and had thus a favourable opportunity of becoming acquainted with its distinctive characteristics, and of forming an estimate of the nature and results of the varied work which it accomplishes. From repeated perusal of reports and other documents regarding it, he had previously formed a decided opinion that an institution of a similar character would be admirably adapted to the wants of the rising generation of farmers in Scotland, and a careful personal inspection of the place and the work carried on strongly confirmed the opinion already entertained.

When established, it was expressly stated that the objects were twofold,—(1) to give theoretical and practical instruction in husbandry to young men who intend to follow farming as a business, and (2) the conducting of experiments tending to the solution of questions of material interest to the agriculturists of the province. For the benefit of the farming community, bulletins are issued from time to time, which narrate the history and results of the experiments. Further, the students in attendance are afforded the fullest opportunity of witnessing these experiments at every stage of their progress, so that these are of great value to them educationally. These are of the most varied character, relating to the production of beef and milk, as well as the growth of farm crops. Thus the institution is at once a provincial agricultural college and an experimental farm.

The Ontario Agricultural College is situated on a farm of 550 acres, one mile south of the city of Guelph, in that province of Canada. It was formally opened in 1874, and therefore it has been in existence for fourteen years. When the property was purchased by the provincial authorities in 1873, it had on it an ordinary dwelling-house and farm buildings which, though superior to the average farm steadings in Ontario, were in many respects inadequate and unsuitable to the purpose to which they were to be devoted. Instead of being taken down and entirely rebuilt, they were added to and remodelled by degrees. Probably it would have been more economical in the long run to have gone on the principle of making "a new stock, lock, and barrel." However that may be, they are now commodious, and on the whole satisfactory. The college buildings, which present a rather imposing appearance, are built of magnesian limestone

They consist of two stories and a basement, and the central portion has an additional story. They are 240 feet in length, and have an average depth of 42 feet.

As already indicated, the institution is not only the property of the Provincial Government, but it is also annually subsidised by a grant from its exchequer. The sum voted by the Provincial Legislature varies more or less, but it may be stated at upwards of 20,000 dollars, which is equivalent to fully 4000 guineas sterling. For a time after it was first started the entire establishment, including every officer connected with it, was immediately and directly under the charge of the Commissioner of Agriculture, who is responsible to the Government, which is amenable to the Legislature, and that of course to the people. Recently, however, the management has been greatly changed, inasmuch as the Commissioner of Agriculture has now associated with him an advisory board, which is nominated by the Government from both political parties in the province. This board consists of seven members, who retire in rotation, but are eligible for reappointment. When on duty they are paid for their services at the rate of four dollars (say 17s.) per day, in addition to their actual travelling expenses. Thus, while liberally subsidised from the public funds, yet in its general supervision and management it is in the hands of a board of men specially qualified for such work.

The staff consists of—

(1) The President, who, in addition to a general supervision of the whole establishment, lectures on English literature and political economy.

(2) The Professor of Agriculture, who also teaches arboriculture, as well as manages the farm, including the live stock department.

(3) The Professor of Chemistry, who, in addition to delivering lectures, directs and superintends the work of the students in the laboratory.

(4) The Professor of Geology, Botany, Zoology, Meteorology, and Horticulture.

(5) The Professor of Veterinary Science.

(6) The Professor of Dairying. In this connection it may be mentioned that there is a butter factory on the farm, mainly maintained for the instruction of the students. The cream is purchased and collected from the farmers in the district. The butter is disposed of to a Glasgow firm, and is understood to be for the most part consumed in Edinburgh, where it is said to be highly appreciated. The writer learned that the cost of carrying the butter from Guelph railway depôt to the Clyde in refrigerated cars on the railway, and similarly on board ship, is at the rate of 66 cents. per 100 lbs.—equivalent of one-third of a

penny per lb. It is packed in small tin-lined tubs, which realise in Scotland, when empty, a considerable proportion of their cost price. The above figures show to what a small extent our Canadian competitors are placed at a disadvantage, in consequence of their distance from our shores.

(7) The Teacher of Mechanics, Elementary Surveying, Book-keeping, &c.

In addition to the above, there is a farm foreman, a horticultural foreman, and a mechanical foreman.

The work carried on in connection with the institution may be classified under two heads or divisions, viz.—(1) The theoretical, and (2) the practical, the former of which is conducted in the different class-rooms in the college proper, and the latter on the farm. The course of study extends over two years, and the subjects embraced therein need not be separately enumerated here, as they can be inferred from the list of the staff given above. In addition, an arrangement has been made for post-graduate work, that is for associates of the college who wish to continue their work in certain departments for a few months longer than the regular course permits, with a view to preparing themselves more fully for the work of the farm, or for positions as teachers or professors of agriculture. The degree of B.S.A. (Bachelor of Science in Agriculture) has been provided, which those attending a third year generally seek to take.

There are two sessions—the winter and the summer session. The former, embracing the fall and winter terms, extends from 1st October to 16th April, omitting the Christmas vacation, which lasts from 22nd December to 22nd January. The summer session includes the spring and summer terms, and continues from 17th April to 31st August. During the summer term, which extends over two months, viz., July and August, there is no class-room work attempted, the students during that period being entirely occupied in the outside work of the farm. During the fall, winter, and spring terms the time of the students is divided between indoor and outdoor work in the following manner:—

Twelve students, selected in rotation, go out at 6 in the morning to feed the cattle and sheep, clean stables, &c. The rest are called at 6, and go to breakfast at half-past 6. At 7.30 those who are not working outside go to drill for an hour. All assemble in the class-room for roll-call and prayers at 8.30; and from 8.45 to 11.45, that is, for three hours, they are at lectures in the college.

For the afternoons the entire number is divided into two equal divisions, who work and study alternately. One division goes out to work from 1.30 to tea time, and the other reads or studies under a professor in the class-room from 1.30 till 4, after which they are free until the call is made for tea at 5.30 or 6 o'clock, according to the season of the year.

From 7 to half-past 9 in fall and winter, and from 8 to half-past 9 in spring, they all study in their rooms under the supervision of the night watchman and one of the professors. Lights are put out at 10, and the doors closed at half-past 10. The half of every Saturday is a holiday, and every student, who is not under ban for some misdemeanour, is allowed to be out one evening in the week till half-past 10. Those who remain during the summer term (July and August) work 9½ hours outside.

It will be seen from the foregoing, that in addition to the occasional morning's work among the live stock, each student for eight months of the year works four hours on every alternate day, the remainder of his available time being devoted to attendance on lectures and to private study, the latter being more or less closely supervised by one or other of the professors. Each student takes his turn at a great variety of jobs, clean and dirty, easy and difficult, in fact, whatever falls to be done, without favour or distinction. They are, however, paid for their labour at the rate of from 5 to 10 cents (2½d. to 5d.) per hour, according to their experience and the nature of the work done. Under the system we have described, they have not only ample opportunities of witnessing and having explained to them by the Professor of Agriculture the practical carrying out of the theoretical principles set before them in the class-rooms, but they also become acquainted with all the details of farming operations, by personally taking part in every department of farm work. In short, they get an all-round agricultural education, being thoroughly instructed in both its theoretical and practical sides.

In this connection it may be mentioned that there are several specimens—breeding animals—of all the principal varieties of British breeds of cattle kept on the farm, so that the students are made acquainted with the distinctive characteristics of each; in fact, special means are adopted to make them thoroughly sound and intelligent judges of live stock. A class-room has been fitted up for the express purpose of one or more animals being brought into it, and the Professor of Agriculture is in the habit of illustrating his remarks on the characteristics of different varieties of beef-producing and other breeds of cattle by using the animals before him for his demonstrations. After explaining the points of an animal, the professor makes every student do the same thing in the presence of the class. He is cross-questioned by his fellow-students as well as by his teacher, and made to give evidence of his knowledge of the distinctive breeds of beef and milk producing animals respectively, as well as the weak and strong points of the individual beasts being handled. This method of demonstrative teaching is somewhat novel, but we would ask, could there be a better system of making young men, who intend to be farmers, good judges of live stock? Professor Brown was very emphatic in his testimony as to the marked success which has attended this method of practical instruction. Would not great benefit be derived by our young farmers if a few demonstrations of this kind were carried out in our principal market towns by a few competent authorities on live stock?

The institution being maintained for the benefit of the residents of Ontario, pupils from that province have the first claim to be admitted, and they are charged a lower tuition fee than students from other parts of Canada and elsewhere. If by the 8th or 9th of September the applications from Ontario are not sufficient to fill the vacancies, the President notifies in their order such as have applied from the lower provinces and from Great Britain. The authorities require a written declaration in every case that the applicant intends to be a farmer. According to the testimony of President Mills, in the majority of cases the declarations by students have been kept, but he adds there are a few instances in which ex-students profess to have changed their minds, and have not gone into farming. On the whole, however, the declaration has been a *bona fide* agreement. As far as the preliminary test is concerned, the terms of admission are easy, the standard being the same as for the entrance to the high schools. The certificate of admission to a high school in Ontario is accepted as equivalent to passing the matriculation examination of the college. No student is admitted under 15 years of age. The ages range from 15 to 30, most of the students being from 15 to 22 years of age.

We now come to specify the expense at which this education in the theory and practice of agriculture can be had by the different classes of young persons who are found to take advantage of it. Ratepayers and *bona fide* residents in Ontario are charged annually 25 dollars (say 5 guineas) for tuition: while non-residents have to pay double that amount, viz., 50 dollars (say 10 guineas). Board and washing are charged at cost price, viz., 2.25 dollars (say 9s. 6d.) per week. As has already been explained, every student is paid for his work at the rate of from 5 to 10 cents (2½d. to 5d.) per hour, and the amount thus earned is credited on his board account. The entire outlay incurred for tuition, board, and washing is from 35 to 50 dollars (say 7 to 10 guineas) to an Ontario farmer's son who understands and is so far familiar with ordinary farm work. The total expense is from 45 to 65 dollars (say 9 to 13 guineas) to an Ontario boy who has not been trained to work on the farm; for example, such youths as come from the cities in the province. To a non-resident the outlay is found to be from 65 to 85 dollars (say from 13 to 17 guineas).

Since 1886 there has been a modification to some extent in the terms on which a certain number of Ontario boys are admitted to the benefits of the institution. Since that date every county and every territorial district in the province has had the privilege of having, during all college terms, one student in attendance and receiving instruction at the college without the payment of any entrance or tuition fee. The County Council nominates the student entitled to this privilege for its respective county, and the students from the territorial districts (which have no proper organisation) are selected by the Advisory Board. Such student must be the son of a practical farmer resident in the county or district, and have lived on his parents' farm at least two years prior to his admission to the college. In the first year that this new rule was in operation no fewer than thirty-two counties nominated young men, and it has had the effect of supplying the college with a larger proportion of farmers' sons, and a better class of students than previously.

This leads us to the subject of attendance. The facilities which the Ontario Agricultural College and Experimental Farm afford of providing young men with a thorough education alike in the science and practice of agriculture, at what will no doubt be considered on this side of the Atlantic a small cost, have been taken advantage of to an extent that must be considered entirely satisfactory. The following figures show the numbers on the roll during seven years—the data being taken from the published reports of each year:—

Year.	On the Roll.
1880,	176
1881,	217
1882,	206
1883,	202
1884,	188
1885,	175
1886,	149

The reports for the last three years specified enable us to supply the following additional particulars as to the districts and countries from which the students were drawn:—

Year.	Ontario.	Elsewhere.	England.	Scotland.	Ireland.
1884,	120	68	26	3	2
1885,	103	72	30	5	5
1886,	94	55	25	4	4

As far as I am aware, a doubt has never, with any show of reason or good grounds, been cast on the success of the work carried on at this institution. From what I saw when at the college, heard when I was in Canada, and have read of it before and since my visit, it accomplishes the objects aimed at by its founders with a degree of efficiency and success which leave little indeed to be desired. Its patrons and admirers on the other side of the Atlantic make the following claims on its behalf, each of which is undoubtedly well founded:—

(1) The education is excellent in every respect; (2) it is practical as well as theoretical; and (3) it is procured at such a very moderate cost as to be within the means of almost every young man who intends to make farming his business.

Are not these the very requirements which any system of higher agricultural education provided for Scotland should fulfil? The force of the first and third are so self-evident as not to call for any argument being advanced in support of them. Different views have been expressed as to the second, while some have objected altogether to the students performing manual labour, as being incompatible with due attention to class-room work and the private studies which it is necessary to carry on. As to the latter point, let it be borne in mind that the students at the Ontario Agricultural College are occupied in manual work on an average little more than two hours daily during eight months of the year—a length of time little more than is necessary to be devoted to healthful exercise, and certainly not entailing too much personal exertion to unfit a healthy young man for mental work.

It would be foreign to the object of this paper were I to discuss at length the advantages of an education in the science and practice of agriculture being carried on together. But surely it will not be denied that could a young man acquire a knowledge of both at no greater cost than an acquaintance with the theoretical principles of agriculture alone would cost him, the acquiring of them at one and the same time would be advantageous in point of economy in money, expenditure of time, and otherwise.

I submit that the establishment of such an institution as the Ontario Agricultural College and Experimental Farm in the neighbourhood of one of our large cities would fulfil the three requirements specified above, provided means could be found to pay a large proportion of the salaries of the teaching staff. This could be done at a comparatively small outlay, seeing the class-room work could be conducted by non-resident lecturers, with the exception of the Professor of Agriculture, who should be resident. The time of these visiting lecturers would only be partially occupied in the work of the college, and consequently they would not require to be so liberally remunerated as would otherwise be the case. The benefits of the institution might be available not only to boarders in the college, but also to students who live in the adjoining city, and who attend the lectures in the college daily. The outlay to resident students would be the actual cost of their board, and such a small tuition fee as would be necessary to supplement the salaries of the lecturers otherwise provided. The board account would fall to be reduced by the amount credited to each student for his labour. At the utmost, under such a scheme, the total cost to the student would be less than the actual cost of his board, which if the institution were managed with reasonable economy and success, would be so moderate as to place the benefits of the establishment within the reach of a considerable proportion of the rank and file of farmer's sons who intend to follow farming as a business.

APPENDIX (A).

PROCEEDINGS AT BOARD MEETINGS.

MEETING OF DIRECTORS, 2ND FEBRUARY 1887.

Present.—Vice-Presidents—Viscount Stormont; Rev. John Gillespie, Mouswald. Ordinary Directors—Mr Elliot of Wolfelee; Mr Marr, Cairnbrogie; Mr Matthews, Newton-Stewart; Mr Middleton, Clay of Allan; Mr Paterson of Birthwood; Mr Murdoch, Gartcraig; Mr Elliot, Hollybush; Mr Mackenzie, yr. of Kintail; Mr Kerr, Broomhouse; Mr Maxwell, yr. of Munches; Mr Ballingall, Dunbog; Mr Fisher, Jellyholm; Mr Cran, Kirkton; Mr Hewetson, Auchenbainzie; Sir Robert Menzies, Bart.; Mr Buttar, Corston; Mr Park, Dechmont; Lord Arthur Cecil, Orchard Mains; Mr Macpherson Grant of Drumduan; Mr Stirling of Kippendavie; Mr Glendinning, Hatton Mains; Mr Dudgeon, yr. of Cargen. Extraordinary Directors—Mr Dingwall, Ramornie; Mr Ferguson, Kinnochtry; Mr Macduff of Bonhard; Mr Shaw, Skaithmuir; Mr M'Queen of Crofts; Mr Paterson, Plean Farm; Mr Howatson of Glenbuck; Mr Dudgeon, Easter Dalmeny. Chairmen of Standing Committees—Mr Villiers, Closeburn Hall; Sir James H. Gibson-Craig, Bart; Mr Hope, East Barns. Chemist—Dr A. P. Aitken. Auditor—Mr Wm. Home Cook, C.A. Engineer—Mr James D. Park. Viscount Stormont, and afterwards the Rev. John Gillespie, in the chair.

Mr F. N. MENZIES reported apologies for the absence of Sir William S. Walker, K.C.B.; Mr Allan, Munnoch; Mr Irvine of Drum; Mr Lumsden of Balmedie; Mr Mackenzie of Portmore; Mr Murray, Catter House; Mr Connal Rowan of Meiklewood; Mr Young of Cleish Castle; and Dr Cleghorn, Stravithy.

VETERINARY DEPARTMENT.

Pleuro-Pneumonia.—The Board resolved that a deputation wait on the Privy Council next week, to lay before their Lordships the present unsatisfactory working of the Contagious Diseases (Animals) Act with reference to pleuro-pneumonia.

CHEMICAL DEPARTMENT AND AGRICULTURAL EDUCATION.

The Committee on the Chemical Department and Agricultural Education recommended the Board to send a deputation to Government to ask for a subsidy to enable them to devise a plan of agricultural education, details to be furnished to Government when it is ascertained whether they will be inclined to assist the Society in the matter.

The Board approved of a deputation going to London on the subject, and left it to the committee to arrange the members of the deputation.

BOTANICAL DEPARTMENT.

A minute of the Botanical Department was read, from which it appeared that the committee had under consideration the temperature to be adopted in testing seeds, when it was agreed that the temperature suggested by Mr Carruthers, botanist to the Royal Agricultural Society of England, and adopted by Professor M'Alpine—namely, from 65 to 70 degrees—was better than the high temperature of 80° used in Germany. The process of testing is uniform, being on blotting-paper and soft brick. The committee were of opinion that it was impossible to adopt a uniform time for all kinds of seeds; for instance, clover seeds could be tested in ten days, while grasses would require three weeks.

PERTH SHOW, 1887.

Viscount Stormont was named convener of the local committee.

Mr W. S. Ferguson, Pictstonhill, who supplied the forage on the occasion of the Show at Perth in 1879, was selected to supply the forage at the forthcoming Show.

QUEEN'S JUBILEE CUPS.

On the motion of Mr HOWATSON of Glenbuck, it was unanimously agreed—"That the Directors make it known that they are prepared to receive Queen's Jubilee or other cups from societies or any party offering the same as prizes for pure-bred animals at their Shows, the value of any cup not to be less than £20—intimation of the prizes to be sent to the Secretary before the 30th of April."

PRICE OF FARM PRODUCE.

The Committee on the Price of Farm Produce was authorised to prepare a report of the information they have obtained, and to have it printed.

SHOW DISTRICTS.

On the motion of the Rev. JOHN GILLESPIE, seconded by Mr MATTHEWS, Newton-Stewart, it was agreed that no member shall vote in more than one show district in the nomination of Directors.

LECTURES ON MENSURATION AND SURVEYING.

A letter was read from Mr J. Gibson Fairweather, Edinburgh, intimating that he proposed giving a course of ten lectures on mensuration and surveying on Saturday mornings at his chambers, 21 St Andrew Square, to be followed by five field lessons in March, to be given in the suburbs on Saturday afternoons.

COMMITTEES FOR 1887.

The various committees for the current year were arranged, and the proceedings terminated.

MEETING OF DIRECTORS, 2ND MARCH 1887.

Present.—Vice-Presidents—The Earl of Elgin and Kincardine; Viscount Stormont; Rev. John Gillespie; and Colonel Gillon of Wallhouse. Ordinary Directors—Mr Marr, Cairnbrogie; Mr Murray, Catter House; Mr Paterson of Birthwood; Mr Young of Cleish Castle; Mr Murdoch, Gartcraig; Mr Elliot, Hollybush; Mr Mackenzie, yr. of Kintail; Mr Kerr, Broomhouse; Mr Lumsden of Balmedie; Mr Maxwell, yr. of Munches; Mr Ballingall, Dunbog; Hon. R. Baillie Hamilton of Langton; Mr Cran, Kirkton; Mr Hewetson, Auchenbainzie; Sir Robert Menzies of Menzies, Bart.; Mr Buttar, Corston; Mr Park, Dechmont; Lord Arthur Cecil, Orchard Mains; Mr Macpherson Grant of Drumduan; Mr Glendinning, Hatton Mains; Sir John Innes of Edengight, Bart.; Mr Dudgeon, yr. of Cargen. Extraordinary Directors—Mr Gilmour of Lundin; Mr Macduff of Bonhard; Mr Allan, Munnoch; Mr Mackenzie of Portmore; Mr Dudgeon, Easter Dalmeny; Mr Shaw, Skaithmuir; Mr M'Queen of Crofts; Mr Paterson, Plean Farm. Chairmen of Standing Committees—Mr Villiers, Closeburn Hall; Mr Scott Dudgeon, Longnewton; Mr Hope, East Barns; Mr Irvine of Drum. Chemist—Dr A. P. Aitken. Auditor—Mr William Home Cook, C.A. Engineer—Mr James D. Park. The Earl of Elgin in the chair.

Mr F. N. MENZIES reported apologies for the absence of Sir James Gibson-Craig, Bart.; Sir William S. Walker of Bowland, K.C.B.; Mr Balfour of Balbirnie; Mr Elliot, yr. of Wolfelee; Mr Fisher, Jellyholm; Mr Howatson of Glenbuck; Mr Matthew, Newton-Stewart; Mr Connal Rowan of Meiklewood; and Mr Stirling of Kippendavie.

GENERAL SHOWS.

The Rev. JOHN GILLESPIE moved—"That it be an instruction to the Secretary, when the recommendations of the members in the show district of the year regarding the prize list have been disposed of, to communicate the decision of the Board thereon, together with such explanations as may be deemed necessary, to the Chairman of the meeting at which the recommendations were agreed to." In supporting the motion, Mr Gillespie said he wished it to be understood that it had not been the habit of the Board to give notice of any decision come to in such cases, and therefore the Perth people were treated as had always been the custom.

Mr MACDUFF of Bonhard seconded the motion, which was unanimously agreed to.

SELECTION OF JUDGES.

The report by the Committee on the Selection of Judges was then presented. It was as follows:—

"*Report by Committee, 1st February 1887.*—*Present*—Mr Mackenzie, yr. of Kintail, in the chair; Mr Elliot, Hollybush; Mr M'Queen of Crofts; Mr Marr, Cairnbrogie; Mr Park, Dechmont; Mr Villiers, Closeburn Hall. The committee beg to report as follows:—1. That there be no change in the number of judges to be appointed. 2. That the present system of exhibitors sending in lists of judges be discontinued, as the result has not been found satisfactory. 3. That the country be divided into three divisions. The first division, comprising the districts of Inverness, Aberdeen, and Perth, be called the Northern Division; the second division, comprising the districts of Stirling, Edinburgh, and Glasgow, be called the Central Division; the third division, comprising the districts of Dumfries and Kelso, be called the Southern Division. 4. That three committees of five members each be appointed by the Directors, representing the classes of stock exhibited—1, cattle; 2, horses: 3, sheep, &c. Such committees shall prepare lists of gentlemen considered competent to act as judges of the various classes. 5. After the closing of the entries, the committee shall submit the lists for the approval of the General Show Committee. The General Show Committee shall from these lists select names not less in number than will prove sufficient for the number of judges required for each section, together with one name in reserve for each judge who may be appointed. 6. The General Show Committee shall cause the names of judges so selected by them to be drawn by lot in such a manner as they may suggest, provided always that one judge and one name in reserve be drawn if possible from each division of the country. 7. In the event of any selected judge declining or failing to act, the name of the reserved judge representing the division for which the judge so declining would have acted shall be inserted. The Convener, in laying the report before the meeting, expressed his great regret that he was obliged to enter his dissent against the finding of the other members of the committee, particularly as to that part referring to the system of balloting or drawing by lot for the judges of the different stock."

Mr PATERSON of Birthwood moved—"That only the two first clauses of this report be adopted; that the thanks of the Board be given to the committee, and that they be freed from further service."

Mr SHAW seconded the motion, on condition that No. 2 should not be retained.

Sir ROBERT MENZIES, Bart., seconded the motion as it stood.

Mr MARR moved the adoption of the report, which was seconded by Mr KERR.

The Rev. JOHN GILLESPIE moved—"That Nos. 1 and 2 be retained, and that instead of the remainder the following regulation be adopted:—'The General Show Committee shall draw up a list of judges for each class of stock not fewer in number than double the number required, the final selection from these to be determined by lot. The General Show Committee are instructed, in selecting judges, to see that the respective districts where each class of stock is bred and reared be duly represented on the list.'"

Mr BUTTAR seconded Mr Gillespie's motion.

A discussion then ensued, in which Lord Arthur Cecil, Viscount Stormont, Mr M'Queen, Mr Murray, Mr Hewetson, and the Chairman took part.

On a show of hands, 25 voted for the disapproval of the report, and none against.

On a second division between Mr Gillespie's motion and Mr Paterson's, 20 voted for Mr Gillespie's and 9 for Mr Paterson's.

PLEURO-PNEUMONIA.

A letter was read from Sir James Gibson-Craig, Bart., in regard to the interview the deputation from the Highland Society had with the Privy Council on the 8th of last month. He considered the result as satisfactory as could be expected, and especially so on two points. 1st. It was found that the agricultural division of the Privy Council was thoroughly in accord with the Highland Society, and ready to give the agricultural interest any assistance in their power; 2nd. The explicit acknowledgment by Lord Cranbrook that our outbreaks of pleuro were in all probability due to Ireland. There was one question, Sir James said, which had not been noticed in the newspaper reports—namely, the question of quarantine of Irish cattle, and putting them on the same footing as Canadian. He did not expect to get anything definite from the Privy Council on this point, and perhaps for pleuro it would not be workable, but he wished to accustom the official mind to the idea of such a thing, and the next time we are visited with a foot-and-mouth we may have to press it. At any time it would be a great safeguard, as the knowledge of even a twenty-four hours' detention would prevent the Irish drovers risking any suspicious cattle. Though the expense would be great, the advantages, even to the Irish, would be far greater. They export 700,000 beasts annually, and they would easily rise 10s. a head if they were presented in our markets in fair condition, and with a reasonable presumption of freedom from disease. This means an increased value of the Irish cattle trade of £350,000 a year, besides an advantage to ourselves. As regards inoculation for pleuro, Professor Brown seems to be of opinion that inoculated animals are capable of transmitting the disease, and should never leave the place, except for the butcher. If this is the case, we should have a rule prohibiting inoculated animals from being exhibited at our Shows. Very little, however, seems to be known on the matter, and there is nothing the Society could do more good in than by instituting a series of exhaustive experiments. It is evident we can expect no grant from the Treasury, and the Society's funds are not in a state to undertake it. He believed a great deal might be done for £500 or £600, and this could surely be raised among the members for an investigation of such importance to all farmers.

The Rev. JOHN GILLESPIE said that, as a member of the deputation, he desired to take the opportunity of saying that the deputation itself and the Board were under great obligation to Sir James Gibson-Craig for the clear, and forcible, and admirable manner in which he represented the views of the Society to the Privy Council. The statement could not have been more admirable than it was in every respect from the lips of Sir James Gibson-Craig. He did not think they should be doing their duty in regard to this important subject if they passed it without doing anything more. He moved as follows:—"Resolve to recommend all local authorities to prohibit the importation of Irish cattle into their respective jurisdictions till 1st May."

Mr MACKENZIE of Portmore seconded the motion, which was unanimously agreed to.

PRICE OF FARM PRODUCE.

The SECRETARY stated, with reference to the price of farm produce, that the subject had been before the committee that forenoon, and he read the minute of the committee recommending the Directors to publish in the *Transactions* the report and relative tables.

The Directors approved of the recommendation.

THE "TRANSACTIONS."

It was agreed, on the motion of Mr M'QUEEN of Crofts, seconded by Sir ROBERT MENZIES, Bart.—"That it be remitted to the Committee on Publications to prepare a fresh list of subjects for next year's *Transactions*."

GLASGOW INTERNATIONAL EXHIBITION, 1888.

On a letter being read from Mr W. M. Cunningham, secretary, inviting the Society to nominate three of their number to act as members of an Agricultural Committee, Mr Scott Dudgeon, Mr M'Queen, and Mr Murray were nominated.

AGRICULTURAL AND FORESTRY EDUCATION.

The SECRETARY intimated that the examinations had been fixed for the 28th, 29th, and 30th March, and candidates' names must be entered with him before the 16th.

RESOLUTION ON THE DEATH OF MR H. M. JENKINS.

A letter was read from Lord Egerton of Tatton, acknowledging the resolution passed at the meeting on the 19th January, and, on behalf of the Council of the Royal Agricultural Society of England, offering his sincere thanks for the kind expression of sympathy therein contained.

TESTIMONIAL IN MEMORY OF THE LATE MR H. M. JENKINS.

A circular letter was read from Messrs Druce, Dyer, and Thornton in regard to a testimonal in memory of the late Mr H. M. Jenkins, which, after consideration as to what line should be adopted, was postponed till next meeting.

BOOKS PRESENTED TO THE SOCIETY.

The SECRETARY submitted Volume XI. of the Polled Herd-Book, and Volume IX. of the Clydesdale Stud-Book, presented to the Society.

The books were accepted with thanks.

MEETING OF DIRECTORS, 6TH APRIL 1887.

Present.—Vice-Presidents—Earl of Elgin and Kincardine; Viscount Stormont; Rev. John Gillespie, Mouswald; Colonel Gillon of Wallhouse. Ordinary Directors—Mr Elliot of Wolfelee; Mr Middleton, Clay of Allan; Mr Murray, Catter House, Mr Paterson of Birthwood; Mr Young of Cleish Castle; Mr Elliot, Hollybush; Mr Mackenzie, yr. of Kintail; Mr Maxwell, yr. of Munches; Hon. R. Baillie Hamilton of Langton; Mr Buttar, Corston; Mr Glendinning, Halton Mains. Extraordinary Directors—Mr Dingwall, Ramornie; Mr Ferguson, Kinnochtry; Mr Macduff of Bonhard; Mr Howatson of Glenbuck; Mr Mackenzie of Portmore; Mr Dudgeon, Easter Dalmeny; Mr M'Queen of Crofts; Mr Paterson, Plean Farm. Chemist—Dr A. P. Aitken. Auditor—Mr Wm. Home Cook, C.A. Engineer—Mr James D. Park. Chairman of Veterinary Department—Mr Hope, East Barns. The Earl of Elgin in the chair.

Mr F. N. MENZIES reported apologies for the absence of Sir Robert Menzies of Menzies, Bart.; Sir James Innes of Edengight, Bart.; Mr Cran, Kirkton; Mr Dudgeon, yr. of Cargen; Mr Fisher, Jellyholm; Mr Irvine of Drum; Mr Kerr, Broomhouse; Mr Matthews, Newton-Stewart; Mr Murdoch, Gartcraig; Mr Park, Dechmont; and Mr Connal Rowan of Meiklewood.

DECEASED MEMBERS.

Before proceeding with the business on the programme, it was agreed to record in the minutes an expression of the Directors' deep regret at the death of Sir Walter Elliot of Wolfelee, K.C.S.I., and Mr James Shaw, Skaithmuir, both of whom had acted as Ordinary and Extraordinary Directors of the Society, and members of various committees.

PLEURO-PNEUMONIA.

The SECRETARY reported that, in terms of the instructions at last meeting, he had sent a circular to all the Local Authorities in Scotland recommending that they should, as far as possible, prohibit the importation of Irish cattle into their respective districts till 1st May. The circular had been favourably received and generally adopted.

PERTH SHOW, 1887.

Jubilee Prizes.—A letter was read from Mr M'Neilage, secretary of the Clydesdale Horse Society of Great Britain and Ireland, intimating that the council of his Society offers two jubilee champion prizes of £20 each for competition at the Show to be held at Perth. One of these prizes is for the best male Clydesdale exhibited, of any age, registered in the Clydesdale Stud-book, but excluding geldings. The other prize is for the best female Clydesdale, of any age, exhibited, and registered in the Clydesdale Stud-book. The offer was accepted with thanks. Mr Howatson reported that he was not in a position at present to give a list of the jubilee prizes for black-faced sheep. The money they had collected was greater than they expected, but before the 30th of April he would have the classes of stock for which the cups were to be given sent to the Secretary.

NOMINATION OF LOCAL COMMITTEE.

Letters to the Conveners of the Counties connected with the Show.—The Eastern Division of Perthshire, Western Division of Forfarshire, Fifeshire, and Kinross-shire —and to the Lord Provost of Perth, in regard to the nomination of the local committee, were agreed to.

GLASGOW SHOW, 1888.

The Board approved of letters being addressed to the conveners of the counties embraced in the district of the Glasgow Show—Lanark, Ayr, Argyll, Renfrew, and Bute—and to the Lord Provost of Glasgow, in reference to the auxiliary subscription.

SHOW, 1889.

Mr ELLIOT of Wolfelee, pursuant to his notice—postponed from the Board meeting on the 2nd of March—moved "That a committee be appointed to select a suitable place in the Kelso district for the Show of 1889." After some discussion, the motion was ultimately withdrawn, it being considered that it was too early to move in the matter, but that it would be considered at a future meeting.

AGRICULTURAL AND FORESTRY EDUCATION.

The reports of the agricultural and forestry examinations were submitted, showing that the written examinations were held on the 28th and 29th and the oral on the 30th March. The number of candidates who presented themselves was 22—namely, 21 in the agricultural and one in the forestry department. The examinations resulted in 8 passing for the diploma, 5 for the first-class and 6 for the second-class certificates in agriculture, and one for the first-class certificate in forestry.

QUARTER-ILL OR BLACKLEG IN CATTLE.

The following letter, addressed to the Secretary, was read:—

"Arbuthnott, Fordoun, 12th March 1887.

"Sir,—I desire to bring under your notice a remedy or prophylactic for quarter-ill or blackleg in young cattle, in hopes that it may be regarded as worthy of publication in the records of the Society. I have practised it on hundreds of cattle for the last twenty-five years without one case of failure. But not to speak of my own work, I have the evidence of numerous letters to myself, as also letters in the *North British Agriculturist and Farming World* of February 18th, of which I enclose copy, that the method pursued is very successful in its results. The disease, as is well known, is very fatal in many districts, and great loss by it is of every-day occurrence, and in these times of depression farmers can ill afford to lose cattle by death when those that live don't pay. My remedy,.and I think I may fairly claim the discovery, is as simple as it is effective. The treatment consists of a species of inoculation, by which the young animal is freed from liability to the disease. A preparation of turpentine and garlic is inserted under the skin in each quarter, and so quickly does it permeate the system that within a few minutes of its application the smell of the ingredients is perceived in the breath of the animal. The art of the operation is in the way of performing it so that the remedy shall remain inside the skin, and not come out until the animal is killed and skinned, when it will be found as fresh and active as when first put in. I have long been under the impression that what is called braxy in young sheep is the same as quarter-ill in cattle, and last September I inoculated 100 ewe lambs for Mr John Campbell Baillie, Farfside, Glenesk, with the result that not one out of the hundred has died. They were sent to the low country for the winter along with other 300, and out of that number 21 have died, the whole flock getting the same treatment. The expense is so little that it is hardly worth writing about. Sixpence would more than do 20 cattle, and half-a-crown 100 sheep. I seek no personal emolument, being content to serve my fellowman in the matter, so far as I may, by helping him to eradicate the evil.—I am, &c.,

(Signed) "BENJAMIN BUCHANAN.

"F. N. Menzies, Esq."

Excerpt from Letter enclosed.

"Get from a seedsman ½ lb. of finest French garlic bulbs, remove the skin and break every section of the bulb from one another; these all again have to be skinned, after which take a jar or wide-necked bottle, put in the garlic as prepared (that is, the soft juice parts), and then put turpentine into the bottle sufficient to cover the garlic; cork it up for twenty-four hours; it will then be ready for use. It will keep as long as you like. Treatment of the animals:—They are inoculated on all the four quarters—on the flat of the fore and hind legs, on the thigh in the most convenient place. Take the skin between the finger and the thumb of the left hand, make sure and draw it well from the flesh, make a horizontal cut with a sharp knife sufficient to admit your little finger, which insert to remove the skin from the flesh in the direction of the animal's foot, put the finger as far down as you can get it, this makes a hole exactly like a pocket, put in one of the sections of the garlic, and leave it there.'

H. M. JENKINS'S MEMORIAL FUND.

A circular was submitted from Lord Egerton of Tatton, sending copy of a resolution passed at a representative meeting of agriculturalists, when it was resolved to raise a fund as a memorial of the late Mr H. M. Jenkins, in recognition of the many public services he rendered to agriculture, the subscription being limited to £25. Mr Paterson of Birthwood, who brought forward the motion at the previous meeting, said he was sure that those who had had the pleasure of knowing Mr Jenkins would desire that they should contribute a sum worthy of the Society towards the uprearing of his family. Mr Jenkins had done a great deal for agriculture. He was also an accomplished linguist, knowing, as he did, no fewer than eleven different languages, and was able in any part of the Continent to understand at once any experiments that might be going on there. A more affable man he never knew, or one who more deserved their recognition in the way now proposed. After some conversation, it was unanimously agreed that a sum of £50 should be voted. The Rev. John Gillespie thought it should be made perfectly clear that the money was given on account of the great services which Mr Jenkins had rendered to agricultural literature and to agriculture generally.

GALLOWAY HERD-BOOK.

The Secretary submitted Volume VII. of the Galloway Herd-Book, presented by the Rev. John Gillespie on behalf of the Galloway Cattle Society.

MEETING OF DIRECTORS, 4TH MAY 1887.

Present.—Vice-Presidents—Viscount Stormont; Rev. John Gillespie, Mouswald. Ordinary Directors—Mr Elliot of Wolfelee; Mr Matthews, Newton-Stewart; Mr Middleton, Clay of Allan; Mr Paterson of Birthwood; Mr Wardlaw Ramsay of Whitehill; Mr Young of Cleish Castle; Mr Elliot, Hollybush; Mr Kerr, Broomhouse; Mr Lumsden of Balmedie; Mr Maxwell, yr. of Munches; Mr Ballingall, Dunbog; Hon.

R. Baillie Hamilton of Langton; Mr Fisher, Jellyholm; Mr Cran, Kirkton; Sir Robert Menzies, Bart.; Mr Buttar, Corston; Mr Glendinning, Hatton Mains; Mr Dudgeon, yr. of Cargen. Extraordinary Directors—Mr Macduff of Bonhard; Mr Howatson of Glenbuck; Mr Dudgeon, Easter Dalmeny; Mr Paterson, Plean Farm. Secretary—Sir G. Graham Montgomery, Bart. Chemist—Dr A. P. Aitken. Auditor—Mr William Home Cook, C.A. Engineer—Mr James D. Park. Chairman of Veterinary Department—Mr Hope, East Barns. Viscount Stormont in the chair.

Mr F. N. MENZIES reported apologies for the absence of Sir William S. Walker, K.C.B.; Colonel Gillon; Mr Gilmour of Montrave; Mr Macpherson Grant of Drumduan; Mr Irvine of Drum; Mr Mackenzie of Portmore; Mr Mackenzie, yr. of Kintail; Mr M'Queen of Crofts; Mr Murdoch, Gartcraig; Mr Murray, Catter House; Mr Park, Dechmont; and Mr Connal Rowan of Meiklewood.

THE LATE SIR HEW DALRYMPLE.

Before proceeding with the business on the programme, the Directors recorded in the minutes an expression of their sincere regret at the death of Sir Hew Dalrymple of North Berwick, Bart., who had on various occasions filled the office of Director.

THE LATE SIR WALTER ELLIOT, K.C.S.I.

A letter was read from Mr Elliot of Wolfelee, acknowledging receipt of the resolution passed at last meeting on the death of Sir Walter Elliot, and, on behalf of Lady Elliot and the other members of the family, as well as of himself, thanking the Directors most sincerely for their kindly sympathy.

GENERAL MEETING.

The half-yearly general meeting of the Society was fixed to be held on Wednesday, 15th June.

PERTH SHOW, 1887.

Jubilee Cups.—Mr HOWATSON of Glenbuck, pursuant to his notice, moved as follows:—"That the Directors are prepared to receive Queen's Jubilee Cups or Prizes from societies or any party offering the same as prizes for pure-bred animals at Perth Show, 1887, provided the value of such prizes given to any breed be not less than £20, and intimated to the Secretary on or before the 30th April."

The following Queen's Jubilee Prizes for blackfaced sheep were then intimated:—Best tup in show-yard—£20, £10, £5. Best tup lamb and four rams (any age)—£20, £12, £6, £4, £2. Best ewe lamb and four ewes—£15, £8, £4, £2. Three best wethers, not more than one shear—£3, £2, £1.

WOOL PRIZES.

Blackfaced sheep (entered in any class, male or female) carrying the fleece best adapted for protecting the animal in a high, exposed, and stormy climate—£3, £2, £1.

SHEPHERDS' PRIZES.

To the shepherd in charge of sheep gaining the largest amount of prize-money—£5, £4, £3, £2, £1, and 10s. To the shepherd for feeding first-prize shearling wethers—£3, £2, £1. *Note.*—The tup gaining the £20 prize to be excluded from competing in group prizes. No exhibitor to be allowed more than one entry in any of the classes except in the wether class.

LOCAL COMMITTEE.

Letters were submitted from the Clerks of Supply of Perthshire, Fifeshire, and Kinross-shire, and from the Town-Clerk of Perth, sending the names of the gentlemen appointed to represent these counties and the city of Perth in the Local Committee. *Stewards.*—The following were appointed to act as stewards:—Mr Mackenzie, yr. of Kintail, for horses; Mr Walker, Portlethen, for cattle; Mr Maxwell, yr. of Munches, for sheep, swine, &c.; Mr Elliot of Wolfelee, for forage; Mr Scott Dudgeon and Mr Middleton, Clay of Allan, implements.

WORKING DAIRY.

Mr M'Queen of Crofts and Mr F. N. Menzies were appointed to undertake the arrangements of this department at Perth.

GLASGOW SHOW, 1888.

The SECRETARY reported that the Commissioners of Supply for Lanark and Ayr had agreed to voluntary assessments to assist in meeting expenses of the general Show to be held at Glasgow in 1888.

Proposed Show at Dundee.

A letter was read from Provost Ballingall, Dundee, renewing, on behalf of the Corporation of Dundee, their application to have Dundee put upon the list of towns visited in rotation by the annual Show of the Society. After discussion, the following resolution was adopted:—"That as the Shows have been arranged for at least two years, the Board is not in a position to make any definite arrangement beyond that, but that when the proper time comes the application from Dundee will receive due consideration."

Pleuro-Pneumonia.

Mr Paterson of Birthwood stated that the county of Lanark had agreed to subscribe 50 guineas towards an investigation on pleuro-pneumonia. and he suggested that the Directors should assist in such an important matter. The following motion was ultimately agreed to:—"That the following committee be appointed to inquire into and report as to the practicability of making an exhaustive inquiry in regard to pleuro-pneumonia, with power to add to their number:—Mr Paterson of Birthwood, convener; the Hon. R. Baillie Hamilton; Mr Maxwell, yr. of Munches; and other members."

Veterinary Department.

The Veterinary Committee held a meeting immediately before the Board met, when they had under consideration a letter from the Glasgow Hide-Inspecting Society, inviting the Society's attention to the subject of warbles in hides, and suggesting that it should take up the matter, either through means of the various local agricultural societies or otherwise. The committee, after careful consideration, recommended that a circular embodying the views expressed in the letter from the joint-committee of the Glasgow Hide-Inspecting Society should be addressed to the secretaries of all the district societies in Scotland, and along with it to send a copy of Miss Ormerod's pamphlet on Warbles. They also recommended that a copy of the circular be sent to the Privy Council, with a request that they will take such steps as they may see fit to eradicate or mitigate the evil. The Board approved of the report.

Agricultural Education.

A letter was read from Mr Christison, W.S., intimating that the Edinburgh University Court had appointed Mr Gilbert Murray, Elvaston Castle, Derby, to the office of additional Examiner in Agriculture in connection with graduation in science in the Department of Agriculture for three years from 1st January 1887. In addition to Mr Murray and the University Professors who teach subjects required for graduation in the department, the Court appointed the following additional examiners:—Dr John Voelcker for agricultural chemistry, and Principals Walley and Williams for veterinary hygiene.

Horse-Breeding.

It was agreed, in accordance with a circular from Mr Walter Gilbey, to send a petition to the House of Lords in support of the views advocated by Lord Ribblesdale with reference to horse-breeding to the following effect:—"That an annual grant of, say, £5000 from the Government must be devoted in the shape of premiums to thoroughbred stallions, the owners of which should guarantee each horse to serve a number of mares at small fees.

MEETING OF DIRECTORS, 1st JUNE 1887.

Present.—Vice-Presidents—Rev. John Gillespie, Mouswald; Colonel Gillon of Wallhouse. Ordinary Directors—Mr Elliot of Wolfelee; Mr Marr, Cairnbrogie; Mr Matthews, Newton-Stewart; Mr Middleton, Clay of Allan; Mr Paterson of Birthwood; Mr Young of Cleish Castle; Mr Murdoch, Gartcraig; Mr Mackenzie, yr. of Kintail; Mr Maxwell, yr. of Munches; Mr Ballingall, Dunbog; Hon. R. Baillie Hamilton of Langton; Mr Fisher, Jellyholm; Mr Cran, Kirkton; Sir David Baird, Bart.; Mr Milne, Inverurie; Mr Hewetson, Auchenbainzie; Sir Robert Menzies, Bart; Mr Buttar, Corston; Mr Park, Dechmont; Lord Arthur Cecil, Orchard Mains; Mr Macpherson Grant of Drumduan; Mr Glendinning, Hatton Mains. Extraordinary Directors—Lord Provost of Perth; Mr Dingwall, Ramornie; Mr Ferguson, Kinnochtry; Mr Gilmour of Lundin; Mr Macduff of Bonhard; Mr Walker, Portlethen; Mr Howatson of Glenbuck; Mr Mackenzie of Portmore, Mr Dudgeon, Easter Dalmeny; Mr M'Queen of Crofts; Mr Paterson, Plean Farm.

Treasurer—Sir William S. Walker, K.C.B. Chemist—Dr Aitken. Auditor—Mr Wm. Home Cook, C.A. Chairmen of Standing Committees—Mr Scott Dudgeon, Longnewton; Mr Irvine of Drum. Rev. John Gillespie in the chair.

Mr F. N. MENZIES reported apologies for the absence of the Earl of Elgin; Viscount Stormont; Mr Allan, Munnoch; Mr Balfour of Balbirnie; Mr Dudgeon, yr. of Cargen; Mr Elliot, Hollybush; Mr Kerr, Broomhouse; Mr Lumsden of Balmedie; Mr Connal Rowan of Meiklewood.

THE PERTH SHOW.

A deputation appeared from the city of Perth for the purpose of impressing on the Directors that there was no necessity for putting off the Show. The deputation consisted of Lord Provost Martin; Dean of Guild Mackenzie; Mr James MacLeish, Town-Clerk; Mr Kyd, cattle salesman, Perth; George Dunn, Balgonie; and James Tod, Easter Cash.

The LORD PROVOST OF PERTH said he came there as representing the Town Council of the city of Perth. The deputation had come in consequence of a statement they saw in the papers some time ago that it was in contemplation by the Directors of the Highland Society to postpone the holding of the Show in Perth this year in consequence of the prevalence of pleuro-pneumonia. They were much astonished to learn this, as the burgh of Perth had been practically free from disease for a considerable time. They had acted along with the county authorities, and had never hesitated in slaughtering all animals that were affected with the disease. The consequence was that the outbreaks were limited to the places where they began; and, besides, they had adopted the most stringent rules possible with reference to the introduction of Irish cattle at the present time. Altogether they had been acting so that the burgh had been completely free from disease for a long time. They, as a community, would feel very much if the Show were postponed, and it would be an immense disappointment to the general public. He was not stating that in the interests of the trade or of the farmers, but it was the feeling of the general public. Since the paragraph appeared in the papers they had been waited on and asked to do what they could to influence the Directors to carry out their original proposal to hold the Show. There were Directors at the Board who intended to exhibit at the Show, notwithstanding what had been stated, showing that they were not alarmed, and there was no cause of alarm on the part of any one. He had no hesitation in saying there could be no danger in the shape of disease, as it has been so long away from Perth. He could assure the meeting that it would be a great loss to farmers and others if the Show were not held.

Mr JAMES MACLEISH, Town-Clerk, said he was clerk for the Local Authority for the burgh and county of Perth, and he was able to give some information to the Board on the subject before them. In the first place, he might mention with regard to the burgh that there had been only four or five outbreaks altogether, and that they had existed in dairies. They knew that there were no store cattle kept in Perth, and no breeders within the burgh, so that the cattle there were almost entirely connected with dairies. The outbreaks to which he referred were in consequence of purchases made in October or November last year. The last occurred on the 8th of February, and all the animals that were affected were slaughtered at once. There had been no case since the 8th of February, so that for several months the city of Perth had been entirely clear of it. As to the county, the latest outbreak was on the 9th of May, and all the animals were slaughtered on the 12th of May. The outbreak before that was on the 4th of May, and the one previous to that again on the 28th of April. He might mention that very large sales of breeding stock were held in Perth early in the spring, and buyers were not in the least afraid to purchase bulls and heifers going to all parts of the country. There were also sold some 1500 store cattle every week, and farmers and breeders were not afraid to purchase them. So severe and stringent were the measures taken to prevent the disease that he did not think there was the least chance of any more fresh outbreaks, and he did not think there was any reason why they should not hold the Show in Perth as had been agreed upon. So far as Perth was concerned this year, he did not think it was in so bad a state in proportion as Edinburgh or Glasgow was on all occasions that the Shows were held in these places. He believed there were cases of pleuro-pneumonia at all times in Edinburgh and Glasgow. He did not think there was the slightest risk so far as the holding of the Show in Perth was concerned, and he trusted the Directors would see their way to carry out their original proposal.

Mr KYD said that he came at the request of a very large number of agriculturists in Forfarshire and districts lying adjacent to Perth, to express the hope that the Show would be held. They had this idea that the time was not far distant when the claims of Dundee to have the Show held there would be admitted; and if they postponed the Perth Show this year it would be putting off Dundee still further. The Lord Provost and Mr MacLeish had given particulars as to the outbreaks that had occurred. Unfortunately, the disease had been imported into Perth in the autumn. However, by slaughtering the diseased animals they screwed it off at the meter, with the assistance of the Local Authorities, and the disease was practically stamped out. He was glad to be able to say that the disease was not allowed to spread either into Perth or adjacent counties. That was done by the dairy cows that were diseased being stamped out. The disease had not reached the valuable pure-bred stocks that would go to the Show. He knew that to the valuable Clydesdales and shorthorns every Show of the Society formed a page in their history, and it would be a great pity if it was obliterated. There was now great competition in the Clydesdale world, and the making of history in the way he had stated was a great thing to those men who had capital in Clydesdales. In the county of Perth they had had very little pleuro-pneumonia, and it only existed at Tippermuir, about seven miles from Perth. The origin of the disease there was a lot of Irish cattle purchased at Hallow Fair. The inspector said it was doubtful whether the disease that appeared was pleuro-pneumonia; but in order to take every precaution against it spreading, the diseased animals were slaughtered. The other forty-three animals had been inoculated, and they were doing well. Indeed, it was thought that it was not a case of pleuro-pneumonia at all. He was convinced that there was nothing whatever to alarm the breeders of stock. If they took clean cattle to a clean place, and if the railway people were made to clean their trucks, there would be no danger whatever.

Mr MAXWELL, yr. of Munches, asked, with reference to the railway accommodation, whether there would be a siding for the cattle going to the Show—so that the stock would not be loaded or unloaded with other cattle?

Dean of Guild MACKENZIE said that there was a siding at St Leonard's, the use of which might be obtained from the railway.

Mr KYD said that the siding at St Leonard's was not used for cattle, but for minerals.

The LORD PROVOST said that the siding was in close proximity to the Showyard.

Mr HOWATSON asked if the deputation would make arrangements with the railway company to get the siding?

The LORD PROVOST said they would approach the railway company at once. Seeing that the company did not use the siding for cattle at present, he had no doubt they would give the use of it.

Sir WILLIAM WALKER, K.C.B., said it would be for the interests of the railway company to give such facilities.

The CHAIRMAN said that, on behalf of the Board, he had to return thanks to the deputation for coming and laying before them the information they had given. The Board was not only glad to receive the deputation, but thankful that they had come, because it was necessary that the Board, in coming to a conclusion on the matter, should know all the facts of the case. They would give the facts stated by the deputation their serious consideration, and do the best they could in the interests of all parties.

The LORD PROVOST, on behalf of the deputation, returned thanks for the kind reception that had been given to them.

The deputation then retired.

After some discussion,

Mr BALLINGALL moved—"That the Show be held at Perth."

Mr FERGUSON seconded the motion.

Sir ROBERT MENZIES, Bart., moved as an amendment, seconded by Mr ELLIOT of Wolfelee—"That the holding of the Show be postponed till next year."

On a division, 8 voted for the amendment, and 21 for the motion.

It was accordingly agreed to hold the Show.

It was suggested by Sir WM. WALKER, K.C.B., that the Local Authorities of the various counties should afterwards be communicated with, so as to prevent any difficulties being imposed on the return of cattle from the Show, if this should be found necessary by the continuance of disease in Scotland.

This was approved of.

GLASGOW SHOW, 1888.

A letter was read from the Town-Clerk Depute, Glasgow, intimating that the Town Council had agreed to give the use of a part of Glasgow Green for the Society's Show in 1888, and also to give the Society a donation of £200 in connection therewith.

WARBLE FLY.

The SECRETARY reported that a circular had been sent to the secretaries of 192 local agricultural societies in Scotland, drawing attention to the loss sustained by the farmers by the damage done to hides, and even to beef, by warbles, and asking them to move in the matter, and get their members to adopt means to prevent the warble fly from depositing its eggs in the hides of the animals. This, the circular stated, is easily done by washing the animals' backs with a simple wash of tobacco and common soap, or with a proper sheep-dip. The proper time to do this is in August and September. The bots should also be pinched or squeezed out of the skin, and destroyed in spring or early summer. Along with the circular there were sent to each secretary from six to twelve copies of two reports and notes on the warble fly, kindly placed at the disposal of the Society by the writer—Miss Eleanor A. Ormerod, Dunster Lodge, Isleworth, Consulting Entomologist of the Royal Agricultural Society of England. With reference to the above circular, the Directors expressed a desire that the press would make the subject as widely known as possible, and draw the attention of farmers to the extremely simple mode of eradicating the pest. The Secretary stated that copies of the circular and pamphlets could be supplied on application to him.

On the motion of the CHAIRMAN, a cordial vote of thanks was given to Miss Ormerod for her kindness and consideration in the matter.

EXTENSION OF TELEGRAPH IN THE HIGHLANDS.

The Board agreed to present a memorial to the Postmaster-General respecting an extension of the telegraph to Moidart, Arisaig, Morar, and Knoydart.

GENERAL MEETING.

The programme of business to be brought before the half-yearly general meeting of the Society was arranged.

THE HACKNEY STUD BOOK.

The SECRETARY submitted Volume VI. of the "Hackney Stud-Book," presented to the Society by the Hackney Stud-Book Society.

The volume was accepted with thanks.

MEETING OF DIRECTORS, 15TH JUNE 1887.

Present.—Vice-Presidents—The Earl of Elgin; Rev. John Gillespie, Mouswald; Colonel Gillon of Wallhouse. Ordinary Directors—Mr Elliot of Wolfelee; Mr Marr, Cairnbrogie; Mr Matthews, Newton-Stewart; Mr Middleton, Clay of Allan; Mr Murray, Catter House; Mr Paterson of Birthwood; Mr Young of Cleish Castle; Mr Murdoch, Gartcraig; Mr Elliot, Hollybush; Mr Mackenzie, yr. of Kintail; Mr Kerr, Broomhouse; Mr Lumsden of Balmedie; Mr Maxwell, yr. of Munches; Mr Ballingall, Dunbog; Mr Fisher, Jellyholm; Mr Cran, Kirkton; Sir Robert Menzies, Bart.; Mr Buttar, Corston; Mr Park, Deehmont; Mr Glendinning, Hatton Mains; Mr Dudgeon, yr. of Cargen. Extraordinary Directors—Sir John Ogilvy, Bart.; Mr Ferguson, Kinnochtry; Mr Macduff of Bonhard; Mr Walker, Portlethen; Mr Dudgeon, Easter Dalmeny; Mr Paterson, Plean Farm. Hon. Secretary—Sir G. Graham Montgomery, Bart. Chairmen of Standing Committees—Mr Villiers, Closeburn Hall; Mr Scott Dudgeon, Longnewton; Mr Irvine of Drum; Mr Hope, East Barns. Chemist—Dr Andrew P. Aitken. Engineer—Mr James D. Park. The Earl of Elgin in the chair.

The business had reference principally to the Perth Show and to the subjects to be brought before the general meeting of this date.

EMERGENCY MEETING OF DIRECTORS, 29TH JUNE 1887.

Present.—Vice-Presidents—Rev. John Gillespie; Colonel Gillon of Wallhouse. Ordinary Directors—Mr Elliot of Wolfelee; Mr Paterson of Birthwood; Mr Young of Cleish; Mr Murdoch, Gartcraig; Mr Ballingall, Dunbog; Hon. R. Baillie Hamilton; Mr Fisher, Jellyholm; Mr Milne, Inverurie; Sir Robert Menzies, Bart.; Mr Buttar, Corston; Mr Park, Deehmont; Lord Arthur Cecil; Mr Stirling of Kippendavie; Mr Macpherson Grant of Drumduan; Mr Glendinning, Hatton Mains. Extraordinary Directors—Mr Gilmour of Lundin; Mr Macduff of Bonhard; Mr Howatson of Glenbuck; Mr Mackenzie of Portmore; Mr Dudgeon, Easter Dalmeny; Mr M'Queen of Crofts. Hon. Secretary—Sir G. Graham Montgomery, Bart. Chairman of Committee—Mr Villiers, Closeburn Hall. Chemist—Dr Aitken. Auditor—Mr W. H. Cook, C.A. Engineer—Mr Jas. D. Park. Rev. John Gillespie in the chair.

Mr F. N. MENZIES said he had taken it upon himself to call the meeting, on account of pleuro-pneumonia having broken out in a dairy at Bridgend, in the town of Perth. He then detailed the circumstances attending the outbreak.

The CHAIRMAN said that the Directors were unanimously of opinion that the Secretary was quite right in having called the meeting.

A deputation from the Local Authority of Perth, consisting of Dean of Guild Mackenzie, Treasurer Wilson, and Mr Keay, Depute Town-Clerk, was then introduced to the meeting.

Dean of Guild MACKENZIE said that the Lord Provost of Perth would have been present, but that he was away on a holiday. He would, however, endeavour to lay before the Board representations such as he believed his Lordship would have done in the circumstances. Knowing that this meeting was to be held, they thought that the fact of pleuro-pneumonia having unfortunately broken out within the precincts of the Local Authority might form an element in the decision to which the Directors might come in regard to the holding of the Show. While the outbreak was within the jurisdiction of the Local Authority of Perth, it was, as some of them were aware, isolated to some extent from the burgh. The cattle had never grazed on the public parks of the city, or on the Inches, on which the Show was to be held. They grazed in a park one and a half miles distant from the Showyard on the other side of the water. They were not in contact at all with any of the cattle grazing on the Inches. When the outbreak was reported to the Local Authority they ordered the whole cows on the place—18 in number—to be slaughtered, and they took every precaution so that there might be as little risk of spreading the disease as possible. They had the animals placed in a low cart, used for the purpose of conveying large heavy cattle which were off their feet, and they had them taken by that means to the slaughter-house and all slaughtered, so that those cattle, in the streets or otherwise, were not in contact with any other animals in the city. The cattle that were first attacked in this outbreak came to the city early in the spring from a healthy locality, and how it was affected the veterinary surgeon could not understand. The animal first affected came from a healthy farm, in which there was no disease. There was an outbreak in the county not far from the farm in the month of November last, but they had not been able to trace anything else. Therefore, so far as it appeared to the Local Authority, nothing had arisen which should prevent people from sending their cattle to Perth. The place on which the Show was to be held was the same as was arranged at last meeting, and was approached by a new road made by the railway company. The Secretary would inform the meeting that the road was from the loading bank, which would not be used by cattle for a considerable time before the Show, and the place where the Show would be held would be cleared from this time to that. None of the cattle in Perth had ever been in contact with the cattle that were slaughtered, and no cattle either arriving or leaving ever did so. The Local Authority wished to urge that no circumstances had arisen that had changed the position of matters since the meeting was held at which it was decided to hold the Show. In the interests of the Society, and for the credit of the city, the Local Authority would be sorry if the Show was not to be a success. The members of the Local Authority were perhaps divided as to whether it should be held with cattle or not, but they thought it would be better for the Society and the community that it should at all events go on, because it would be difficult to get a town or city where there would not be an outbreak at some time or other. If any further information were desired, he and the other members of the deputation would be happy to give it.

Treasurer WILSON said he did not think he had anything to add to what had been stated by Dean of Guild Mackenzie. Had it not been that the Local Authority knew that several of the Directors knew the locality and were aware of the circumstances, and if they had not thought it would have shown disrespect or indifference to the Society, they would have considered the matter so trifling that they would not have thought it necessary to put in an appearance. Those who were in the locality and were aware of the circumstances could not say that there was any great danger.

In reply to Mr PATERSON of Birthwood,

Dean of Guild MACKENZIE said that the animal that was first detected as being affected with pleuro-pneumonia was bought at one of the sales early in the spring. It came from a farm which was healthy, and which remained healthy.

Mr PATERSON asked how long it was since the detection was made?

Dean of Guild MACKENZIE said on Saturday week—the week before last. The whole of the eighteen animals were slaughtered on Tuesday the 21st.

Mr PATERSON asked whether on examination it was found that the lungs of the first animal detected were further advanced in disease than the others of the same lot?

Dean of Guild MACKENZIE said that both the veterinary surgeon and the superintendent of the slaughter-house said that that animal was the furthest gone with disease. He asked the veterinary surgeon whether, in his opinion, it was possible that that animal might not be the one that introduced the disease, but that another animal with a healthier constitution might not have communicated it, and that it lingered about. He replied that that was quite possible, so that where the disease came from could not be traced at present. There were only four of the eighteen that had traces of being affected besides the first one.

The CHAIRMAN said that he understood that the cattle grazed some distance from the byres where they were accommodated.

Dean of Guild MACKENZIE—About a quarter of a mile distant.

Mr PATERSON asked what was the state of the lungs of the thirteen animals that were not detected?

Dean of Guild MACKENZIE said the veterinary surgeon had stated that to all appearance seventeen of the cattle were as healthy cows as were in Perth, but after they were slaughtered four of them showed traces of disease. That was in addition to the first animal.

Mr MACKENZIE of Portmore asked if other cattle were in the habit of using the same road by which the animals referred to went to their grazing?

Dean of Guild MACKENZIE said it was the main road from Scone to Perth. The traffic on the roads with cattle, except fat ones for sale and slaughter, was very small indeed.

The SECRETARY asked if animals were not sent out from the cattle sales to graze beyond Kincurathy?

Dean of Guild MACKENZIE said that there was ground for grazing, but it was on the other side of the town.

The CHAIRMAN asked how wide was the infected area?

Dean of Guild MACKENZIE said it included the premises occupied and the ground grazed by the owner of the cattle.

The CHAIRMAN said he wished to draw attention to a remark made by Dean of Guild Mackenzie to the effect that at the loading-bank where the cattle would be unloaded there would be no cattle for a considerable time. He understood it was a place where no cattle were loaded at all.

Dean of Guild MACKENZIE said it was sometimes used on Mondays by cattle going to the sales.

The CHAIRMAN said that that was a different statement from what had been made before as to the loading-bank.

Dean of Guild MACKENZIE said the railway company had told them that it would not be used at any time before the Show. It was not used except on very rare occasions, and that was by cattle going to Messrs Swan's mart.

Mr HOWATSON said it was distinctly understood, from what had been stated by the deputation formerly, that the loading-bank had not been used, nor would be used, as a siding before the Show. Now it had been used. He wished to know when the Local Authority gave information to the Secretary here of the outbreak.

Dean of Guild MACKENZIE said that, so far as the outbreak was concerned, the usual information was given. It appeared in the newspapers. If there had been any promise to communicate with the Secretary, they would have done so. They had not been in the habit of communicating in that way, and to impute that there was any desire to hide anything was wrong.

Mr MACQUEEN asked if they were prepared to have a Show without the cattle rather than no show at all?

Dean of Guild MACKENZIE said the deputation had thought over that matter, and naturally they were not all of one opinion. They felt that a Show without the cattle would not be so successful as otherwise, and they were reluctant to advise. They would rather simply put the facts before the meeting. He thought Sir Robert Menzies' motion at last meeting was to postpone the Show; and they would decidedly ask that if there were to be no cattle the Show should be held in Perth next year.

Mr MACDUFF of Bonhard asked whether the deputation were authorised to press that the Show should be held this year, or whether they were merely sent to give information?

Dean of Guild MACKENZIE said the deputation were sent to urge that no circumstances had emerged to alter the proposal to hold the Show. At the same time, if the Board resolved to have a Show without cattle, the Local Authority would endeavour to make it as successful as possible.

The CHAIRMAN then said that, in the name of the Board, he returned their best thanks to the deputation for laying the information before them.

Treasurer WILSON said that, so far as the Local Authority was concerned, they had taken every precaution and every step to prevent the spread of infection.

The deputation then withdrew.

Mr MACKENZIE of Portmore said he thought the Local Authority of Perth had been remiss in not giving them information of the outbreak.

Lord ARTHUR CECIL moved—"That the Show be held at Perth, but without cattle." He said he did so on the following grounds:—They understood that the stables and sheds were in a forward condition, and that to hold no Show would cost between £700 and £800. The question was whether, by holding a horse and sheep show, they could not manage to redeem part of that sum. They must also bear in mind that special efforts had been made to make the Show a success so far as various breeds were concerned. He spoke for the Clydesdale Horse Society, which had got two Jubilee cups to be competed for. Then he would remind them that the owners of blackfaced sheep had collected nearly £200 in prizes for their sheep; and he did not think it would be right to exclude all the other pure-bred stock from exhibiting after they had made such great efforts this particular year to make the Show a success.

Mr MURDOCH seconded the motion.

Mr MACDUFF moved as an amendment—"That the Show at Perth be postponed till 1888."

Sir ROBERT MENZIES, Bart., seconded the amendment. He said that as to having a Show without cattle, they were aware that all the counties in the neighbourhood had subscribed very large sums for a general Show which would embrace cattle; and if they were to have a Show, it would not be right to have it for sheep and horses alone.

On a division, 6 voted for Mr Macduff's amendment and 17 for Lord Arthur Cecil's motion.

The Show at Perth will accordingly be held, but without cattle.

Mr Menzies was instructed to send a circular to all the cattle exhibitors, informing them that cattle were to be excluded from the Show.

SPECIAL MEETING OF DIRECTORS, 14TH SEPTEMBER 1887.

Present.—Vice-President—Viscount Stormont. Ordinary Directors—Mr Marr, Cairnbrogie; Mr Matthews, Newton-Stewart; Mr Paterson of Birthwood; Mr Young of Cleish Castle; Mr Elliot, Hollybush; Mr Kerr, Broomhouse; Mr Maxwell, yr. of Munches; Mr Ballingall, Dunbog; the Hon. R. Baillie Hamilton of Langton; Mr Fisher, Jellyholm; Mr Milne, Inverurie; Mr Stirling of Kippendavie; Mr Glendinning of Hatton Mains. Extraordinary Directors—Mr Dingwall, Ramornie; Mr Howatson of Glenbuck; Mr Dudgeon, Easter Dalmeny. Hon. Secretary—Sir G. Graham Montgomery, Bart. Chemist—Dr Aitken. Chairman—Viscount Stormont.

Mr F. N. MENZIES reported apologies for the absence of Sir Robert Menzies of Menzies, Bart.; Sir John Ogilvy of Inverquharity, Bart.; Sir William S. Walker of Bowland, K.C.B.; Mr Cran, Kirkton; Mr Elliot of Wolfelee; Mr Gilmour of Lundin; Mr Irvine of Drum; Mr Lumsden of Balmedie; Mr Macduff of Bonhard; Mr Mackenzie, yr., of Kintail; Mr M'Queen of Crofts; Mr Middleton, Clay of Allan; Mr Murdoch, Gartcraig; Mr Murray, Catter House.

The meeting was called on a requisition signed by five members of the Board in terms of the bye-laws, to consider a report by a committee appointed on 4th May to inquire into and report as to the practicability of making an exhaustive inquiry in regard to pleuro-pneumonia.

Mr PATERSON of Birthwood moved the adoption of the report, and Mr MARR, one of the members of committee, signified his dissent from it.

After a long discussion, during which a letter from Mr Marr to Mr Paterson was read stating his reasons for dissenting, Mr Marr moved as follows:—"That this report be not adopted; that the committee be thanked for their labours; and that the report be allowed to lie on the table."

Sir G. GRAHAM MONTGOMERY, Bart., moved—"That the committee be thanked for their report; that further consideration of it be postponed till next meeting in November; that, in the meantime, the Secretary be instructed to send to the Privy Council a copy of this report with a *precis* of evidence; and also that he be instructed to ask the Privy Council whether they would be willing to institute an investigation into the subject on the evidence that would be forwarded to them."

Mr PATERSON withdrew his motion in favour of Sir Graham Montgomery's. On a division eight voted for Mr Marr's motion, and eight for Sir Graham Montgomery's amendment. The Chairman gave his casting in favour of Mr Marr's motion.

Mr MARR then gave notice of the following motion for next meeting:—"That this Society should memorialise the Government in favour of further legislation, rendering it imperative to slaughter all animals affected with pleuro-pneumonia throughout Great Britain and Ireland, and also all healthy animals which have been in contact with them.

MEETING OF DIRECTORS, 2ND NOVEMBER 1887.

Present.—Vice-Presidents—The Earl of Elgin and Kincardine; the Rev. John Gillespie, Mouswald. Ordinary Directors—Mr Elliot of Wolfelee; Mr Marr, Cairnbrogie; Mr Matthews, Newton-Stewart; Mr Middleton, Clay of Allan; Mr Murray, Catter House; Mr Paterson of Birthwood; Mr Young of Cleish Castle; Mr Elliot, Hollybush; Mr Kerr, Broomhouse; Mr Lumsden of Balmedie: Mr Ballingall, Dunbog; the Hon. R. Baillie Hamilton of Langton; Mr Fisher, Jellyholm; Mr Cran, Kirkton; Mr Hewetson, Auchenbainzie; Sir Robert Menzies of Menzies, Bart.; Mr Buttar, Corston: Mr Park, Dechmont; Lord Arthur Cecil; Mr Stirling of Kippendavie; and Mr Glendinning, Hatton Mains. Extraordinary Directors—Mr Dingwall, Ramornie; Mr Ferguson, Kinnochtry; Mr Macduff of Bonhard; Mr Howatson of Glenbuck; Mr Mackenzie of Portmore; Mr M'Queen of Crofts; Mr Paterson, Plean Farm. Chemist—Dr Aitken. Auditor—Mr Wm. Home Cook, C.A. Engineer—Mr James D. Park. Chairmen of Standing Committees—Mr Irvine of Drum; Mr Hope, East Barns.

Mr F. N. MENZIES reported apologies for the absence of Viscount Stormont; Sir G. Graham-Montgomery, Bart.; Sir William S. Walker, K.C.B.; Mr Balfour of Balbirnie: Mr Dudgeon, Easter Dalmeny; Mr Dudgeon, yr. of Cargen; Mr Gilmour of Lundin; Mr Macpherson Grant of Drumduan: Mr Mackenzie, yr. of Kintail; Mr Maxwell, yr. of Munches; Mr Villiers, Closeburn Hall; and Mr Walker, Portlethen. The Earl of Elgin; Rev. John Gillespie; and Sir Robert Menzies, Bart., successively occupied the chair.

DECEASED MEMBERS.

Resolutions expressive of regret at the death of Lord Lovat and of Mr Connal Rowan of Meiklewood were unanimously adopted.

PLEURO-PNEUMONIA.

It was moved by Mr MARR, and seconded by Mr MATTHEWS—"That this Society should memorialise the Government in favour of further legislation, rendering it imperative to slaughter all animals affected with pleuro-pneumonia throughout Great Britain and Ireland, and also all healthy animals which have been in contact with them."

The Rev. JOHN GILLESPIE, Mouswald, moved—"That the Privy Council be memorialised to exercise their powers to compel Local Authorities to slaughter, during the approaching winter months, all animals affected with pleuro, and also those that have been in contact with them, and to use their influence to get the same policy carried out in Ireland."

Mr FERGUSON seconded.

Mr PATERSON of Birthwood moved that Mr Marr's motion be not approved of.

After some discussion, Mr Paterson and Mr Marr withdrew their motions in favour of Mr Gillespie's, which was accordingly unanimously adopted.

Mr PATERSON then moved—"That an inquiry be instituted by the Society into pleuro-pneumonia," which was seconded by Colonel STIRLING.

Mr MACKENZIE of Portmore moved—"That a deputation wait on the Privy Council to urge them to take up the inquiry."

Mr MIDDLETON seconded.

Mr LUMSDEN moved the previous question, which was seconded by Mr MARR.

Mr Paterson and Mr Mackenzie agreed that their motions should be conjoined as follows:—"That it is desirable that a thorough investigation should be instituted into the nature of the disease called pleuro-pneumonia, and that a deputation of the Board wait upon the Privy Council to urge on them the imperative necessity for this being done, and to request them either to undertake such investigation or provide a sum in aid to enable the Society to do so."

On a division, the latter motion was carried by 23 to 4.

It was agreed that the deputation should consist of Mr Stirling, convener; Mr Paterson, Mr Marr; and F. N. Menzies, Secretary.

BURSARIES.

The examination for the Society's bursaries took place on the 19th of October, when sixteen candidates enrolled their names, and the following passed:—

For £20 bursaries—W. S. Anderson, 37 South Clerk Street, Edinburgh; Joseph Bisset, Longcote Farm, Forres; W. M. Brunton, High Street, Inverkeithing; Thomas H. Middleton, Rose Farm, Cromarty; James R. C. Smith, Mowhaugh, Kelso.

For £10 bursaries—George S. Corstorphine, 77 Great Junction Street, Leith; Douglas A. Gilchrist, Bothwell Park Farm, Bothwell: John James Jeffray, Blackaddie, Sanquhar; James Kerr, Mid-Kelton, Castle-Douglas; Duncan Munro, 3 Dalrymple Place, Edinburgh.

Nomination of Directors by Show Districts.

A report by the Secretary was read, showing that the following members had been nominated and recommended by the Board to act as Ordinary Directors, in terms of the regulations :—Glasgow District—Mr John Lorne Stewart of Coll. Perth District—Mr Macduff of Bonhard. Stirling District—Mr David Buchanan, Garscadden Mains. Edinburgh District—Sir James H. Gibson-Craig of Riccarton, Bart. Aberdeen District—Mr John Marr, Cairnbrogie. Dumfries District—The Rev. John Gillespie, Mouswald. Inverness District—No nomination. Kelso District—Mr R. H. Elliot of Clifton Park.

Office-Bearers and Directors.

It was remitted to the following committee to prepare a list of Office-Bearers and Directors, and to submit it for consideration at the December meeting :—Mr Maxwell, yr. of Munches ; Mr Murray, Catter House ; Mr Elliot, Hollybush ; Mr Paterson, Plean Farm ; Mr Mackenzie, yr. of Kintail ; Sir Robert Menzies, Bart. ; Rev. John Gillespie ; Mr Howatson of Glenbuck ; Mr Cran, Kirkton ; Mr Matthews, Newton-Stewart ; Mr Milne, Inverurie ; Mr Murdoch, Gartcraig ; Mr Allan, Munnoch ; Mr Gilmour of Lundin ; Mr M'Queen of Crofts ; Mr Fisher, Jellyholm ; Mr Park, Dechmont. Mr Murray, convener.

Horse Breeding.

Mr Gilmour of Lundin, Kilmaron Castle, Cupar Fife, was nominated to represent the Society on the Trust to be appointed for managing the fund for the encouragement and improvement of the breed of horses in Great Britain.

Agricultural and Dairy Schools.

A deputation, consisting of Mr Mackenzie of Portmore, the Rev. John Gillespie, and Mr M'Queen of Crofts, was appointed to give evidence to the Committee on Agricultural and Dairy Schools, should they be required.

General Shows.

A report by the Committee on General Shows, recommending the classes and premiums for Glasgow Show next year, was before the Board, and directed to be printed and circulated before the meeting of the Board in December.

District Competitions.

It was remitted to the District Committee on Shows and on Cottage Competitions to revise the awards in 1887, and to consider the applications for 1888.

Telegraph Offices on West Coast.

With reference to the memorial adopted by the Board in June last, the following communications were read :—" General Post Office, London, 28th September 1887. Sir,—With reference to the petition from the Highland and Agricultural Society of Scotland, forwarded in your letter of the 4th June last, I am directed by the Postmaster-General to enclose, for the information of the petitioners, a copy of a letter which has been sent to Mr Arthur W. Nicholson of Arisaig House, Fort-William, in reply to a memorial on the same subject.—I am, &c. (Signed) C. H. B. Patey."

Copy Letter to Mr Nicholson.

"General Post Office, London, 28th September 1887.

"Sir,—With reference to the memorial which you forwarded on the 23rd May last, praying for the establishment of telegraph offices on the west coast of Inverness-shire, I am directed by the Postmaster-General to acquaint you, for the information of the memorialists, that Salen could not be made the starting-point for the proposed extension, because it is not possessed of the necessary means for transmitting the messages which would probably pass between the proposed new offices and other parts of the kingdom. The Postmaster-General understands that the memorialists suggest the erection of a line from Salen to the Isle Ornsay, serving twelve places in route ; and I am to explain that apart from the physical difficulties which would be encountered in an attempt to construct it, and apart from the objection to which I have referred of making Salen its starting-point, such a line would be unworkable, owing to the excessive number of officers upon it. I am to suggest that the memorialists should consider to which of the places they have in view, as it is of the greatest importance that telegraphic communication should be established, and should submit the names of those places. The Postmaster-General would then be glad to have inquiry made as to the best method of carrying out the extensions, and as to the cost. Meanwhile, I am to say that he has forwarded to the Treasury and the Scotch Office a recommendation from Mr Chamberlain, M.P., that telegraph offices should be established at certain places in the Western Highlands and Islands. These places include Ardvassar, Arisaig, Glenelg, and Kinlochmoidart.—I am, &c.,

(Signed) C. H. B. PATEY."

MEETING OF DIRECTORS, 7TH DECEMBER 1887.

Present.—Vice-President—Rev. John Gillespie, in the chair. Ordinary Directors—Mr Marr, Cairnbrogie; Mr Matthews, Newton-Stewart; Mr Middleton, Clay of Allan; Mr Murray, Catter House; Mr Paterson of Birthwood; Mr Elliot, Hollybush; Mr Mackenzie, yr. of Kintail; Mr Kerr, Broomhouse; Mr Lumsden of Balmedie; Mr Maxwell, yr. of Munches; Mr Ballingall, Dunbog; Mr Fisher, Jellyholm; Mr Cran, Kirkton; Mr Milne, Inveruric; Mr Hewetson, Auchenbainzie; Mr Buttar, Corston; Mr Park, Dechmont; Mr Stirling of Kippendavie. Extraordinary Directors—Mr Dingwall, Ramornie; Mr Gilmour of Lundin; Mr Macduff of Bonhard; Mr Howatson of Glenbuck; Mr Allan, Munnoch; Mr Dudgeon, Easter Dalmeny; Mr M'Queen of Crofts; Sir W. C. J. Carmichael Anstruther, Bart.; Mr Paterson, Plean Farm. Treasurer—Sir W. S. Walker, K.C.B. Honorary Secretary—Sir G. Graham Montgomery of Stanhope, Bart. Chairmen of Standing Committees—Mr Scott Dudgeon, Longnewton; Mr Irvine of Drum; Mr Hope, East Barns. Chemist—Dr A. P. Aitken. Auditor—Mr William Home Cook, C.A.

Mr F. N. MENZIES reported apologies for the absence of the Earl of Elgin; the Hon. R. Baillie Hamilton; Sir Robert Menzies, Bart.; Mr Balfour of Balbirnie; Mr Dudgeon, yr. of Cargen; Mr Elliot of Wolfelee; Mr Ferguson, Kinnochtry; Mr Glendinning, Hatton Mains; Mr Mackenzie of Portmore; Mr Murdoch, Gartcraig; Mr Villiers, Closeburn Hall; Mr Walker, Portlethen; and Mr Young of Cleish Castle.

THE LATE LORD LOVAT.

A letter was read from Lady Lovat, conveying her thanks to the Directors for the terms in which they recorded the services to the Society of the late Lord Lovat, and their sympathy with her and her family on their terrible loss.

THE LATE MR CONNAL ROWAN.

A letter was read from Mrs Connal Rowan, returning her thanks to the Directors for their expressions of regard for her late husband and sympathy towards herself.

HORSE-BREEDING TRUST.

A letter was read from Mr Gilmour of Lundin, agreeing to act as the Society's representative on the Horse-Breeding Trust.

GLASGOW SHOW, 1888.

The Committee on General Shows met on the 1st of November to suggest the premiums, and recommended that the Show should be held at the usual period—namely, from the 24th to the 27th July, both days inclusive. A proof of the proposed list was yesterday revised by the Board, and the Secretary was instructed to submit it to a meeting of members to be held in the George Hotel (late Queen's), George Square, Glasgow, on Wednesday the 14th current, at one o'clock.

Mr HOWATSON intimated that he would present a £10 cup for the heaviest blackfaced sheep one-shear wether, and that the breeders of blackfaced sheep would offer £4 in prizes to the shepherds feeding blackfaced shearling wethers.

GENERAL MEETING.

The anniversary general meeting of the Society for the election of new members, and for other business, was fixed to be held on Wednesday, 18th January 1888, being the usual day for holding the meeting.

SHOWYARD ERECTIONS.

The report of the committee appointed at Perth for the purpose of examining all the erections in the Showyard, and reporting to the Directors, of which Mr Stirling of Kippendavie was convener, was submitted and agreed to, and the committee was continued to take in estimates.

DISTRICT SHOWS AND COTTAGE COMPETITIONS.

The reports of the Committees on District Shows and on Cottages and Gardens, detailing the awards at the competitions held during 1887, and suggesting the grants for 1888, were submitted and agreed to.

Office-Bearers and Directors for 1888.

The report by the Committee on Office-Bearers and Directors for 1888 was read and approved; and the Secretary was instructed to communicate with the noblemen and gentlemen suggested to fill the vacancies which occur in January next before publishing their names.

Chemical Department.

The report by the Committee in charge of the Chemical Department, containing the list of analyses in which discrepancies occurred, was read and agreed to.

Pleuro-Pneumonia.

Mr F. N. Menzies reported that, according to previous arrangement, the deputation appointed at the Board meeting on the 2nd of November, viz., Mr Stirling of Kippendavie; Mr Paterson of Birthwood; Mr Marr, Cairnbrogie; and himself, waited on Viscount Cranbrook and Lord John Manners at the Privy Council Office on Friday, 18th November, to lay before their Lordships representations on the subject of pleuro-pneumonia. There were also present Mr C. Lennox Peel, C.B., clerk of the Council, and Professor Brown, of the Agricultural Department. The deputation submitted—First, a memorial requesting the Government to compel local authorities to slaughter, during the approaching winter months, all animals affected with pleuro-pneumonia, and also all cattle that had been in contact with them, and to use their influence to have the same policy carried out in Ireland; and, secondly, the resolution passed at the Board meeting on the 2nd November, to the effect that a thorough investigation should be instituted into the nature of pleuro-pneumonia, and requesting the Government either to undertake such an investigation or to provide a sum to enable the Society to do so. Mr Stirling, Mr Marr, and Mr Paterson having supported the views of the Society, and Professor Brown having stated the present position of matters, Lord Cranbrook promised that the Government would take into consideration the representations made, and would see whether anything further could be done by the Privy Council on the subject of pleuro-pneumonia. With regard to the other matter, the first step would be to explain to the Irish Government the remarks which have been made of the condition of things in Scotland, and see whether any security against the importation of unsound cattle into Scotland, as well as into England, could be obtained from them. Care would be taken that an answer in writing is sent as soon as possible after it had been carefully considered.

The Secretary was instructed to prepare a digest of the evidence taken before the committee, to be submitted to the Committee on Pleuro-Pneumonia previous to being forwarded to the Privy Council.

On the motion of Mr Paterson of Birthwood, a vote of thanks was accorded to Dr Aitken for his services in connection with the work of the committee, and the great ability he displayed in examining the witnesses.

A letter was read from the Clerk of Supply, Nairn, sending copy of one addressed by him to the Privy Council on making compulsory the slaughter of cattle in contact with animals affected with pleuro-pneumonia.

A letter was read from Mr Westley Richards, Ashwell, Oakham, Rutland, on infected areas under the Cattle Disease Act; and suggesting that the Privy Council should take the responsibility, and make regulations the same all over the kingdom, instead of letting each county or burgh make its own. Instead of making a county an infected area, the infected area should be a district of a certain number of miles round the seat of the disease.

Weighing of Cattle.

In his letter, Mr Westley Richards, in writing on the best kind of weight for the new machines that are to be put up in the cattle markets to indicate, states that he thinks for the weighing of cattle the imperial stone and lbs. will be best. Tons, cwts., quarters, and lbs. are not so well suited for cattle. It is very important, as far as possible, to get the new machines to record the same weights, and in his opinion the imperial stone (of 14 lbs.) will be the best. Mr Richards states that Sir John Lawes, who has given the subject a good deal of consideration, is also of the same opinion, as also are Messrs Swan, Edinburgh. As to the size of the machines, Mr Richards states that it is advisable that they should not be too small. Many of the corporations in England are putting up machines only large enough to weigh one beast at a time. This he considers quite useless for weighing store stock, as no business could be got through. The small markets should be provided with machines large enough to hold five beasts at a time, and the larger markets ten beasts; a platform 12 feet by 7 feet is a very good size. The small machines that are being ordered will not comply with the Act, which says, "sufficient and proper weighing places," and a machine holding one beast at a time is not a sufficient and proper weighing machine.

Hunters Improvement Society.

Volume I of Record of Prize Mares and Thoroughbred Stallions, presented by this Society, was submitted and accepted with thanks.

MEETING OF DIRECTORS, 4th JANUARY 1888.

Present.—Vice-Presidents—Viscount Stormont and Rev. John Gillespie. Ordinary Directors—Mr Elliot of Wolfelee; Mr Matthews, Newton-Stewart; Mr Young of Cleish Castle; Mr Murdoch, Garteraig; Mr Elliot, Hollybush; Mr Kerr, Broomhouse; Mr Maxwell, yr. of Munches; Mr Ballingall, Dunbog; the Hon. R. Baillie Hamilton of Langton; Mr Milne, Inverurie; Mr Park, Dechmont; Mr Stirling of Kippendavie; Mr Macpherson Grant of Drumduan; Mr Glendinning, Hatton Mains. Extraordinary Directors—Mr Macduff of Bonhard; Mr Mackenzie of Portmore; Mr Dudgeon, Easter Dalmeny. Treasurer—Sir William Stuart Walker, K.C.B. Honorary Secretary—Sir G. Graham Montgomery, Bart. Chairmen of Standing Committees—James Auldjo Jamieson, W.S.; Mr Hope, East Barns. Chemist—Dr Aitken. Auditor—Mr Wm. Home Cook, C.A. Practical Engineer—Mr James D. Park. Viscount Stormont in the chair.

Mr F. N. Menzies reported apologies for the absence of Sir Robert Menzies, Bart.; Mr Allan, Munnoch; Mr Balfour of Balbirnie; Mr Cran, Kirkton; Mr Fisher, Jellyholm; Mr Dingwall, Ramornie; Mr Gilmour of Lundin; Mr Howatson of Glenbuck; Mr Mackenzie, yr. of Kintail; Mr M'Queen of Crofts; Mr Middleton, Clay of Allan; Mr Murray, Catter House; Mr Paterson of Birthwood; Mr Villiers, Closeburn Hall; Mr Walker, Portlethen.

Office-Bearers and Directors.

The list of noblemen and gentlemen who will be proposed by the Directors for election at the anniversary general meeting of the Society, on the 18th current, to fill the vacancies in the list of office-bearers, was reported.

Glasgow Show, 1888.

Premium List.—The report of the meeting of members held at Glasgow on the 14th December, when the premium list and regulations were submitted and approved, subject to the following suggestions for the consideration of the Board:—(1) That to the class of poultry the usual sections be added for Minoreas and Leghorns; (2) that in butter, in place of three prizes of £6, £4, and £2, there be six prizes varying from £5 to 10s.

The Board did not agree to the first suggestion, but approved of the premiums for butter being increased as follows:—£5, £4, £3, £2, £1, in each of the three sections,

Charge of Implement Shedding.—On a letter being read from the Scottish Agricultural Engineers' Association, the charge for implement shedding was reduced from 3s. to 2s. 6d. per foot to members, and 3s. 6d. to non-members.

Offer of Silver Medals from the Clydesdale Horse Society.—A letter was read from the Secretary of the Clydesdale Horse Society, stating that his council would award the Clydesdale Horse Society's silver medal (value £3) to the breeder of the best registered Clydesdale in each of the sections, 1 to 9 inclusive, of the Glasgow Show premium list.

The Board accepted the offer with thanks.

Glasgow Technical College.

The following deputation appeared and presented memorials, requesting the Society to give a grant to the Glasgow and West of Scotland Technical College, to place the lectureships on agriculture in that College on a satisfactory and permanent basis:—Glasgow and West of Scotland Technical College—Mr Alexander Stephen, Linthouse, Govan; Mr Thomas Russel, Ascog, Bute; Professor George G. Ramsay, LL.D., Glasgow; Mr Thomas A. Mathieson, Glasgow; Mr Alexander Whitelaw, Glasgow. Glasgow Agricultural Society—Mr W. E. Gilmour, Alexandria; Mr H. R. B. Peile, Greenock; Mr John Speir, Newton; Mr Robert Young, Glasgow. Representatives of Bothwell Farmers' Club—Mr William Neilson Belshill, factor on Woodhall and Woodilee Estates; Mr William Gilchrist, Bothwell.

After several members of the deputation had addressed the meeting in support of their memorial, the deputation thanked the Chairman and Directors for their courtesy, and withdrew.

The Board agreed to consider the subject, but delayed taking it up till the meeting in February.

Commission on Grants to Agricultural and Dairy Schools.

The Rev. John Gillespie made a verbal report as to the appearance of himself and Mr M'Queen as witnesses before the Commission on Grants to Agricultural and Dairy Schools. He said that on the day of the last meeting of the Board a telegram was received from London intimating that the Committee would hear a deputation on the following day. Owing to the short notice given, Mr Mackenzie, Portmore, was unable to attend, but he himself and Mr M'Queen were present. They were very fully heard, and the Committee showed them every consideration. Mr M'Queen and himself gave their evidence on the lines already approved by the Board. They quoted resolutions approved by the Board and enlarged upon them. They were sorry that Mr Mackenzie could not be with them.

On the motion of the Chairman, a vote of thanks was awarded to Mr Gillespie and Mr M'Queen for the trouble they had taken in the matter.

Dairy School in Forfarshire.

An application from Lord Strathmore for a grant of £100 for the formation of a Dairy School in Forfarshire was before the Board, but consideration of it was delayed till the report of the Commission on Grants to Dairy and Agricultural Schools had appeared.

Agricultural Education.

A statement was made by Mr Mackenzie of Portmore with reference to Agricultural Education. He said he had had a communication from the Secretary to the Educational Endowment Commissioners regarding a proposed scheme of agricultural education, and a fund, part of which might be devoted to that object.

Mr Mackenzie and Mr F. N. Menzies, the Secretary, were appointed to meet with the Commissioners and lay before them the Society's claims with reference to practical and scientific agricultural education.

Essays and Reports.

Various awards were made for Reports lodged in competition, and the names of the successful competitors will be announced at the general meeting.

Nomination of Directors by Show Districts.

The following motion by Mr Macduff of Bonhard, seconded by Mr Park, Dechmont, was unanimously agreed to:—"That in future the members of the Society in each Show District be summoned to the nomination of Directors in their districts by means of circulars, instead of by advertisement."

Botanical Department.

Mr Maxwell, yr. of Munches, moved as follows:—"That the Botanical Department be requested to draw up a report, to be submitted to the General Meeting, giving particulars of the work done by the Society's Botanist during the past year.

The motion was seconded by the Rev. John Gillespie, and unanimously adopted.

Royal Commission on Horse Breeding.

The Secretary submitted the Report of the Royal Commission on Horse Breeding, together with the prize-list for the forthcoming Show at Nottingham.

MEETING OF DIRECTORS, 18th JANUARY 1888.

Present.—Vice-President—Rev. John Gillespie. Ordinary Directors—Mr Elliot of Wolfelee; Mr Matthews, Newton-Stewart; Mr Murray, Catter House; Mr Paterson of Birthwood; Mr Young of Cleish Castle; Mr Elliot, Hollybush; Mr Maxwell, yr. of Munches; Mr Ballingall, Dunbog; Hon. R. Baillie Hamilton of Langton; Mr Fisher, Jellyholm; Mr Cran, Kirkton; Sir Robert Menzies of Menzies, Bart.; Mr Buttar, Corston; Mr Stirling of Kippendavie; Mr Macpherson Grant of Drumduan; Mr Glendinning, Hatton Mains. Extraordinary Directors—Mr Gilmour of Lundin; Mr Macduff of Bonhard; Mr Dudgeon, Easter Dalmeny; Mr M'Queen of Crofts; Mr Paterson, Plean Farm. Treasurer—Sir W. S. Walker, K.C.B. Chairmen of Standing Committees—Admiral Maitland Dougall of Scotscraig; Dr Cleghorn of Stravithy; Mr Villiers, Closeburn Hall; Sir James H. Gibson Craig, Bart.; Mr Scott Dudgeon, Longnewton; Mr Irvine of Drum; Mr Hope, East Barns. Chemist—Dr A. P. Aitken. Auditor—Mr W. Home Cook, C.A. Engineer—Mr Park. Rev. John Gillespie in the chair.

Apologies were reported for the absence of the Earl of Elgin; Sir James T. S. Richardson of Pitfour, Bart.; Mr Allan, Munnoch; Mr Dudgeon, yr. of Cargen; Colonel Gillon of Wallhouse; Mr Howatson of Glenbuck; Mr Mackenzie of Portmore; Mr Mackenzie, yr. of Kintail; Mr Middleton, Clay of Allan; Mr Murdoch, Gartcraig.

The business had reference principally to the subjects to be brought before the General Meeting of this date.

PROCEEDINGS AT GENERAL MEETINGS.

GENERAL MEETING, 15TH JUNE 1887.

The EARL OF ELGIN, Vice-President, in the chair.

APOLOGIES FOR ABSENCE.

The SECRETARY read apologies for absence from the Duke of Athole, President, who wrote that there was not the slightest chance of his being in Scotland on the day of meeting; and from the Earl of Haddington, Vice-President, who also regretted his inability to attend.

JUBILEE ADDRESS TO THE QUEEN.

The CHAIRMAN said that before they proceeded to the ordinary business of the Society, it was thought right that they should unite with all classes of Her Majesty's subjects in presenting to her an address on the completion of her Jubilee year. With the permission of the meeting, he would read the address which had been framed and submitted to the Directors, and approved by them. He then read the address, which expressed the loyalty of the Society. It also stated that the Society had been instituted for the advancement of agriculture, and the useful arts therewith connected, and incorporated for this purpose by an early charter of George III., confirmed by William IV. and by Her Majesty. It also expressed grateful appreciation of the special recognition of Her Majesty in condescending to allow her name to be enrolled as an ordinary member of the Society. He did not think he need add a single word to the reasons which were expressed in the address, and he begged to move that the Society adopt it.

The address was unanimously agreed to.

FREE LIFE MEMBERS.

The following holders of the Society's diploma were elected Free Life Members, in terms of the Bye-laws :—N. N. Bannerjee, Calcutta; George Carrington, M.R.A.C. Missenden'Abbey, Great Missenden, Bucks; Edward Smith Davies, Claverley, Bridgenorth, Shropshire; Andrew T. L. Dunlop, Morriston, Maybole; Robert Haig, Dollarfield, Dollar; Harry Reid Maitland, Muiryfold; William Somerville, 46 Findhorn Place, Edinburgh; Daniel Steele, Merkland, New Cumnock.

PLEURO-PNEUMONIA INQUIRY.

Mr PATERSON of Birthwood reported with reference to the inquiry instituted by the Directors regarding pleuro-pneumonia. He said that at the meeting of Directors of 4th May, a committee was appointed to discover whether there were good grounds for instituting an inquiry into the methods at present adopted for the purpose of preventing the spread of pleuro-pneumonia in the country, and whether any investigation or experiments of a practical kind might profitably be undertaken by the Society to improve the methods at present in force, or to discover some other method by which the disease might be held in check, or be entirely swept from the country. The committee consisted of Mr Paterson of Birthwood; the Hon. R. Baillie Hamilton; Mr Maxwell, yr. of Munches; Mr Marr, Cairnbrogie; Mr Murray, Catter House; Mr Middleton, Clay of Allan; Mr Stirling of Kippendavie; and Dr Aitken. The importance of such an inquiry, he thought, would be patent to every one. The committee had met three times, and had before them farmers who had large herds of cattle, and who had been engaged in the cattle trade for periods up to fifty years. One man had his cattle free of disease for twenty-four years, and previous to that for twenty-six years he had it constantly. The other witnesses were large farmers, some of them in the immediate neighbourhood of Edinburgh, having large dairies. Their evidence was most interesting. In one case, where there were 80 head of cattle on the disease breaking out, seven were slaughtered, and the rest inoculated; and from that hour to this, although there were animals brought into his sheds and byres, there had been no outbreak of the disease, and nothing going out from the sheds or byres had been complained of as having the disease after being slaughtered. That was one very important point to remember, and it was this case which he thought induced the Directors to institute the inquiry. If by inoculation they could escape the disease or decrease it, it was a very small cost that would carry it out, and it would certainly be very beneficial to the public. There were others in the neighbourhood of Edinburgh—cow-feeders. One man in particular in 1878, instead of having 60 head of cattle, found himself reduced to 15. His mother and himself had a conference, and the young man said that unless they did something to free themselves of the disease they should probably become bankrupt. He asked his mother to allow him to adopt the plan of inoculation. The plan was adopted, and that man's losses from that hour to this had been extremely small. Several cow-feeders in Edinburgh had appeared, and all seemed to be in favour of inoculation. He hoped the Society would allow him to thank the gentlemen who had appeared, not only those farmers and cow-feeders, but the other witnesses whom they had had before them, for the frankness with which they had come forward and the clear and lucid evidence they had given to the committee. In addition to these gentlemen, they asked the Principals of the three principal Veterinary Colleges in Scotland to appear and tell them their experiences. These gentlemen had done so in a most frank and open manner. Other veterinary surgeons had also appeared, and the united wisdom of the whole came to this—that inoculation, if done properly and in time, would be not only a means of preventing the very great destruction of healthy animals, and saving a large amount of money, but if adopted and carried out satisfactorily would sweep the disease from the country. Quoting from the report, he proceeded—"As the result of their inquiry, the committee have to report that there is need of an investigation into pleuro-pneumonia. The experiments begun in this country have not been carried to a satisfactory conclusion. We are at present in ignorance of some of the most elementary facts regarding the disease. It is not known (1) how it is propagated, (2) how far the disease may be carried, and what may be considered an infected area; (3) whether the infection can be resident in byres, trucks, boats, or pens; (4) at what stage of the disease it begins to be infectious, and whether it is able to be detected before that period; (5) whether inoculation gives permanent protection against the disease, and for how long it may be capable of doing so. There are other questions and lines of investigation that have already been referred to. Considering how long the disease has been in the country, and how much it has cost the country to limit the range of the disease, it is remarkable, and not very creditable that so little should be known regarding it. The committee are of opinion that an investigation by some competent persons should be at once set on foot, and they have confidence that if such an investigation were instituted it would result in discovering how best and most economically to combat the disease or to banish it from the country. They are of opinion that such an investigation should receive the support of the local authorities in the country, and that the cost of it would not amount to so much as one year's compensation for slaughtering animals under the present regulations. The committee also desire to point out that the present system whereby an inspector is made personally liable for any loss which may be sustained in the slaughter of healthy animals suspected to be suffering from pleuro-pneumonia, and the limited powers conferred upon him, are a fruitful means of spreading, for it has to make some headway before the inspector feels so confident as to cause the animals to be slaughtered." He commented upon the fact contained in the last sentence, and said that was the point on which he should like their knowledge increased, and he thought it could be done by the aid of this investigation. He was in hopes that, if they had experiments entered upon, instead of being able to detect the disease only after the lungs were affected, they might get it in the fever stage, and be able possibly then to arrest the disease. With regard to the cost of an inquiry, he was not able to give any estimate of what that might be, but he thought a very great deal of information could be got at no great cost. It was said that the cost would not exceed one year's outlay on the slaughtering of diseased animals. He should hope it would not cost even a fourth of that. Their bill was £10,000 in Lanarkshire for this year alone. Other counties were suffering. Instead of decreasing, he was very sorry to say that there were fresh outbreaks in districts which had not been previously reported. He did not think they could move too soon in beginning this investigation, and he hoped it would be carried out at a very early date. Many a time inoculation had not been carried out until the disease had broken out in the cow byre or shed where the animals had been standing. That seemed like shutting the door after the horse was out of the stable, because if inoculation had taken place before the animals were affected at all he did not fancy they would have taken the disease. They had very strong evidence yesterday from Professor M'Call, Glasgow. He bought a cow which was inoculated. He kept it for a certain length of time till the inoculation had taken place. It was then put into a byre where pleuro-pneumonia was raging, and yet the animal was now alive and well. In the case he had spoken of in the neighbourhood of Edinburgh regarding 70 or 80 cows, there had not been a sick animal since inoculation. Had these animals been slaughtered the losses to the owner would have been £2000, and a further sum of £2000 for milk that would have been lost. The cost of any inquiry in comparison with a loss of that kind was not worth considering; for beyond paying for the cattle that were slaughtered there were the restrictions put upon people passing their stocks to the different grazings. He thought the losses to the country at the present time were something extremely serious. If they turned up the returns given for the Government last year they would find that the loss in Scotland alone amounted to £15,000. But that did not represent anything like the whole loss to the country. He hoped the committee would continue, and that ways and means would be found to enable them to carry out to a satisfactory conclusion this inquiry. He had no hesitation in saying that great benefit would accrue from it, for although a worthy professor at the head of the Privy Council considered he had all the knowledge in the world in regard to this matter, he was rather of a different opinion; and he fancied, from consultations he had had with the heads of the University here, that this disease was little known, and that an inquiry would possibly lead to very different results from those they had at the present time. He hoped the statement he had now made would be satisfactory to the meeting, and that they would support the Directors in carrying out the investigation.

Mr VILLIERS asked Mr Paterson if he considered that the tendency of the committee was to recommend legislation for compulsory inoculation in the end.

Mr PATERSON replied that the committee was simply appointed for the purpose of considering as to the practicability of instituting an inquiry into this matter. They had given in their report to-day to the Board, and they proposed to continue the committee with full powers to bring out all the truth they could in regard to the question, but as to whether they were going to recommend legislation he had not the authority to say. He had no doubt that if inoculation were carried out at the proper time, before the disease had broken out in a byre, it would be free of disease for a very lengthened time. They had had considerable difference of opinion as to how long animals would be free from disease after inoculation. They had one learned professor saying they would be free for life, and another saying for two or three years. It would be of very great consequence indeed if such a result could be attained.

The report was then received.

PERTH SHOW, 1887.

Colonel GILLON said—I have to report that the General Show at Perth will take place on the 26th, 27th, 28th, and 29th July. There was at one time some doubts if the Show would be held, owing to pleuro-pneumonia, but these have been overcome, owing to the strong feeling in the city of Perth and district that the Show should not be postponed. The following is a comparative statement of the entries at Perth in 1879 and on the present occasion :—

	1887.	1879.
Cattle,	270	383
Horses,	239	253
Sheep,	530	470
Swine,	38	56
Poultry,	210	200
Butter,	72	36
Implements,	1509	2207

At a meeting of the General Committee, held at Perth on Friday last, the following sub-committees were appointed :—Admission to Parade Gallery—Mr Macduff of Bonhard (convener); Dean of Guild Mackenzie; Mr Crawford; Mr Macdougall, Goodlyburn; Treasurer Wilson. Police—Captain Smythe, yr. of Methven; Lord Provost Martin. Banquet—The Duke of Athole, K.T.; the Earl of Elgin; Lord Stormont (convener); Mr Small of Dirnanean; Sir Robert Menzies, Bart.; Lord Provost Martin; Dean of Guild Mackenzie. Ball—The Duke of Athole; the Earl of Elgin; Lord Stormont; Sir James Stewart Richardson, Bart. (convener); Lord Provost Martin; Bailie Mitchell; Mr Richmond, Hilton; Mr Cathcart, yr. of Pitcairlie; Captain Clayhills Henderson of Invergowrie; Mr Moubray of Naemoor; Mr Beveridge, yr. of Kinneston; and Mr Gilmour of Montrave. The erection of the Showyard is being carried out by Mr James Farquhar, Broomhill Place, Aberdeen, who performed the work in a satisfactory manner at Aberdeen in 1885 and Dumfries in 1886. The refreshments in the yard will be in the hands of Mr Mitchell, 3 India Street, Edinburgh; Messrs Hunter & Glover, 3 North St Andrew Street, Edinburgh;

Mr Robert Wilson, 38 St John Street, Perth; and Mrs Johnstone, Fountain Café, Dumfries, will have the temperance tent. The headquarters of the Society will be at the Salutation Hotel. Tickets for the Show will in due time be sent to all members of the Society residing in the United Kingdom.

Mr MATTHEWS, Newton-Stewart, remarked that owners could, with every confidence, bring forward their stock to Perth Show. There was a direct road from the railway to the Perth Show road, and no cattle could be admitted from an infected area. Consequently there could be no fear of stock being brought into contact with infected cattle.

The Rev. JOHN GILLESPIE said it should be made public that one month before the Show was held, all cows would be removed from the South Inch at Perth. Therefore stock being taken to the Showyard would go on the railway to a special siding, where they would not come in contact with any place where cattle had previously been, but when they arrived at the Showyard they would reach a place absolutely clean, and where no cattle had been for a month before.

The reports were approved.

GLASGOW SHOW, 1888.

Colonel GILLON also reported that the preparatory arrangements for the general Show to be held at Glasgow in 1888 had been made; and that the support given to the Society on former occasions by the Lord Provost and authorities of the city of Glasgow, and by the counties of Lanark, Ayr, and Renfrew, would be repeated.

AGRICULTURAL EDUCATION.

The Rev. JOHN GILLESPIE, in the absence of Mr Mackenzie of Portmore, reported that arrangements had been matured for a deputation going to London to wait on the heads of various departments of the Government, with the view of asking a liberal subsidy for the furtherance of higher agricultural education in Scotland, but unfortunately there had been a change in the office of Chancellor of the Exchequer, and Mr Goschen—for very good reasons, he had no doubt—had said he could not receive a deputation until the Budget had been disposed of. As they knew, the Budget had not yet been entirely disposed of, and practically the deputation had been able to do nothing, from circumstances over which neither they nor the Board had any control whatever. They extremely regretted the delay, but could not possibly help it. He might say generally that the object was to ask the Government as far as possible to give grants in aid of the whole of Scotland for the promotion of higher agricultural education; that wherever districts could raise a sufficient sum locally they should be subsidised to some extent by an imperial grant; also, and more especially, as a step in advance, that a strong staff should be connected with the Agricultural Chair in the University of Edinburgh; that grants should be got for lectures on agricultural chemistry and botany as applied to agriculture; and that, if possible, an experimental farm, or, at all events, an agricultural experimental station, should be started where investigations could be carried on to solve questions in agriculture, and to give practical training for students attending classes in Edinburgh. The deputation, as he had said, regretted the delay that had taken place, but would avail themselves of the first opportunity to prosecute the object they had in view. Mr Gillespie further reported that the annual examination of candidates for the diploma and certificates in agriculture took place on the 28th, 29th, and 30th March, when 21 gentlemen presented themselves, and that the following passed:—For Diploma—Nogendro Nath Banerjee, Calcutta; George Carrington, M.R.A.C., Missenden Abbey, Great Missenden; Harry Reid Maitland, Muiryfold, Grange, Keith; Daniel Steele, Merkland, New Cumnock; Edward Smith Davies, Claverley, Bridgenorth; Andrew T. L. Dunlop, Morriston, Maybole; Robert Haig, Dollarfield, Dollar; William Somerville, 46 Findhorn Place, Edinburgh. For First-class Certificate—Alfred Henry Inman, Muirpark, Eskbank, Dalkeith; Khosheroo B. Jadhava, Baroda, Bombay; Walter Frank Perkins, Portswood House, Southampton; Pandit Srilal Misra, Mahaban, Dist. Muthra, N.W.P., India. For Second-class Certificate—John Barker, Cockden, Briercliffe, Burnley; Christopher Drieberg, Colombo, Ceylon; Patrick Ritchie Murrison, Forfarshire; Charles T. A. Robertson, Kenworth Lodge, Merchiston, Edinburgh; Robert Gordon, Gordonston, Clatt, Kennethmont; James Kerr, Mid Kelton, Castle-Douglas. The prizes to the class of agriculture in the Edinburgh University were awarded to—1, J. R. C. Smith, Mowhaugh, Kelso; 2, Daniel Steele, Merkland, New Cumnock.

FORESTRY DEPARTMENT.

Sir ROBERT MENZIES, Bart., said that the Directors had come to be of opinion that there should be a standing committee to manage the Forestry Department, and that it be requested to arrange the nature and extent of the examinations for the

Society's Certificates. They ventured to suggest that the following committee be appointed :—Lord Lovat ; Sir Robert Menzies, Bart. ; Sir Herbert Maxwell, Bart. ; Dr Cleghorn : Professor Dickson ; Mr W. J. Maxwell ; Dr Aitken ; Mr John Macgregor ; Mr John M. Aitken ; Mr John Methven ; Mr Robert Lindsay, Edinburgh Botanic Garden. Sir Robert then reported that the forestry examinations were held on the same days as those under the Educational Charter, when a first-class certificate was awarded to Mr John Bardgett, Sockbridge Mill, Tirril, Penrith, he having satisfied the examiners in all the required subjects.

The report was adopted.

Chemical Department and Experimental Station.

Dr Aitken, the chemist, gave in the following report :—I have to report that the two experimental stations are now under barley, and that the circumstances in which the crops are being grown resemble those which were arranged for the grass crops last year. At Harelaw, the lower half of each plot has been manured in the same manner as heretofore, while the upper half has again been sown without manure. The object of this method of treatment is to discover what is the amount of unexhausted fertility remaining in the soil, and derived from the large quantities of light manures applied in former years. The crop was put in excellent order, and notes are being taken of its progress. There are marked differences already observable over the station, and it bids fair to form a very instructive picture two months hence. At Pumpherston, the barley crop has been sown out with a carefully-selected mixture of seeds, consisting chiefly of the natural grasses intended for permanent pasture. No manures whatever have been applied to the barley crop, so that at this station also there will be an opportunity of observing the relative amounts of fertility due to former manurings. I look forward with great interest to the lessons which will be taught by the grass crops on this station. The proper manurial treatment of grass is a matter of increasing importance in these times, and the plots of what may be termed pedigree land at Pumpherston possess advantages for such an investigation that are not to be found anywhere else in Scotland.

Botanical Department.

Mr M'Alpine, the botanist, reported that during the past season he had examined over 100 samples of seed, most of which were very pure and clean. The germination had been somewhat interfered with at the beginning of the season by attacks of fungi, but, by alterations in the germinating case, he had almost entirely prevented the outbreaks. The following figures gave the extreme percentages of germination observed in the samples analysed :—Meadow fescue, 100 to 98 per cent. ; foxtail, 75 to 30 ; Italian grasses, 95 to 80 ; perennial grasses, 96 to 80 ; crested dog's tail, 98 to 75 ; timothy, 100 to 95 ; sweet vernal, 50 to 40 ; cocksfoots, 98 to 55 ; clovers, cowgrass, 99—none below 90 ; white clover, 90 to 80 ; alsike, 95 to 80 ; rape, 100. Poas germinated very badly, and all the percentages were low.

Mr James Robertson (Newhouse) said he wished to draw attention to the large amount the Society paid in connection with chemistry. They were charged a guinea for analysis. He thought it would be perfectly reasonable if they were charged only half-a-guinea ; and that the chemist would be well paid. He thought it would be very advantageous if they had the opportunity on more reasonable terms of getting analysis. The Society would thereby be giving a boon to its members in a higher ratio than they were now getting in other ways. He urged on the Directors the propriety of considering the question of reducing the charge for analysis.

The Chairman said he had no doubt that the Directors would take the matter into consideration.

Transactions.

Mr Irvine of Drum laid on the table Volume XIX. (Fourth Series) of the *Transactions.*

Horse-Breeding.

Mr Mackenzie, yr. of Kintail, reported that the following petition by the Society had been presented to the House of Lords by the Right Hon. Lord Ribblesdale :—

"Unto the Right Hon. the Lords Spiritual and Temporal of the United Kingdom of Great Britain and Ireland in Parliament assembled, the Memorial of the Highland and Agricultural Society of Scotland, incorporated by Royal Charter,

"Sheweth—That on the 7th of March last, the attention of your Lordships was alled by the Right Hon. Lord Ribblesdale to the question of horse breeding and supply for military and industrial purposes in this country.

"That this Society takes a deep interest in all that can benefit agriculture, and in these depressed times it would be of very great importance to stimulate the breeding of good half-bred horses.

"That, in furtherance of this object, it is most desirable that an annual grant of £5000 should be made by Her Majesty's Government, to be devoted in the shape of premiums to thoroughbred stallions, the owners of which to guarantee each horse to serve a certain number of mares at small fees.

"And your petitioners will ever pray.

"Sealed," &c. (Signed) "STORMONT, Vice-President.

"Highland and Agricultural Society's Hall, Edinburgh, 4th May, 1887."

Mr Mackenzie added that Lord Ribblesdale had written in reply, stating that he was much obliged to the members of the Society for the memorial, and that nothing they could have done could have more strengthened his hands.

UTILISATION OF URINE.

The SECRETARY reported that in connection with the offer of a premium of £400 by the Society to any one who shall discover a practicable method by which the valuable constituents of urine may be most profitably utilised, there had been lodged 39 reports, many of them written in foreign languages, and of great length. The foreign reports have been translated, and will be shortly in the readers' hands, but it will be some months before a decision can be arrived at.

WARBLE FLY.

The SECRETARY called attention to a circular which had been sent by the Society to nearly 200 local agricultural associations in Scotland, on the loss sustained by the farmers by the damage done to hides, and even to beef, by warbles, and asking them to get their members to adopt means to prevent the warble fly from depositing its eggs in the hides of animals. Along with the circular there were sent copies of two reports and a leaflet on the warble fly by Miss E. A. Ormerod, Dunster Lodge, Islesworth, kindly presented by that lady to the Society. Copies of the pamphlets may be had on application to the Secretary.

H. M. JENKINS'S MEMORIAL FUND.

Mr PATERSON of Birthwood reported that soon after the death of Mr Jenkins, secretary of the Royal Agricultural Society, it was resolved, at a representative meeting of agriculturists held in London, to raise a memorial fund in recognition of the many public services he had rendered to agriculture. At a meeting on the 6th of April the Directors unanimously agreed to vote a sum of £50 on account of the many public services which Mr Jenkins had rendered to agricultural literature, and to agriculture generally.

A vote of thanks was passed to the Chairman, and the proceedings ended.

GENERAL MEETING IN THE SHOW YARD AT PERTH, 27TH JULY 1887.

The EARL of ELGIN, Senior Vice-President, in the absence of the Duke of Athole, the President, occupied the chair.

THE SOCIETY'S ADDRESS TO THE QUEEN.

The SECRETARY read a letter from the Home Secretary acknowledging the Society's address to the Queen on the occasion of Her Majesty's Jubilee. Mr Matthews said Her Majesty was graciously pleased to receive the address.

VOTES OF THANKS.

The CHAIRMAN moved that the thanks of the Society be given to the Lord Provost, the Magistrates, and Town Council of Perth for the excellent accommodation afforded for the Show, and for their hearty co-operation and admirable arrangements. Captain GILMOUR, Montrave, in seconding the motion, testified to the zeal and energy the Lord Provost and Magistrates had shown from the commencement in endeavouring to assist the Society in carrying out the details of the Show. The resolution was adopted.

Mr STIRLING of Kippendavie moved a vote of thanks to the Earl of Elgin for his zealous discharge of the duties devolving upon him as Senior Vice-President of the Society. The resolution was seconded by Mr J. MIDDLETON, Clay of Allan, agreed to, and acknowledged by Lord ELGIN.

Mr MAXWELL, yr. of Munches, said that a good deal of the success of the Show depended upon Viscount Stormont, the convener, and the other members of the district committee, and he moved a vote of thanks to them for the able manner in which they had performed their duties. Mr MURDOCH, Gartcraig, seconded the motion, which was adopted. Viscount STORMONT, in acknowledging the vote of thanks, said he very much feared that the success of the Show this year was rather doubtful, and he trusted that the next time the Society honoured Perth with a visit, they would be able to have a cattle Show where there would be some cattle.

Mr ELLIOT of Wolfelee moved that the thanks of the Society be given to the Commissioners of Supply for the counties of Perth, Forfar, Fife, and Kinross for their liberal contributions in aid of the auxiliary fund. The motion, which was seconded by Mr MACPHERSON GRANT, and adopted, was acknowledged by Viscount STORMONT.

PLEURO-PNEUMONIA.

Mr HUGH LINDSAY, Meadowflat, raised the question of pleuro-pneumonia, which he said was of great interest to farmers, and expressed the hope that the convener of the Society's committee in charge of the question would inform the meeting what had been done in the way of carrying out their investigations.

Mr PATERSON of Birthwood, the convener, said the committee had had several meetings since the last general meeting of the Society. Last year he had spoken of an animal that belonged to Professor M'Call, Glasgow, and stated that it withstood any infection, although placed among some which were seriously affected by the disease. Professor M'Call had the animal for a considerable time in his possession, and it was never in contact with any animals suffering from the disease. It was inoculated by Dr Rutherfurd, Edinburgh, and after its recovery from the inoculation it was placed in a byre where a serious outbreak had taken place. The animal withstood all effects of the disease, and was alive and well at the present time. He thought that might be taken as showing that animals inoculated before coming into contact with others suffering from the disease would withstand its attack. The committee had issued a circular to local authorities asking replies from their inspectors to eleven queries with reference to the disease. From 110 to 120 replies had been received and tabulated. They found that the almost unanimous opinion expressed by those who had experience of the disease and of inoculation was that a further inquiry should be carried out, and that that inquiry would be fruitful of good results. He thought that at present no man could really tell when an animal was suffering from pleuro-pneumonia. Six weeks was allowed to be the period between its first contact with disease and the appearance of external symptoms. It might be months before the disease showed itself. He mentioned that in connection with the report which had been issued by the Privy Council on the subject of pleuro-pneumonia, and upon which a leader appeared in the *Scotsman* on Tuesday, they were told that animals could be inspected at the port of export. There was no man living who could tell whether a particular animal had the disease or not; and, with the knowledge they had of the disease, inspection of that character was not worth having. He was in hopes that if they carried out that inquiry they would arrive at a position different and more satisfactory than that which they occupied at the present moment. He looked upon the slaughter of animals that was going on all over the country as one of the most hideous and horrible things it was possible to contemplate. In his own county of Lanark he had decreed the slaughter of 107 cattle; and the young ones among them were found to be perfectly free from the disease. He thought it was a very great disgrace to science that they were in that lamentable position, that they were at this time of day in ignorance of the nature of the disease. In conducting the proposed inquiry, they required the assistance of veterinary surgeons, chemists, and others, and it was absolutely necessary that they should have ample funds at their disposal; and he trusted that their investigations would be successful, for at present they knew as much about pleuro-pneumonia as it knew about them. He hoped the members would bring the subject before their local authorities, and induce them to contribute to the funds necessary for the inquiry. As soon as their report was finished, it would be sent to the different local authorities, and they would also approach Government on the subject. One member had already done so.

Mr STIRLING (interrupting) appealed to the meeting not to press the committee for any further report that day. He thought it was hardly fair to the committee that they should be to a certain extent pledged to any opinion on the subject. He felt that the convener was to a certain extent pledging him further than he was perhaps inclined to go. He begged that the meeting would believe that the committee would give their very best consideration to the subject, and that the members of the Society would not be kept in ignorance of what the committee was doing.

Mr PATERSON said he was very sorry if he had pledged any one, but he did not think he had done so. He trusted that the harmony which had existed in the committee would continue. There was no more active member than Mr Stirling, and he felt deeply indebted to him for the care and attention he had given to the subject, and for taking the opportunity of seeing what they might expect from the Government. That was a national matter, and he thought that, as both England and Ireland would participate in the benefit of the inquiry, the Government should extend pecuniary aid to the committee. Colonel Stirling had approached the Government on the subject, and had been assured that every suggestion the committee made would receive from the Government the greatest possible consideration. Some people estimated the cost of the inquiry at £5000, and others at £10,000; but whatever it cost, the expenditure would be small in comparison with the terrific loss which the disease caused to the country at large. Professor Brown, the Privy Council Inspector, who did not believe in inoculation, had stated that this was not a time for inquiry, but a time for action. They had taken "action" in Lanarkshire, and it had cost them £12,000, and would probably cost them £20,000. They had killed every animal in every place except one, and there the cattle were healthy and pure because they had been inoculated.

Professor WILLIAMS, as veterinary surgeon to the Highland and Agricultural Society, supported Mr Paterson in what he had said as to the value of inoculation. He could assure them that inoculation had been a great success, and his belief was that if it was carried out they would not only save an immense amount of money, but would put an end to the disease. It was true that Professor Brown was opposed to inoculation, and that he based his conclusions on the want of success that had attended it on the Continent; but he had read all the Continental reports, and the whole experiments there had been a mistake from beginning to end. The Continental veterinary surgeons did not know how to inoculate cattle for pleuro-pneumonia. The subjects were not properly inoculated, and they knew nothing about the lymph. When they inoculated for small-pox they did not produce small-pox, but only a modified form of the disease; and in the same way they produced by inoculation a modified form of pleuro-pneumonia in the tail of the cow. He did not think the experiments would cost anything like £5000, but that a very moderate expenditure would suffice; and he believed that pleuro-pneumonia could be prevented without the very disastrous process of slaughtering the cattle.

The Rev. JOHN GILLESPIE said he observed from newspapers published south of the Tweed that it was taken for granted that the Highland Society had pronounced in favour of the success of inoculation. The Society had done nothing of the kind. What they had said was that their experience had been such as to warrant a thorough and searching inquiry; but the Society was committed to nothing beyond the determination to do all they could to understand, not only the value of inoculation, but the whole subject of pleuro-pneumonia.

Mr STIRLING said their pockets were more likely to be affected by being misrepresented in Canadian and American papers than in English papers. If the Canadians and Americans believed that the Society had pronounced in favour of inoculation, they would be very loth to receive any of their home-bred cattle. For that reason alone they should not pledge themselves to any line of action without very full and most impartial inquiry.

Sir GRAHAM MONTGOMERY said he would like to hear if the committee had obtained any further information with reference to the disease than was possessed by the Privy Council in London?

Mr PATERSON said, as the committee were still taking evidence and consulting the leading veterinary surgeons in the country, they were unwilling to express any hasty opinion. He did not wish, therefore, to go counter to Professor Brown, but to say that the pole-axe should be applied to all cattle affected was abhorrent to human nature and a disgrace to present-day science. He knew of many instances where inoculation had proved of great benefit, but he was not pledged to it, nor were the committee. He observed that Mr Clement Stephenson, Newcastle, on being applied to the other day by the Aberdeenshire farmers, had given his opinion in favour of the pole-axe; but against that opinion he (Mr Paterson) placed the experience of a well-known breeder like Mr Pole-Gell, who after an outbreak among his cattle, had taken the virus off the lungs of a diseased animal, and had the remainder inoculated, with the result that not one had died.

The CHAIRMAN thought it would be more advantageous that the committee should be allowed to finish their deliberations and present their complete report before any discussion took place, so that they might consider it carefully and be able to come to a decisive opinion.

This suggestion was adopted, and the subject was allowed to drop.

THE CLAIMS OF DUNDEE.

Captain CLAYHILLS HENDERSON of Invergowrie, Dundee, brought under the notice of the Directors the claims which Dundee had to a visit from the Society.

It was, he said, strange that the third town in Scotland in point of wealth, commerce, and population, and the important agricultural county of Forfar, should be milked on both sides by two other towns which got the Show in turns. He also complained of the constitution of the Directorate of the Society, which gave seven Directors to Perthshire, while Forfarshire had practically none. Although he was beaten when he last brought forward the claims of Dundee—(a voice, "And beaten handsomely") —no, he was not beaten handsomely; he was beaten in the most ungenerous and most unhandsome fashion. He was told by one gentleman that if the Show were taken away from Perth the Perthshire Commissioners of Supply would withdraw their subscription, and his reply was that whether the Show went to Dundee or not, the county of Forfar would never do such a dirty thing as that; and if the county did, he would guarantee the money himself. He hoped the claims of Dundee would be taken into consideration by the Directors.

Viscount STORMONT protested against the statement that the Perthshire Commissioners of Supply proposed to withdraw their subscription if the Show was not held at Perth. Whoever said so had no warrant for the statement.

Captain HENDERSON.—I accept Lord Stormont's apology—I beg pardon, his explanation, with many thanks, and I am glad to receive it.

Provost BALLINGALL, Dundee, expressed the hope that the Directors would see their way within the next three years to place Dundee upon their circuit. The last time the Society visited them was in 1843, but since then the population of Dundee and district had greatly increased; they had now got the Tay Bridge reconstructed, and there were other reasons why the Society might favourably entertain their request.

Mr FERGUSON, Pictstonshill, asked what direct special interest the Highland and Agricultural Society had in the Farmers' Supply Association that they were allowed to post their bills on the Committee Room, and got the use of the pavilion for their meeting?

The CHAIRMAN, speaking as an individual, said he was thoroughly of opinion that Dundee ought to be visited by the Society; and he believed he had the authority of the Directors for saying that although on this occasion they could not forego the claims of Perth, they would certainly reconsider the claims of Dundee. With regard to Mr Ferguson's question, the Directors had sanctioned the holding of a Farmers' Supply Association meeting in the pavilion, but as it had been objected to they would reconsider the matter in future.

THE MANAGEMENT OF THE SOCIETY.

Mr CRAWFORD, Balgarvie, Perth, said he had a few remarks to make as to the way the Show had been managed, or rather mismanaged. The members of the Society in the Perth Show District had met some time ago, and after going over the proposed premium list, had forwarded certain recommendations to the Directors, but these had been treated with contempt. A few of them had gone to Edinburgh to ascertain why their recommendations had not been given effect to, and they were told by one prominent Director that the Society did not exist for Perthshire. That gentleman might have retained that piece of information, and handed it down to his family.

Mr MACKENZIE, yr. of Kintail, rose to order. The subject, he said, had been discussed at last general meeting, and could not be brought up again.

The CHAIRMAN said he would put it to the meeting if it was fitting that the matter should be again discussed at that time.

Mr CRAWFORD.— That is the way all the business is carried on.

Mr SCOTT DUDGEON, Longnewton, objected to any stop being put to any expression of local opinion. That was what these meetings in the Showyard were intended for, and he hoped the Directors would not attempt to interfere with free discussion.

The CHAIRMAN said he did not wish in any way to stop an expression of local opinion, but to point out to the members that this particular complaint of the manner in which the representations were dealt with had been discussed by a general meeting of the Society, and was afterwards disposed of by the Directors.

The Rev. JOHN GILLESPIE said these meetings in the Showyard were most valuable for ventilating any grievances that might be felt by members, but the gentleman should not re-discuss a matter that had been fully dealt with at Edinburgh.

Mr CRAWFORD.—When we went to Edinburgh we were told by a Director what the Society did not exist for. I will tell him what it does exist for. The Society exists for a comfortable living for the officials, and for a week's outing for the Directors.

Mr PATERSON.—I will be glad if the gentleman will pay my expenses in travelling to the Directors' meetings.

Sir ROBERT MENZIES.—The Show costs me £60 a year.

Mr CRAWFORD.—But as you get all the business to do in the yard, you get all the credit and honour.

The CHAIRMAN said the Secretary had been instructed to communicate in future to the localities interested any decision the Directors might come to with regard to recommendations forwarded to them, and he thought that would meet the case.

PRIZES FOR HALF-BRED HORSES.

Mr JAMES ROLLO, Dunning, thought the Directors should consider the desirableness of offering prizes for half-bred horses, and providing classes for brood mares and yearlings.

The CHAIRMAN said the Directors would give the matter their attention if it was brought before them.

A vote of thanks was then passed to the Chairman for presiding, and the meeting separated.

ANNIVERSARY GENERAL MEETING, 18TH JANUARY 1888.

Rev. JOHN GILLESPIE, Mouswald, Vice-President, and afterwards Mr MURRAY, Catter House, Vice-President, in the chair.

NEW MEMBERS.

Forty-one new members were balloted for and elected.

NEW OFFICE-BEARERS.

The following noblemen and gentlemen were elected to fill the vacancies in the list of office-bearers:—President—His Grace the Duke of Portland. Vice-Presidents —Most Noble the Marquis of Bute, K.T.; Sir Michael R. Shaw Stewart, Bart.; James Murray, Catter House; F. E. Villiers, Closeburn Hall. Ordinary Directors —Sir James R. Gibson Maitland, Bart.; Sir James H. Gibson Craig, Bart.; John Lorne Stewart of Coll; Alexander Macduff of Bonhard; David Buchanan, Garscadden Mains; John Marr, Cairnbrogie; Rev. John Gillespie, Mouswald; R. H. Elliot of Clifton Park; Andrew Mackenzie, Dalmore. Extraordinary Directors—The Hon. Sir James King, Lord Provost of Glasgow; Lieut.-Col. Sir Archibald C. Campbell, Bart., M.P.; Captain David Bolye of Shewalton, R.N.; Colonel W. W. Hozier of Mauldslie Castle; Colonel J. W. Malcolm, yr. of Poltalloch, M.P.; David M'Gibbon, Ardnacraig; Bailie James M'Lennan, Glasgow; John Speir, Newton Farm; J. Windsor Stuart, Rothesay; J. H. Turner, The Dean; James T. S. Elliot of Wolfelee; J. M. Martin of Auchendennan; Jonathan Middleton, Clay of Allan.

VOTE OF THANKS TO THE DUKE OF ATHOLE.

The following resolution was unanimously adopted:—"That the Duke of Athole, K.T., having during the past year discharged the duties of President of the Society, thereby sustaining the dignity and promoting the interests of the Society, the best thanks of the meeting are eminently due to his Grace on retiring from that office."

ACCOUNTS FOR 1886-87.

Mr JAMES AULDJO JAMIESON submitted the accounts for 1886-87, which were approved.

ARGYLL NAVAL FUND ACCOUNTS.

Admiral MAITLAND DOUGALL of Scotscraig submitted the accounts of the Argyll Naval Fund, which were approved.

PERTH SHOW, 1887.

Mr STIRLING of Kippendavie, said—After the exhaustive reports on the late Show held at Perth, which were published at the time, it is unnecessary for me to occupy the time of the meeting with more than a brief reference to the financial results. From the printed abstracts which have just been submitted, it is gratifying to notice that there will be only a probable loss of about £4, against a deficiency of £336 in 1879, the previous occasion of the Show being held at Perth. Every one regretted the absence of cattle; but in all other respects the meeting was a decided success, and exceeded the most sanguine expectations of those in favour of holding it. It need scarcely be added that the Society met with that cordial support and reception which has always been accorded to it. The Duke of Athole, the president, though unable to be present, took a warm interest in the success of the meeting. The Society was much indebted to the Earl of Elgin, the Senior Vice-President, for presiding at the general meeting of members held in the Showyard, as well as at the banquet; and also to Viscount Stormont, who acted as convener of the Local Committee.

This report was unanimously approved of.

Glasgow Show, 1888.

Mr Stirling also said—As members are aware, the General Show for this year will be held at Glasgow from the 24th to the 27th July inclusive. The last days for receiving entries have been fixed as follows:—For implements, 11th May; stock, poultry, and dairy produce, 8th June. In order to lessen the number of vacant stalls, the following fines will be imposed on all exhibitors whose animals are not forward:—For horses, 40s; cattle, 20s; sheep and swine, 10s; poultry, 5s. This fine is in addition to the entry-money. In the case of death or illness of an animal, a veterinary surgeon's certificate is necessary for the remit of the fine. On the report of the committee appointed at Perth for the purpose of examining all the erections in the Showyard, the following alterations have been agreed to:—That the boxes for all stallions, except yearlings, and for mares in foal, be 10 feet by 10 feet; that the boxes for mares with foal at foot be 13 feet by 10 feet; that the sheep pens be on three sides composed of iron hurdles, and be 7 feet broad by 5 feet wide, that the shed be divided down the centre by wood posts and rails, and that the implement sheds be 8 feet high instead of 9 feet. There having been no award of a Tweeddale gold medal at Perth, two will be offered at Glasgow—one for the best shorthorn bull, the other for the best Border Leicester tup. The Clydesdale Horse Society will award their silver medal (value £3) to the breeder of the best registered Clydesdale in each of the sections 1 to 9 inclusive of the Glasgow prize-list. A cup of the value of £10 has been included in the premium list, presented by Mr Howatson, of Glenbuck, for the heaviest one-shear blackfaced wether. The breeders of blackfaced sheep offer £4 in prizes to the shepherds feeding prize shearling blackfaced wethers. The Clydesdale Horse Society have also intimated that they will offer premiums for:—1. Family group of five yearling colts or fillies got by one sire. 2. Family group of five two-year-old colts or fillies got by one sire. 3. Family group composed of mare and two of her progeny. A first, second, and third prize will be offered in each class, the amounts of which will not be less than the premiums usually offered by the Glasgow Agricultural Society. All the competing sires, and all the animals composing the various groups, must be registered in the Clydesdale Stud-Book. The premium list is now being revised and copies will be ready about the middle of February. The Town Council of Glasgow have agreed to give the use of a part of the Green for the Showyard, and also to give the Society a contribution of £200. The counties of Lanark, Renfrew and Ayr, have intimated that they are to raise voluntary assessments to assist in meeting the expenses which the Society has to incur.

This report was unanimously approved of.

Vote of Thanks to Colonel Gillon.

The following resolution was unanimously adopted:—"That Colonel Gillon of Wallhouse, having resigned the convenership of the Committee on General Shows, the cordial thanks of the Society be given to him for taking so lively an interest in the affairs of the Society, and particularly for having devoted so much time to the duties devolving upon him as chairman of the Veterinary Committee from 1868 to 1872, and as chairman of the Committee on General Shows from 1872 to 1888."

Machinery Department.

Mr Scott Dudgeon, Longnewton, convener of the Committee on Machinery, announced that on the occasion of the Glasgow Show, the following premiums would be offered in the implement department:—1. Best fixed single cylinder steam engine with boiler combined or separate, for erection in steadings, to drive all ordinary farm machinery. Nominal power, 6 horse. In awarding the prize, special regard will be paid to price, simplicity of construction, economy in consumption of fuel, rapidity in raising steam, facility of erection, and cheapness of foundations, &c. Total cost at Glasgow not to exceed £150. Premium, £75. Exhibitors competing for this prize must send, along with their certificates, a detailed specification of both engine and boiler. Schedules specifying the dimensions to be given will be issued on application to the Secretary. 2. Best combination of machinery for cutting chaff as the straw is delivered from ordinary thrashing machine, and transporting by blower or otherwise the cut chaff for storage in bulk or in bags. Premium £25. The trials will take place in the Showyard at Glasgow during the Show. The report was approved of.

Highland Industries and Fisheries.

Sir James Gibson Craig, Bart., chairman of the Committee on Highland Industries and Fisheries, intimated that the following prizes would be offered on the occasion of the Glasgow Show:—

Section	£	£	£	
1. Best collection of inland fishing tackle, ...	10	5	3	
2. Best collection of kippered and preserved salmon, . .	10	5	3	
3. Best method of sending salmon and trout fresh to southern markets,.	5	2	0	
4. Best method of transporting live fry or young fish, .	5	2	0	
				£50

The report was unanimously approved of.

Agricultural Education.

The Rev. John Gillespie, Mouswald, said, in the absence of Mr Mackenzie of Portmore, the convener of the Committee on Agricultural Education, he had to make a verbal report. Immediately after the meeting held in that room twelve months ago, it was resolved by the Board to approach Government with the view of asking a liberal subsidy for higher agricultural education. Arrangements had been completed for the reception of a deputation by the Government when a change in the office of Chancellor of the Exchequer took place, and Mr Goschen was so fully engaged in work connected with the preparation of the Budget that he could not receive the deputation at the time they should have gone up. That practically put the matter on the shelf for a time. Lately the Board resolved to send up a deputation to the Commission on Agricultural and Dairy Schools to give the views of the Board on the subject. That was done, and the report of their evidence had already appeared in the newspapers. Mr Gillespie then gave an account of the examination of himself and Mr M'Queen by the Committee. Proceeding, he said the present position of matters was that the Commission had concluded its labours as regarded the taking of evidence, and he believed the appearance of the report might be expected very shortly. Individually, he would take the occasion to express the hope that the recommendations of the Commission would prove adequate. Great Britain was the only civilised country in the world that did not subsidise liberally agricultural education, and yet that remark was subject to correction. Great Britain had subsidised agricultural education in Ireland for many years to the tune of £4000 annually. Scotland for a number of years had got £150 to the agricultural chair of the University of Edinburgh, and England had got £200 in connection with the professorship at South Kensington. That was the measure of the Imperial liberality so far as Scotland and England were concerned. Ireland got £4000 a year, and he rejoiced that it did so, but he did not understand why so much should go to Ireland and so little to England and Scotland. In the meantime they must possess their souls in patience until the report appeared. But, unless adequate recommendations were made in this report for agricultural education both in England and Scotland, he humbly thought it was their duty, in the agricultural interests of Scotland—as in one sense representing the people of Scotland—it was their duty to leave no stone unturned to induce the Government to give them a liberal amount. He hoped such measures as were necessary for that purpose would be taken. He also hoped that the recommendations of the Commission would be such that no complaint would be made regarding them. He thought that it was well in the meantime that the public should understand what the position of matters was as regarded the money grants, and with that information they should be able to judge of the recommendations which that Commission might make.

Mr Niven Matthews, Newton-Stewart, as one who had had a good experience of dairying, said there was no system of farming so likely to succeed during the present unfortunate depression in agriculture as that of dairy farming. (Hear, hear.) He had had a great many intelligent dairy managers, but their difficulty had been the want of sound education, and especially the want of a thorough knowledge of chemistry. He therefore thought it was the duty of the Society to do everything in its power to promote the establishment of dairy schools throughout the country.

The report was then adopted.

Pleuro-Pneumonia.

Mr Stirling of Kippendavie, reported that since the general meeting in June, the committee appointed in May last to inquire into and report as to the practicability of making an exhaustive inquiry in regard to pleuro-pneumonia had asked the principals of the three Scottish Veterinary Colleges, and other veterinary surgeons, to give evidence before them, also the representatives of local authorities, and a number of dairymen and other stock owners. The committee afterwards gave in a report, which the Directors did not adopt. The Board, however, appointed a deputation, consisting of Mr Stirling of Kippendavie; Mr Paterson of Birthwood; Mr Marr, Cairnbrogie, and the Secretary, to lay before the Privy Council—First, a memorial requesting the Government to compel local authorities to slaughter, during the winter months, all animals affected with pleuro, and also all cattle that had been in contact with them, and to use their influence to have the same policy carried out in Ireland; and secondly, a resolution passed by the Board on the 2nd November to the effect that a thorough investigation should be instituted into the nature of pleuro-pneumonia, and requesting the Government either to undertake such an investigation or to provide a sum to enable the Society to do so. Lord Cranbrook, on the part of the Privy Council, promised that the Government would take into consideration the representations made by the deputation, and would see whether anything further could be done by the Privy Council on the subject of pleuro-pneumonia. With regard to the other matter, the first step would be to explain to the Irish Government the remarks which had been made of the condition of things in Scotland, and see whether any security against the importation of unsound cattle into Scotland, as well as into England, could be obtained from them. A digest of the evidence taken before the Society's committee had been prepared, was now in course of being revised by the different witnesses, and would be forwarded to the Privy Council as soon as possible.

Sir James Gibson Craig, Bart., said that before they took any step in that matter he would like very much that the evidence taken before their committee should be circulated. The Highland Society had taken on themselves the responsibility of urging on the Privy Council the indiscriminate slaughter of all animals suffering from pleuro-pneumonia. That was a very serious point, and he wanted, in the interest of dairy farmers and dairymen, that that point should be considered. They had had great experience in the county of Mid-Lothian, and their experience of inoculation had been very satisfactory. There were several places he could name, and many more he could refer to, where it had been perfectly successful, and where there had never been any outbreak from the time inoculation had taken place. They had had thirty-eight outbreaks of pleuro-pneumonia in that county this year, and he did not know that there was one where inoculation had been practised. The disease had always been caused by animals brought from a distance. With that slaughter of animals a large amount of capital had been wasted, for which there was no call. It was a matter which called for consideration, and he was sorry such a sweeping recommendation should be made to the Privy Council. He hoped the digest of the evidence which was being prepared would be well circulated.

Mr Maxwell of Munches said he agreed with what had just been said by the last speaker. In a different part of the country they had tried inoculation with the greatest success. It proved a great saving of expense, and not only a great saving to the owner's stock, but a great saving in the assessment upon the district. He hoped nothing would be pressed on so as to carry out such a resolution as the slaughter of all diseased animals. It seemed to him the most unfortunate thing that could happen in this country. He thought the time had come when they should try some other system. He was told that the great reason why the Government would not go in for an inquiry regarding inoculation was the expense, but such expense was nothing compared with what it would be if such slaughter was carried out. He only hoped that slaughtering diseased cattle would not become imperative.

Sir James Gibson-Craig explained that they did not object to the slaughtering of the cattle which were actually diseased. What they did object to was the promiscuous slaughter of the whole of the sound cattle which had come in contact with the diseased ones.

Mr Maxwell said he quite understood that. He was well aware that they must slaughter the diseased ones. What he wished was that the others should simply be inoculated.

Mr Cowe, Balhousie, also endorsed the remarks of Sir James Gibson-Craig, and gave instances of the immunity of cattle in Forfarshire from disease through the means of inoculation after they had been in contact with diseased animals.

The Rev. John Gillespie said he happened to be the member of the Board who moved the adoption of the recommendations, and he was confidently prepared to vindicate what he, as a humble individual, did on that occasion. The Board had not pronounced in favour of indiscriminate slaughter all round. A proposal was made to the Board in favour of promoting legislation to get compulsory slaughter all round. That found no favour with the Board. The resolution was to the effect that the existing circumstances afforded a most favourable opportunity—when winter approached and the removal of stock was brought to a close—for the Privy Council, exercising their powers under the Act of 1886, of ridding the country of this dreadful scourge. That was what the Board approved of, and resolved to do. At the very same meeting the Board passed a resolution to send a deputation to the Privy Council to ask a grant for inquiry as to the merits of inoculation, and also asking them to carry out their proposals. The Board had not committed itself to indiscriminate slaughter. He thought the Board were right, with such a good opportunity, in asking the Privy Council to exercise their powers.

Mr STIRLING said no one could regret more than he did the absence of Sir James Gibson-Craig of late from their meetings, because they all knew perfectly well how thoroughly conversant he was with the state of matters in Mid-Lothian and the interest he took in them. Had he been present he ventured to say that he would have agreed thoroughly with the recommendation of the committee, because they were most careful, in their selection of witnesses, to choose those who had thorough experience, and who could speak with some authority on the subject. There was no doubt that there was the most extraordinary difference of opinion as to the two courses to be pursued. He had much pleasure in endorsing what the gentleman from Forfarshire had said, because as chairman of the local authority of Perthshire he knew that there had been various communications between the two counties. He also thoroughly endorsed what had been said by Sir James Gibson-Craig as to inoculation. Whether they were in favour of entire slaughter or not, their opinion had been changed by the success of inoculation in Perthshire, where they could never trace a single outbreak of disease to any case where the stock had been inoculated. It was always traced to new stock brought into the county. When the Privy Council received them in London they listened most favourably to all they had to say, and treated them with very great courtesy, but they pointed out that the great difficulty in dealing with this matter was the question of expense. Their adviser stated that the first effect of adopting their resolution, and going in for experiments to determine the success of inoculation or not, would be that he would have to ask compensation for the whole three hundred cattle that were inoculated in the county of Perth, which would have to be slaughtered to find out whether the inoculation was effectual or not, and every county would require to be treated in a similar manner. In the face of that advice given to the Privy Council, he thought they would thoroughly understand that they could hardly expect a favourable reply to the request that they would provide the money necessary.

Sir JAMES GIBSON-CRAIG thought the most satisfactory way to deal with the matter would be to bring it up again at the June meeting. So far as Mr Stirling's proposal was concerned—to slaughter all the animals to see how they got on——

Mr STIRLING.—Not my proposal.

The report was then approved.

FORESTRY DEPARTMENT.

Sir ROBERT MENZIES, Bart. of Menzies, said—As convener of the Society's Forestry Department, I have to report that a committee, consisting of Sir Herbert E. Maxwell, Bart.; Dr Cleghorn; Mr Maxwell, yr. of Munches; Dr Aitken; Mr Macgregor, Ladywell; Mr Aitken, Norwood; Mr John Methven, Edinburgh; Mr Lindsay, curator of the Botanic Gardens, and himself, had been appointed to arrange the nature and extent of the examination for the Society's certificates in forestry. The committee held a meeting this forenoon, when a sub-committee was appointed to revise the Society's syllabus of the examinations, and to make suggestions for placing the Forestry Department on an improved footing.

The report was adopted.

CHEMICAL DEPARTMENT.

Dr AITKEN submitted the following report:—

Experimental Stations.—The experiments at Harelaw have now come to a close. The crop last season was barley, and the object in view was to estimate the amount of unexhausted fertility remaining in the land, and derived from the annual supplies of manure that had been given in former years. At Pumpherston the crop was barley, sown out with seeds for permanent grass, and no manures were applied. The grass mixture consisted of a fair proportion of the different grasses, clover, &c., suitable for pasture; and if we may judge from the appearances presented by the various plots during the autumn, the grass experiments promise to be very interesting. There is no crop which requires more attention paid to it than grass in these times, and the plots at Pumpherston present facilities for studying the manurial treatment of grass which are quite unique.

The Chemical Committee have had under consideration a scheme for bringing the Chemical Department of the Society into more intimate relation with the local wants of agriculture. Owing to the very diverse conditions under which agriculture is pursued in this country, different districts differ widely in their practice and aims, and it is the desire of the Chemical Department to aid, as far as possible, in improving and developing the agriculture of different districts in any way in which chemistry can be of service. The scheme is at present receiving the attention of the Directors.

Analytical Associations.—The number of associations applying for grants this year is fifteen—two less than last year. The number of analyses for which grants were given was 182, and the amount of the grants £76, 10s. The number of samples deficient from their guarantees was much less than usual, but there are a few so deficient that the details will probably be published in the next volume of the *Transactions*. Out of the 182 samples there were only twelve feeding stuffs. There may have been more analysed, but only those having an analytical guarantee are eligible for the Society's grant. All such guarantees as *pure*, *genuine*, *concentrated*, and the like are quite useless. They give the buyer no indication of the feeding value of the stuff. If feeding operations are to be carried on with any precision, the feeder must know the composition of the food he is using. He ought to know what he wants, and to see that he gets it. Sellers are frequently unable or unwilling to supply the analyses of the cakes they sell; but if farmers insist upon it they will get it. Some years ago sellers objected to supply analyses with the manures they sold; but they do it now, and farmers know what they are about in purchasing these. The sooner that feeding stuffs are sold in a similar way the better. If feeders would simply refuse to buy a fodder whose albuminoids and oil were not guaranteed at so much per cent., the worthless guarantees at present in vogue would go out of fashion.

There has been a gradual falling off in the number of analyses sent in by the associations, and the drop this year is very considerable. The numbers for the last four years have been 273, 262, 239, and 182. This may be due to hard times causing a diminution in the number of members and the number of their purchases; but whatever the causes are, the fact is before us that the number of analyses returned by the associations is not one-seventh of what was expected at first. It must not be inferred from this that the connection of the Society with the associations has been a failure. It has been a marked success, and has done an incalculable amount of good. The quality of the work done is excellent, but the quantity is deficient. When the association scheme was started, it was hoped that the members of the Society might be reached through the associations; but the committee feel that the members—whose welfare they are in the first place bound to consider—have not been got at in that way. Not one-third of the analyses for which grants were given last season were made for farmers who are members of the Society, and the total number of members of the Society who had their purchases analysed through the associations last year was only thirty-five. It is one of the conditions attached to the receiving of grants by associations that they shall make analyses for any members of the Society who may send samples for that purpose, and that the fees charged to the member shall be lessened by the amount of the Society's grant for each analysis. I am not aware of more than two instances in which, during all these years, this privilege has been taken advantage of by independent members of the Society.

In these circumstances the Directors have resolved, on the recommendation of the committee, to give to the members of the Society privileges in respect of analyses in a direct manner as well as through the medium of associations, and the following are the terms of the resolution of the Board:—

Members' Privileges in Respect of Analyses.

The fees of the chemist for analyses made for members of the Society shall be as follows:—

The estimation of one ingredient in a manure or feeding stuff, 5s.

The estimation of two or more ingredients in a manure or feeding stuff, 10s.

These charges apply only to analyses made for the sole and private use of members of the Highland and Agricultural Society who are not engaged in the manufacture or sale of the substances analysed.

If the sample represents a substance bought under a guarantee, and if it is found to be notably deficient, the Chemical Committee shall take cognisance of such a deficiency in the same manner as they do in the case of deficient manures and feeding stuffs supplied to members of analytical associations, provided that the Society's regulations as regards sampling are carried out, and that the seller's guarantee accompanies the sample.

Also, that valuations of manures, according to the Society's scale of units, shall be supplied in all cases in which the cash price asked by the seller accompanies the sample.

The committee hope that the result of this reduction in the cost of analysis will be to cause many members of the Society to put their purchases under analytical control who have not hitherto done so, and especially that it may induce those whose purchases are small to take advantage of the privileges now offered them.

Full information regarding the composition of manures and feeding stuffs, hints for their use, instructions for sampling, forms of guarantee and other details, will be published in the Premium Book and in the *Transactions*, and separate slips may be had on applying to the Secretary.

The report was approved of without any remarks.

BOTANICAL DEPARTMENT.

Mr A. N. M'ALPINE said—I have the honour to submit the following partial report that during the past year I have examined a number of samples of seed. The following were some of the results:—

	Germination. Per cent.
Hard fescue, pure,	86
Cocksfoot, pure,	80–96
Italian ryegrass, purity 96 per cent.,	95–97
Meadow fescue, purity 91 per cent.,	95
Tall fescue, pure,	80
Crested dogstail, pure,	86
Timothy, pure,	96
Poa trivialis, purity 97 per cent.,	50–60
,, *pratensis*, pure,	50
,, *nemoralis*, purity 97 per cent.,	35-40

I have also made considerable improvements upon the methods I formerly used for determining the germinating power of grass and clover seeds. The apparatus I now use has several features which are new, so far as I know. The conditions for germination in this apparatus are very perfect, and closely approach those that may be obtained in the open field. In germination, difficulty is often caused by outbreaks of fungi, which interfere with the seeds and tend to destroy them before they have had time to germinate. This is very specially the case with some poas and meadow foxtail, which are often very sluggish in their germination, requiring, at times, four or even five weeks for completion. The test of germination is often vitiated and worth little if fungus has ravished the seed; then the trial must be repeated. For this reason the germinating power cannot always be determined so rapidly as one could wish. Poas have often to lie so long in the germinating case before they start that they are destroyed by fungus. Under such circumstances it is very difficult to obtain the real germinating power. In the open field, also, fungus will interfere with the germination, and destroy the seed under certain conditions, just as it does in the artificial germinator. In practice this should be taken into account, as a great deal of seed may be lost in this way. My attention was thus directed to the question of preventing, as far as possible, the growth of moulds and other fungi which interfere with germination. I find that by imitating more closely than hitherto the conditions that prevail in the open field, this can be done. It is known that the growth of certain fungi is favoured by the presence of foul air, such as carbonic acid gas. Further, when seeds are germinating they are breathing with comparative rapidity, and, consequently, evolving large quantities of this injurious gas. Unless it is removed from the germinating case, and fresh air supplied, germination is interfered with, and the moulds may gain the upper hand. I followed the course adopted in nature for the removal of these gases, and arranged my apparatus so that currents of fresh air and fresh water were circulating in the neighbourhood of the seed; in this way injurious gases are removed and the fungi checked in their growth. The air circulating in the neighbourhood of the seeds must have a certain temperature, representing, as closely as may be, the average temperature to which the seeds are exposed in the open field. This temperature is taken at 65° Fahr. The air which obtains access to the germinator must be artificially heated to this degree. This I manage by allowing fresh, cold air to enter a set of pipes placed in the water contained in the trough of the germinator. The hot water here heats the cold air to the proper degree, and this heated air alone can come into contact with the seeds. To secure proper circulation of the air, and thorough ventilation inside the germinator, the air must only enter and leave it at certain definite points. In my apparatus air can alone enter by the air-pipes placed in the heated water. The top part of the case, which must of course be movable, is fitted air-tight on the water-trough by means of a water-joint. The narrow roof of the top is formed of a sheet o fperforated zinc, and air can only leave the germinator by these perforations. The amount of air which escapes, and consequently the amount which enters, can be regulated. The sides and roof of the top part are so sloped that no water can drip upon the seeds, which lie quite bare in the interior. Light obtains access through panes of glass fitted in the sides. Water is supplied to the seeds by damp felt, which lies on a grating inside the case. The steam constantly rising from the water usually suffices to keep the felt at the proper degree of moisture. If more water is desirable, strips of felt can hang down and dip into the water in the trough. The kind of felt used is not a matter of indifference. In thick compact felt there is little circulation, the water becomes stagnant, the seeds are interfered with and liable to become rotten, and the germination is very slow. Thick, compact felt closely resembles heavy stiff clay land, on which pretty much the same state of matters prevails. Germination goes on much better when a thinner and looser felt is used; both water and air are in circulation, and there is little tendency for the seeds to rot away. On such felt the seeds are under conditions very favourable to germination. For conveniences of naming and removal, the seeds to be germinated are placed on small strips of damp blotting paper laid on the felt. During the first two or three days they may be kept uniformly moist by covering them with a second strip of damp blotting paper, but after that time they lie quite bare in the case, and light, air, water, and heat circulate about them. Heat is supplied to the germinator by a Bunsen burner fixed on a stand beneath. From the arrangement of the pipes by which air enters the case, it is impossible that the gases produced by the combustion of the coal-gas can enter and obtain access to the seed. Such gases act very injuriously, especially if combustion is incomplete. In that case the acetylene produced very soon kills the seed, as I have found in my own experience. It is very easy to maintain the water in the germinator at a constant temperature, as so large a quantity is present. The water is kept in very rapid circulation by the presence of a well with a copper bottom, against which the heat from the Bunsen impinges. The rest of the water-trough is made of zinc.

Dairy Department.

Mr M'Queen of Crofts said—I have the honour to report, on behalf of the Dairy Department, that the grant of £100 given by the Society last year to assist in the teaching of improved methods of dairying has been allocated amongst the different local dairy associations. I have also to report that the working dairy at Perth was a success, and that it is intended to continue it this year at Glasgow; and the principal dairy districts being much nearer the Show, it will doubtless be a great attraction. I may also mention that a paper on "Dairy Education," written by Professor James Long, will appear in the next issue of the *Transactions*. The local associations have mostly arranged to continue the teaching of improved methods of dairying for next season; and as the past teaching has been most successful in raising both the quality and price of dairy produce, I would ask the Society to continue the grant of £100 for another year. From inquiries made, and evidence taken, by the Commission appointed to consider the claims in connection with agricultural and dairy education, we may reasonably expect that a grant will be given to Scotland for the purpose of assisting dairy education, by starting dairy schools or otherwise.

The report was approved.

Premiums Awarded for Reports.

Mr Irvine of Drum, convener of the Committee on Publications, reported:—the Premiums awarded for reports lodged in November 1887 and those offered in 1888.

The report was adopted.

District Competitions.

Mr Villiers, Closeburn Hall, reported that during the past year the Society's money premiums and medals had been in operation in 210 districts, and that a sum of £300 had been awarded. For the current year, the Directors propose the following grants, viz., three for cattle, at £18 each; four for mares, at £7 each; three for colts and fillies, at £13 each; two for sheep, at £12; seven for cattle, horses, or sheep, at £12 each; three for stallions, at £15 each; a grant of £50 to the Glasgow Agricultural Society, and one of £20 to the Ayrshire Agricultural Society, to be competed for at Kilmarnock; and three of £3 each to societies in Orkney and Shetland; besides thirty-seven districts for one hundred medals, and the medals given to ploughing associations,—making a total of £405 to 215 districts.

Cottages and Gardens.

Mr Villiers, in the absence of Colonel Hare of Calder Hall, reported that during the past year the Society's premiums and medals had been in operation in forty-three parishes, and that £32, 18s. had been awarded. For the current year the Directors propose fifteen parishes at £3 each, and thirty for two silver medals each, besides two gold medals of the value of £10 each, viz., 1st, to the proprietor in Scotland who shall report the improvement of the greatest number of cottages during the years 1885, 1886, and 1887; 2nd, to the proprietor in Scotland who shall report the erection of the greatest number of approved cottages during the years 1884 to 1887,—making the total sum offered £73.

Horse-Breeding Trust.

Mr Gilmour of Montrave submitted the report of the Royal Commission on Horse Breeding, together with the prize list for the forthcoming show of thoroughbred stallions, to be held at Nottingham in conjunction with the Royal Agricultural Society of England, on Thursday and Friday, 9th and 10th February 1888. The last day of entry is Saturday 21st January, post entries being received up to the 28th on payment of double fees. The district classes for Scotland are as follows:—(1) Aberdeenshire and district; (2) Perthshire, Fifeshire, and district; (3) Ayrshire, Dumfriesshire, and district; (4) Roxburghshire, Berwickshire, and district. Each district one stallion, at £200. Mr Gilmour said he was glad to say that up to the present the application for entry forms was very encouraging to the Commission, and they had great hopes that a very fine collection of thoroughbred stallions would be brought forward at Nottingham.

Mr Villiers thought there would be a general feeling that the arrangements for this year were the best that could be submitted as a tentative scheme, but he hoped it would be open to considerable amendment in the future. In Scotland the attention of breeders had been given more to Clydesdale and agricultural horses, the light-legged breed being put aside as belonging more to the landlord than the tenant; but he thought the country was beginning to take more interest in half-bred horses than they had hitherto done, and he hoped landlords would bring the scheme before their tenantry.

The Rev. John Gillespie asked how one horse was to serve "Ayrshire, Dumfriesshire, and district"? He thought the Government grant should have been sufficiently liberal to provide an adequate number of horses to supply each district, or it should have been dropped altogether.

Professor Wallace said a great mistake was committed in certain parts of the country in travelling stallions over too wide an area, and he thought that should be avoided.

Mr Stirling said his understanding was that the mares, and not the stallions, were to travel, and the reason the district was so large was that the Government were not aware how far the scheme would be taken advantage of by the farmers. If it were largely embraced, fresh arrangements would be made for another season.

Mr Gilmour did not agree with Mr Gillespie that because they could not get all they wanted they should not take what they could get. As to the locating of the horses, it was altogether experimental, and was not intended to be a permanent arrangement.

The matter then dropped.

On the motion of Mr Gilmour, a vote of thanks was given to the Chairman, and the proceedings terminated.

PREMIUMS AWARDED BY THE SOCIETY IN 1887.

I.—REPORTS.

1. John Speir, Newton Farm, Newton, for a Report on the Value of Fish Meal as a Fodder for Cattle,	£15	0	0
2. W. Anderson Smith, Ledaig, Argyllshire, for a Report on the Best Means of developing the Crab Fishery of Scotland,	5	0	0
3. W. Anderson Smith, Ledaig, Argyllshire, for a Report on the West Coast Fisheries,	5	0	0
4. Christopher Young Michie, Forester, Cullen House, Cullen, for a Report on the Diseases of the Larch,	10	0	0
5. Thomas Wilkie, Tyninghame, Prestonkirk, for a Report on Replanting on several Estates,	5	0	0
	£40	0	0

II.—PERTH SHOW.

Class I.—CATTLE.

Owing to an outbreak of Pleuro in the Town of Perth on the 21st June, the Directors, at an Emergency Meeting held on the 29th June, decided that Cattle should be excluded from the Perth Show.

Class II.—HORSES

FOR AGRICULTURAL PURPOSES.

Jubilee Champion Prize for Best Male (Entire) Clydesdale of any age. Given by the Clydesdale Horse Society.

John Marr, Cairnbrogie, Old Meldrum, "Cairnbrogie Stamp" (4274),	£20	0	0

Section 1. STALLION, foaled before 1st January 1884.

1. Peter Crawford, Carruchan, Dumfries, "Prince Lawrence,"	25	0	0
2. David Riddell, Blackhall, Paisley, "Ardnacraig,"	15	0	0
3. John Macdonald, Porterfield, Renfrew, "Lord Hopetoun" (2965),	10	0	0
4. The Marquis of Londonderry, Seaham Hall, Seaham Harbour, "Castlereagh,"	5	0	0
V. H. C., David Riddell, Blackhall, Paisley, "Cairngorm."			
Breeder of Best Stallion—William Gardiner, Cashley, Buchlyvie, Silver Medal,	0	14	0

Section 2. ENTIRE COLT, foaled on or after 1st January 1884.

1. John Marr, Cairnbrogie, Old Meldrum, "Cairnbrogie Stamp" (4274),	20	0	0
2. Sir Michael R. Shaw Stewart, Bart., Ardgowan, Greenock, "MacNeil" (4566),	15	0	0
3. David Riddell, Blackhall, Paisley, "Clifton,"	10	0	0
4. David Riddell, Blackhall, Paisley, "Bonnie Prince,"	5	0	0

V. H. C., Patrick Stirling of Kippendavie, Dunblane, "Knight Errant" (4483). H. C., Alexander Scott, 22 Mearns Street, Greenock, "Rawlenson" (4664). C., Robert Graham, Kildinny, Forteviot, "Jubilee."

Section 3. ENTIRE COLT, foaled on or after 1st January 1885.

1. James Crawford, Brydekirk Mains, Annan, "The Granite City" (5397),	20	0	0
2. David Riddell, Blackhall, Paisley,	10	0	0
3. John Galbraith, Croy Cunningham, Killearn, "Lord Ailsa,"	6	0	0
4. John Galbraith, Croy Cunningham, Killearn, "Lochgoin,"	3	0	0

V. H. C., William Stevenson, Lochgrog, Bishopbriggs, "Sir Lawrence." H. C., Abram Kerr, Castlehill, Durisdeer, Thornhill, "His Lordship" (5077). C., James M'Nab, Glenochil, Menstrie, "M'Vicar" (5204).

Carry forward.	£164	14	0

Brought forward, £164 14 0

SECTION 4. ENTIRE COLT, foaled on or after 1st January 1886.

1. R. F. F. Campbell of Craigie, M.P., Craigie House, Ayr, "Master Bunnie,"	12	0	0
2. William Renwick, Meadowfield, Corstorphine, "The Boss,"	7	0	0
3. W. H. Lumsden of Balmedie, Aberdeen, "Royalist,"	4	0	0
4. David Riddell, Blackhall, Paisley,	2	0	0

V. H. C., Peter Crawford, Carruchan, Dumfries, "Look Again." H. C., Alexander M'Robbie, Sunnyside, Aberdeen, "Marshall Keith." C., The Earl of Strathmore, Glamis Castle, Glamis, "Protection."

Jubilee Champion Prize for Best Female Clydesdale of any age. Given by the Clydesdale Horse Society.

John Gilmour of Montrave, Leven, "Moss Rose,"	20	0	0

SECTION 5. MARE (with Foal at foot), foaled before 1st January 1884.

1. John Gilmour of Montrave, Leven, "Moss Rose,"	20	0	0
2. R. & J. Findlay, Springhill, Baillieston, "Chrystal" (5387),	10	0	0
3. John Gilmour of Montrave, Leven, "Kate of Banks" (2612),	5	0	0
4. John Gilmour of Montrave, Leven, "Lass o' Gowrie,"	3	0	0

V. H. C., John Marr, Cairnbrogie, Old Meldrum, "Darling 5th." H. C., Major L. D. Gordon Duff of Drummuir, Keith, "Lily o' the Dale" (4570). C., Robert Murdoch, West Hallside, Newton, "Comely" (5668).

SECTION 6. MARE (in Foal), foaled before 1st January 1884.

1. James M'Nab, Glenochil, Menstrie, "Lady Macbeth,"	20	0	0
2. David Riddell, Blackhall, Paisley, "Bonnie Jean,"	10	0	0
3. Edward Balfour, yr. of Balbirnie, Markinch, "Cora" (5206),	5	0	0
4. Patrick Stirling of Kippendavie, Dunblane, "Beatrice" (5798),	3	0	0

V. H. C., George Bean, Balquhain Mains, Pitcaple, "Queen o' the Lyons." H. C., James Blyth, Leckiebank, Auchtermuchty, "Lady Jane Grey." C., David Drysdale, Lornshill, Alloa, "Pheme" (5350).

SECTION 7. FILLY, foaled on or after 1st January 1884.

1. Alexander Shanks, Shawhead Farm, Coatbridge, "Coatbridge Mary,"	10	0	0
2. John Simpson, Drumfork, Helensburgh, "Sunray,"	6	0	0
3. David Riddell, Blackhall, Paisley,	3	0	0
4. Major L. D. Gordon Duff of Drummuir, Keith, "Helen Macgregor,"	2	0	0

V. H. C., W. H. Lumsden of Balmedie, Aberdeen, "Lady Marjory Erskine." H. C., John Galbraith, Croy Cunningham, Killearn, "Lady Mary."

SECTION 8. FILLY, foaled on or after 1st January 1885.

1. James Lockhart, Mains of Airies, Stranraer, "Pandora,"	10	0	0
2. W. H. Lumsden of Balmedie, Aberdeen, "Mermaid,"	6	0	0
3. John Marr, Cairnbrogie, Old Meldrum, "Gaudy Girl,"	3	0	0
4. John Gilmour of Montrave, Leven, "Montrave Lady,"	2	0	0

V. H. C., Sir Michael R. Shaw Stewart, Bart., Ardgowan, Greenock, "Bracelet." H. C., Robert Murdoch, West Hallside, Newton, "Hettie." C., Edward Balfour, yr. of Balbirnie, Markinch, "Miss Alice."

SECTION 9. FILLY, foaled on or after 1st January 1886.

1. James Lockhart, Mains of Airies, Stranraer, "Vanora,"	10	0	0
2. James Lockhart, Mains of Airies, Stranraer, "Princess."	6	0	0
3. John Gilmour of Montrave, Leven, "Primrose."	3	0	0
4. Richard Dunn, Udston, Hamilton, "Ida."	2	0	0

V. H. C., William Borland, Townfoot, Thornhill, "Lady Erskine." H. C., David Riddell, Blackhall, Paisley. C., David Mitchell, Middle Mill, Markinch, "Princess."

SECTION 10. DRAUGHT GELDING, of any age.

1. David Mitchell, Middle Mill, Markinch, "Bob,"	8	0	0

Carry forward, £356 14 0

Brought forward, £356 14 0

SECTION 11. FAMILY GROUP of 5 ANIMALS, Male or Female, Yearlings or 2-Year Olds. The progeny of one Stallion (Geldings excluded).

1.	David Riddell, Blackhall, Paisley (offspring of Darnley).	15	0	0
2.	Peter Crawford, Carruchan, Dumfries (offspring of Lord Erskine) (1744),	10	0	0

SECTION 12. MARE and 3 of her Descendants, Male or Female, in the Female line (Geldings excluded).

1.	John Marr, Cairnbrogie, Old Meldrum,	15	0	0

HUNTERS AND ROADSTERS.

SECTION 13. MARE or GELDING, suitable for Field, foaled before 1st January 1884.

1.	W. E. Gilmour, Woodbank, Alexandria, N.B. Gelding, "Walton,"	15	0	0
2.	James Russel, Dundas Castle, South Queensferry, Mare, "Old Year,"	8	0	0
3.	W. E. Gilmour, Woodbank, Alexandria, N.B. Gelding, "Dunwan,"	4	0	0
C.,	George Hugh Mackay, 13 North Street, Elgin, Gelding, "Kildare."			

SECTION 14. MARE or GELDING, suitable for Field, foaled on or after 1st January 1884.

1.	D. J. Bell-Irving, Waterside, Ecclefechan, Gelding, "Meadow King,"	15	0	0
2.	J. W. Norris Mackay, The Tower, Elgin, Mare,	8	0	0
3.	George H. Mackay, 13 North Street, Elgin, Gelding, "Delu-Aine,"	4	0	0
C.,	Charles A. Murray, Taymount, Stanley, Gelding, "Rifleman."			

SECTION 15. MARE or GELDING, suitable for Field, foaled on or after 1st January 1885.

1.	Charles Erskine, The Priory, Melrose, Mare, "Ruby,"	10	0	0
2.	Captain J. S. Black of Balgowan, Perth, Mare, "Baroness,"	5	0	0
3.	Thomas Walker, Demperston, Auchtermuchty, Mare, "Maggie,"	3	0	0
V. H. C.,	John Watson of Earnock, Hamilton, Mare, "Diana."			

SECTION 16. MARE or GELDING, suitable as Hackney.

1.	Mrs Mackie, Auchencairn, Castle-Douglas, Mare, "Silver Belle" (508),	8	0	0
3.	Frank Stewart Sandeman, Stanley House, Stanley, Mare, "Zulu,"	2	0	0

SECTION 17. MARE or GELDING, suitable for Driving, 3 years old and upwards, to be shown in harness and driven.

1.	Mrs Mackie, Auchencairn, Castle-Douglas Gelding, "The Masher,"	10	0	0
2.	Francis Collier, Brae Cottage, Broughty Ferry, Mare, "Lady Frances,"	5	0	0
3.	R. W. R. Mackenzie, Stormontfield, Perth, Gelding, "Major,"	3	0	0
C.,	C. A. Murray, Taymount, Stanley, Perth, Mare, "Polly."			

SECTION 18. MARE or GELDING, for Jumping.

1.	W. E. Gilmour, Woodbank, Alexandria, N.B., Gelding, "Sir Domino,"	20	0	0
2.	G. H. Mackay, 13 North Street, Elgin, Gelding, "Kildare,"	10	0	0
3.	D. Carnegie, East Pitcorthie, Colinsburgh, Gelding, "Knight Errant,"	5	0	0

PONIES.

SECTION 19. STALLION, 15 hands and under.

1.	R. H. Walker of Hardwood, West Calder, "Alpha,"	6	0	0
2.	D. T. & C. Martin, Auchendennan Farm, Balloch, "Saturn,"	3	0	0
3.	The Marquis of Breadalbane, Taymouth Castle, Aberfeldy, "Sir Donald,"	1	0	0

SECTION 20. MARE or GELDING, between 13 and $14\frac{1}{2}$ hands.

1.	William Thomson Barton, Morriston, Elgin, Mare, "Lady Derby,"	6	0	0
2.	William Wilson, 36 Carrick Street, Glasgow, Mare, "Rosie,"	3	0	0
3.	J. D. Lumsden, Huntingtowerfield, Perth, Gelding, "Duke of Wellington,"	1	0	0
H. C.,	William Watt, Cupar-Fife, Gelding, "Robin,"			

Carry forward, £551 14

Brought forward,	£551 14 0

Section 21. MARE or GELDING, between 12 and 13 hands.

1. Mrs Mackie, Auchencairn, Castle-Douglas, Gelding, "Sir Gibbie,"	6 0 0

Section 22. MARE or GELDING, under 12 hands.

1. Mrs R. Howard, Annaginny House, Dungannon, Gelding, "Tom Tit,"	6 0 0
2. Neil M'Lean, Battleby, Redgorton, Perth, Gelding, "Jura,"	3 0 0
3. Neil M'Lean, Battleby, Redgorton, Perth, Mare, "Shuna,"	1 0 0

SHETLAND PONIES.

Section 23. STALLION, not exceeding 10¼ hands.

1. The Marquis of Londonderry, Seaham Hall, Seaham Harbour, "Anster,"	4 0 0
2. D. T. & C. Martin, Auchendennan Farm, Balloch, "The Pirate,"	2 0 0
3. The Marquis of Londonderry, Seaham Hall, Seaham Harbour, "Merry Boy,"	1 0 0

H. C., Mrs Mackie, Auchencairn, Castle Douglas, "General Tom Thumb." C., Mrs Mackie, Auchencairn, Castle Douglas, "General Mite."

Section 24. MARE or GELDING, not exceeding 10¼ hands.

1. The Marquis of Londonderry, Seaham Hall, Seaham Harbour, Mare, "Sparkee,"	4 0 0
2. The Marquis of Londonderry, Seaham Hall, Seaham Harbour, Mare, "Topsy,"	2 0 0

Section 25. PONIES, 14 hands and under, for Jumping.

1. W. T. Barton, Morriston, Elgin, Mare, "Lady Derby,"	5 0 0
2. J. D. Lumsden, Huntingtowerfield, Perth, Gelding, "Duke of Wellington,"	3 0 0

EXTRA HORSES.

Very Highly Commended.

Hackney Stallion, "Dorrington 2nd" (956)—John G. Mackie of Auchencairn, Castle-Douglas,	5 0 0
Norfolk Cob Mare and Foal, "Rhona"—Hon. Marjory Louisa Murray, Scone Palace, Perth,	5 0 0
	£598 14 0

Class III.—SHEEP.

BLACKFACED.

Section 1. TUP, above 1 Shear.

1. John Archibald, Overshiels, Stow,	12 0 0
2. John Archibald, Overshiels, Stow,	8 0 0
3. Charles Howatson of Glenbuck, Glenbuck,	4 0 0

V. H. C., R. & J. Cadzow, Borland, Walston, Biggar. H. C., John Fleming, Ploughland, Strathaven. C., Charles Howatson of Glenbuck, Glenbuck.

Section 2. SHEARLING TUP.

1. The Duke of Argyll, K.G., Ballymenach, Campbeltown,	12 0 0
2. Thomas M'C. M'Min, Wellwood, Muirkirk,	8 0 0
3. The Duke of Argyll, K.G., Ballymenach, Campbeltown,	4 0 0

V. H. C., Patrick Melrose, West Loch, Eddleston. H. C., The Duke of Argyll, K.G., Ballymenach, Campbeltown. C., The Duke of Argyll, K.G., Ballymenach, Campbeltown.

Section 3. TUP LAMB.

1. The Duke of Argyll, K.G., Ballymenach, Campbeltown,	5 0 0
2. The Duke of Argyll, K.G., Ballymenach, Campbeltown,	2 0 0

C., John Archibald, Overshiels, Stow.

Section 4. Three EWES, above 1 Shear, with their LAMBS at foot.

1. James A. Gordon of Arabella, Nigg Station,	10 0 0
2. The Duke of Argyll, K.G., Ballymenach, Campbeltown,	5 0 0
3. James A. Gordon of Arabella, Nigg Station,	2 0 0

V. H. C., The Duke of Argyll, K.G., Ballymenach, Campbeltown.

Carry forward,	£72 0 0

Brought forward, £72 0 0

SECTION 5. Three SHEARLING EWES or GIMMERS.

1. James Duncan of Benmore, Greenock,	10 0 0
2. The Duke of Argyll, K.G., Ballymenach, Campbeltown,	5 0 0
3. The Duke of Argyll, K.G., Ballymenach, Campbeltown,	2 0 0

V. H. C., The Duke of Argyll, K.G., Ballymenach, Campbeltown.

CHEVIOT.

SECTION 6. TUP, above 1 Shear.

1 John A. Johnstone, Archbank, Moffat,	12 0 0
2. Jacob Robson, Byrness, Otterburn, Northumberland,	8 0 0
3. Jacob Robson, Byrness, Otterburn, Northumberland,	4 0 0

V. H. C., John A. Johnstone, Archbank, Moffat. H. C., John A. Johnstone, Archbank, Moffat. C., John A. Johnstone, Archbank, Moffat.

SECTION 7. SHEARLING TUP.

1. Jacob Robson, Byrness, Otterburn, Northumberland,	12 0 0
2. Walter Mundell, Moy, Muir of Ord,	8 0 0
3. Walter Mundell, Moy, Muir of Ord,	4 0 0

V. H. C., Jacob Robson, Byrness, Otterburn, Northumberland. H. C., John A. Johnstone, Archbank, Moffat. C., John A. Johnstone, Archbank, Moffat.

SECTION 8. Three EWES, above 1 Shear, with their LAMBS at foot.

1. Jacob Robson, Byrness, Otterburn, Northumberland,	10 0 0
2. R. W. Laidlaw, Halls, Dunbar,	5 0 0
3. Jacob Robson, Byrness, Otterburn,	2 0 0

V. H. C., Walter Mundell, Moy, Muir of Ord.

SECTION 9. Three SHEARLING EWES or GIMMERS.

1. Jacob Robson, Byrness, Otterburn,	10 0 0
2. R. W. Laidlay, Halls, Dunbar,	5 0 0
3. Jacob Robson, Byrness, Otterburn,	2 0 0

V. H. C., R. W. Laidlay, Halls, Dunbar.

BORDER LEICESTER.

SECTION 10. TUP, above 1 Shear.

1 The Earl of Morton, Dalmahoy, Wilkieston,	12 0 0
2. W. S. Ferguson, Pictstonhill, Perth,	8 0 0
3. J. Maxtone Graham of Cultoquhey, Crieff,	4 0 0

SECTION 11. SHEARLING TUP.

1. Thomas Clark, Oldhamstocks Mains, Cockburnspath,	12 0 0
2. Thomas Clark, Oldhamstocks Mains, Cockburnspath,	8 0 0
3. Thomas Clark, Oldhamstocks Mains, Cockburnspath,	4 0 0

V. H. C., Right Hon. A. J. Balfour of Whittinghame, M.P., Prestonkirk. H. C., A. R. Melvin, Bonnington, Wilkieston. C., Right Hon. A. J. Balfour of Whittinghame, M.P., Prestonkirk.

SECTION 12. Three EWES, above 1 Shear.

1. George Simson, Courthill, Kelso,	10 0 0
2. Right Hon. A. J. Balfour of Whittinghame, M.P., Prestonkirk,	5 0 0

SECTION 13. Three SHEARLING EWES or GIMMERS.

1. Thomas Clark, Oldhamstocks Mains, Cockburnspath,	10 0 0
2. Right Hon. A. J. Balfour of Whittinghame, M.P., Prestonkirk,	5 0 0
3. W. S. Ferguson, Pictstonhill, Perth,	2 0 0

V. H. C., A. R. Melvin, Bonnington, Wilkieston. H. C., W. S. Ferguson, Pictstonhill. Perth.

Carry forward, £251 0 0

Brought forward,	£251 0 0

LONG-WOOLLED OTHER THAN BORDER LEICESTER.

SECTION 14. TUP, above 1 Shear.

2 James Brander, Pittendreich, Elgin,	2 0 0

SECTION 15. SHEARLING TUP.—No Entry.

SECTION 16. Three EWES, above 1 Shear.

2. James Brander, Pittendreich, Elgin,	2 0 0

SECTION 17. Three SHEARLING EWES or GIMMERS.—No Entry.

SHROPSHIRE.

Given by the Shropshire Sheep Breeders' Association and Flock Book Society:—CUP, for the Best Shropshire Tup bred in Scotland by the Exhibitor, The Earl of Strathmore, Glamis Castle, Glamis,	10 0 0

SECTION 18. TUP, above 1 Shear.

1. David Buttar, Corston, Coupar-Angus,	6 0 0
2. The Earl of Strathmore, Glamis Castle, Glamis,	4 0 0
3. The Earl of Strathmore, Glamis Castle, Glamis,	2 0 0

V. H. C., The Earl of Mansfield, K.T., Scone Palace, Perth. H. C., The Earl of Mansfield, K.T., Scone Palace, Perth. C., The Earl of Mansfield, K.T., Scone Palace, Perth.

SECTION 19. SHEARLING TUP.

1. David Buttar, Corston, Coupar-Angus,	6 0 0
2. David Buttar, Corston, Coupar-Angus,	4 0 0
3. The Earl of Strathmore, Glamis Castle, Glamis,	2 0 0

V. H. C., The Earl of Strathmore, Glamis Castle, Glamis. H. C., David Buttar, Corston, Coupar-Angus. C., John Wallace, Duniface, Leven.

SECTION 20. Three EWES, above 1 Shear.

1. David Buttar, Corston, Coupar-Angus,	5 0 0
2. John Wallace, Duniface, Leven,	3 0 0
3. A. J. S. Johnstone of Hallheaths, Lockerbie,	2 0 0

C., The Earl of Mansfield, K.T., Scone Palace, Perth.

SECTION 21. Three SHEARLING EWES or GIMMERS.

1. The Earl of Strathmore, Glamis Castle, Glamis,	5 0 0
2. David Buttar, Corston, Coupar-Angus,	3 0 0
3. John Wallace, Duniface, Leven,	2 0 0

V. H. C., A. J. S. Johnstone of Halleaths, Lockerbie. H. C., H. A. F. Lindsay Carnegie of Kinblethmont, Arbroath. C., The Earl of Mansfield, K.T., Scone Palace, Perth.

SHORT-WOOLLED OTHER THAN SHROPSHIRE.

SECTION 22. TUP, above 1 Shear.

1. Right Hon. Arthur James Balfour of Whittinghame, M.P., Prestonkirk,	6 0 0
2. Miss Morison Duncan, Naughton, Newport, Fife,	4 0 0

SECTION 23. SHEARLING TUP.

1. Right Hon. Arthur James Balfour of Whittinghame, M.P., Prestonkirk,	6 0 0
2. Miss Morison Duncan, Naughton, Newport, Fife,	4 0 0
3. Right Hon. Arthur James Balfour of Whittinghame, M.P., Prestonkirk,	2 0 0

SECTION 24. Three EWES, above 1 Shear.

1. Right Hon. Arthur James Balfour of Whittinghame, M.P., Prestonkirk,	5 0 0
2. Miss Morison Duncan, Naughton, Newport, Fife,	3 0 0
Carry forward,	£339 0 0

Brought forward,	£339 0 0

SECTION 25. Three SHEARLING EWES or GIMMERS.

1. Right Hon. Arthur James Balfour of Whittinghame, M.P., Prestonkirk,	5 0 0

EXTRA SECTIONS.

SECTION 26.—Three BLACKFACED WETHERS, not above 4 Shear.

1. William Watt, Seed Merchant, Cupar Fife,	4 0 0
2. James Russel, Dundas Castle, South Queensferry,	2 0 0
C., William Watt, Seed Merchant, Cupar Fife.	

SECTION 27.—Three CHEVIOT WETHERS, not above 3 Shear.

1. James Russel, Dundas Castle, South Queensferry,	4 0 0
2. James Russel, Dundas Castle, South Queensferry,	2 0 0

BLACKFACED.

Queen's Jubilee Prizes, given by Breeders of BLACKFACED SHEEP.

SECTION 28. Best TUP.

1. John Archibald, Overshiels, Stow,	20 0 0
2. The Duke of Argyll, K.G., Ballymenach, Campbeltown,	10 0 0
3. Thomas M'C. M'Min, Wellwood, Muirkirk,	5 0 0

SECTION 29.—Best TUP LAMB and Four TUPS of any age.

1. The Duke of Argyll, K.G., Ballymenach, Campbeltown,	20 0 0
2. John Fleming, Ploughland, Strathaven,	12 0 0
3. John Archibald, Overshiels, Stow,	6 0 0
4. Patrick Melrose, West Loch, Eddleston,	4 0 0
5. R. & J. Cadzow, Borland, Walston, Biggar,	2 0 0

SECTION 30.—Best EWE LAMB and Four EWES.

1. James A. Gordon of Arabella Nigg, Ross-shire,	15 0 0
2. James Duncan of Benmore, Greenock,	8 0 0
3. The Duke of Argyll, K.G., Ballymenach, Campbeltown,	4 0 0
4. Robert Buchannan, Letter, Killearn,	2 0 0

SECTION 31.—Best Three WETHERS, not more than 1 Shear.

1. James Russel, Dundas Castle, South Queensferry,	3 0 0
2. James Tod, Easter Cash, Strathmiglo,	2 0 0
3. James Tod, Easter Cash, Strathmiglo,	1 0 0
C., James Tod, Easter Cash, Strathmiglo.	

WOOL.

SECTION 32—For BLACKFACED SHEEP (entered in any Class, Male or Female), carrying the Fleece best adapted for protecting the Animal in a high, exposed, and stormy climate.

1. The Duke of Argyll, K.G., Ballymenach, Campbeltown,	3 0 0
2. R. & J. Cadzow, Borland, Walston, Biggar,	2 0 0
3. Charles Howatson of Glenbuck, Glenbuck,	1 0 0

SHEPHERDS.

SECTION 33.—To the Shepherd in Charge of Sheep gaining the largest amount of Prize Money.

1. Shepherd to the Duke of Argyll, K.G., Ballymenach,	5 0 0
2. Shepherd to John Archibald, Overshiels, Stow,	4 0 0
3. Shepherd to James A. Gordon of Arabella,	3 0 0
4. Shepherd to James Duncan of Benmore,	2 0 0
5. Shepherd to Thomas M'C. M'Min, Wellwood, Muirkirk,	1 0 0
6. Shepherd to John Fleming, Ploughland, Strathaven,	0 10 0
Carry forward,	£491 10 0

Brought forward.	£491	10	0

SECTION 34.—To the Shepherd for Feeding Prize Shearling Wethers.

1. Shepherd to James Russel, Dundas Castle, South Queensferry,	3	0	0
2. Shepherd to James Tod, Easter Cash, Strathmiglo,	2	0	0
3. Shepherd to James Tod, Easter Cash, Strathmiglo,	1	0	0

EXTRA SHEEP.

Very Highly Commended.

James Brander, Pittendreich, Elgin. Minor Gold Medal,	3	6	0
	£500	16	0

CLASS IV.—SWINE.

SECTION 1. BOAR, Large Breed.

1. The Earl of Haddington, Tyninghame, Prestonkirk,	£5	0	0

SECTION 2. SOW, Large Breed.

1. The Earl of Haddington, Tyninghame,	4	0	0

SECTION 3. Three PIGS, Large Breed, not above 8 Months old.—No Entry.

SECTION 4. BOAR, Black or Berkshire.

1. The Earl of Haddington, Tyninghame,	5	0	0
2. C. S. Home Drummond Moray of Abercairny, Crieff,	3	0	0
3. W. Campbell, 191 Perth Road, Dundee.	1	0	0

V. H. C., James Gourlay, Blibber Hill, Forfar.

SECTION 5. SOW, Black or Berkshire.

1. George Inglis of Newmore, Invergordon,	4	0	0
2. George Inglis of Newmore, Invergordon,	2	0	0
3. Richard M'Farlane, Port Dundas Distillery, Glasgow,	1	0	0

V. H. C., Richard M'Farlane, Port Dundas Distillery, Glasgow. H. C., Charles Stirling Home Drummond Moray of Abercairny, Crieff. C., Sir Thomas Gladstone of Fasque, Bart., Laurencekirk. C., Sir Thomas Gladstone of Fasque, Bart , Laurencekirk.

SECTION 6. Three PIGS, Black or Berkshire, not above 8 Months old.

1. Sir James T. Stewart Richardson of Pitfour, Bart., Perth,	4	0	0
2. James Gourlay, Blibber Hill, Forfar.	2	0	0
3. Richard M'Farlane, Port Dundas Distillery, Glasgow,	1	0	0

C., W. Campbell, 191 Perth Road, Dundee.

SECTION 7. BOAR, Middle White Breed.

1. The Earl of Haddington, Tyninghame, Prestonkirk,	5	0	0

SECTION 8. SOW, Middle White Breed.

1. The Earl of Haddington, Tyninghame, Prestonkirk,	4	0	0
2. The Earl of Mansfield, K.T., Scone Palace, Perth,	2	0	0

SECTION 9. Three PIGS, Middle White Breed, not above 8 Months old.

1. The Earl of Mansfield, K.T., Logie Almond, Perth,	4	0	0
2. The Earl of Mansfield, K.T., Scone Palace, Perth,	2	0	0
	£49	0	0

Class V.—POULTRY.

Section		
1.	DORKING, Silver Grey. Cock—	
	1. John Cran, Keith,	£1 0 0
	2. James Cranston, Tinwald House, Dumfries,	0 10 0
2.	DORKING, Silver Grey. Hen—	
	1. James Cranston, Tinwald House, Dumfries,	1 0 0
	2. John Cran, Keith,	0 10 0
3.	DORKING, Silver Grey. Cockerel—	
	1. Robert Wood, Panmure, Carnoustie,	1 0 0
	2. James Robertson, Gordon Castle Home Farm, Fochabers,	0 10 0
4.	DORKING, Silver Grey. Pullet—	
	1. James Robertson, Gordon Castle Home Farm, Fochabers,	1 0 0
	2. James Robertson, Gordon Castle Home Farm, Fochabers,	0 10 0
5.	DORKING, Coloured. Cock—	
	1. Andrew Crichton, Glamis,	1 0 0
	2. James Cranston, Tinwald House, Dumfries,	0 10 0
6.	DORKING, Coloured. Hen—	
	1. James Cranston, Tinwald House, Dumfries,	1 0 0
	2. Andrew Crichton, Glamis,	0 10 0
7.	DORKING, Coloured. Cockerel—	
	1. James Cranston, Tinwald House, Dumfries,	1 0 0
	2. William Adam, Tynet Gate, Port Gordon,	0 10 0
8.	DORKING, Coloured. Pullet—	
	1. James Cranston, Tinwald House, Dumfries,	1 0 0
	2. William Adam, Tynet Gate, Port Gordon,	0 10 0
9.	COCHIN-CHINA. Cock—	
	1. Mrs Donald Cameron, Culcabock House, Inverness,	1 0 0
	2. Ebenezer Bird, Glenduckie, Newburgh, Fife,	0 10 0
10.	COCHIN-CHINA. Hen—	
	1. James Lorimer, Sandridge Cottage, Monifieth,	1 0 0
	2. Martin Jameson, Fernhill, Perth,	0 10 0
11.	COCHIN-CHINA. Cockerel.—No Entry.	
12.	COCHIN-CHINA. Pullet.—No Entry.	
13.	BRAHMAPOOTRA. Cock—	
	1. Ebenezer Bird, Glenduckie, Newburgh, Fife,	1 0 0
	2. James Nicoll, 148 Scouringburn, Dundee,	0 10 0
14.	BRAHMAPOOTRA. Hen—	
	1. James Lorimer, Sandridge Cottage, Monifieth,	1 0 0
	2. Ebenezer Bird, Glenduckie, Newburgh, Fife,	0 10 0
15.	BRAHMAPOOTRA. Cockerel—	
	1. Ebenezer Bird, Glenduckie, Newburgh, Fife,	1 0 0
	2. Mrs Sutor, The Collie, Fochabers,	0 10 0
16.	BRAHMAPOOTRA. Pullet.	
	1. James Lorimer, Sandridge Cottage, Monifieth,	1 0 0
	2. Ebenezer Bird, Glenduckie, Newburgh, Fife,	0 10 0
17.	SPANISH. Cock—	
	2. William M'Dougall, George Street, Stirling,	0 10 0
18.	SPANISH. Hen.—No Entry.	
	Carry forward,	£21 10 0

Section		Brought forward,	£21 10 0
19.	SPANISH. Cockerel—		
	1. Mrs D. Mackenzie, Post Office, Meigle,		1 0 0
	2. Mrs D. Mackenzie, Post Office, Meigle,		0 10 0
20.	SPANISH. Pullet—		
	1. Mrs Shanks, Cuthelton, Denny,		1 0 0
	2. Mrs D. Mackenzie, Post Office, Meigle,		0 10 0
21.	SCOTCH GREY. Cock—		
	1. William M'Dougall, George Street, Stirling,		1 0 0
	2. William Agnew, Dalry, Galloway,		0 10 0
22.	SCOTCH GREY. Hen—		
	1. William M'Dougall, George Street, Stirling,		1 0 0
	2. Duncan M'Laren, Cornton, Bridge of Allan,		0 10 0
23.	SCOTCH GREY. Cockerel—		
	1. William M'Dougall, George Street, Stirling,		1 0 0
	2. Duncan M'Laren, Cornton, Bridge of Allan,		0 10 0
24.	SCOTCH GREY. Pullet—		
	1. Duncan M'Laren, Cornton, Bridge of Allan,		1 0 0
25.	HAMBURG. Cock—		
	1. George Buchanan, Laguna House, Murthly,		1 0 0
	2. Mrs Donald Cameron, Culcabock House, Inverness,		0 10 0
26.	HAMBURG. Hen—		
	1. George Buchanan, Laguna House, Murthly,		1 0 0
27.	HAMBURG. Cockerel—		
	2. John Morrison, 80 Mill Street, Alloa,		0 10 0
28.	HAMBURG. Pullet—		
	2. John Morrison, 80 Mill Street, Alloa,		0 10 0
29.	Any other Pure Breed. Cock—		
	1. Rev. Fitzroy Lloyd, The Priory, Pittenweem (Plymouth Rock),		1 0 0
	2. John Cran, Keith (Langshan),		0 10 0
30.	Any other Pure Breed. Hen—		
	1. John Cran, Keith (Langshan),		1 0 0
	2. Rev. Fitzroy Lloyd, The Priory, Pittenweem (Plymouth Rock),		0 10 0
31.	Any other Pure Breed. Cockerel—		
	1. Rev. Fitzroy Lloyd, The Priory, Pittenweem (Plymouth Rock),		1 0 0
	2. John Porter, Anstruther (Plymouth Rock),		0 10 0
32.	Any other Pure Breed. Pullet—		
	1. Rev. Fitzroy Lloyd, The Priory, Pittenweem (Plymouth Rock),		1 0 0
	2. John Porter, Anstruther (Plymouth Rock),		0 10 0
33.	GAME—Black or Brown Reds. Cock—		
	2. John Cran, Keith,		0 10 0
34.	GAME—Black or Brown Reds. Hen—		
	1. C. L. Ralston, Glamis House, Glamis,		1 0 0
	2. John Ellis, Mosshouses, Penicuik,		0 10 0
35.	GAME—Black or Brown Reds. Cockerel—		
	1. John Ellis, Mosshouses, Penicuik,		1 0 0
36.	GAME—Black or Brown Reds. Pullet—		
	1. John Borthwick, Garvald Lodge, Dolphinton,		1 0 0
	2. Mrs Sutor, The Collie, Fochabers,		0 10 0
		Carry forward,	£44 0 0

Section		
	Brought forward,	£44 0 0
37.	GAME—Any other Pure Breed. Cock.—No Entry.	
38.	GAME—Any other Pure Breed. Hen.—No Entry.	
39.	GAME—Any other Pure Breed. Cockerel—	
	2. John Borthwick, Garvald Lodge, Dolphinton (Pile), . .	0 10 0
40.	GAME—Any other Pure Breed. Pullet—	
	1. John Borthwick, Garvald Lodge, Dolphinton (Pile), . .	1 0 0
41.	BANTAM—Any Pure Breed. Cock—	
	1. Duncan M'Laren, Cornton, Bridge of Allan (Sebright), .	1 0 0
	2. Mrs Frew, Kirkcaldy, ...	0 10 0
42.	BANTAM—Any Pure Breed. Hen—	
	1. Duncan M'Laren, Cornton, Bridge of Allan (Sebright), .	1 0 0
	2. Robert E. Frew, Kirkcaldy, ...	0 10 0
43.	BANTAM—Any Pure Breed. Cockerel—	
	1. Hynd Brothers, 27 Parkneuk, Dunfermline, . . .	1 0 0
	2. Miss Robina Frew, Kirkcaldy, ...	0 10 0
44.	BANTAM—Any Pure Breed. Pullet—	
	1. John Ellis, Mosshouses, Penicuik (Duckwing Game), . .	1 0 0
	2. Miss Bessie P. Frew, Kirkcaldy, ...	0 10 0
45.	DUCKS—White Aylesbury. Drake—	
	1. R. G. Smith, Georgeville, Mid-Calder, . . .	1 0 0
	2. R. G. Smith, Georgeville, Mid-Calder, . . .	0 10 0
46.	DUCKS—White Aylesbury. Duck—	
	1. R. G. Smith, Georgeville, Mid-Calder, . . .	1 0 0
	2. R. G. Smith, Georgeville, Mid-Calder, . . .	0 10 0
47.	DUCKS—White Aylesbury. Drake (Young)—	
	1. Mrs Donald Cameron, Culcabock House, Inverness, . .	1 0 0
48.	DUCKS—White Aylesbury. Duckling—	
	1. Mrs Donald Cameron, Culcabock House, Inverness, . .	1 0 0
49.	DUCKS—Rouen. Drake—	
	1. James A. Rollo, Rosemount, Perth, ...	1 0 0
	2. R. G. Smith, Georgeville, Mid-Calder, . . .	0 10 0
50.	DUCKS—Rouen. Duck—	
	1. John Cran, Keith, ...	1 0 0
	2. R. G. Smith, Georgeville, Mid-Calder, . . .	0 10 0
51.	DUCKS—Rouen. Drake (Young)—	
	1. The Earl of Mansfield, K.T., Scone Palace, Perth, . .	1 0 0
	2. R. G. Smith, Georgeville, Mid-Calder, . . .	0 10 0
52.	DUCKS—Rouen. Duckling—	
	1. Admiral Maitland Dougall of Scotscraig, Tayport, Fife, .	1 0 0
	2. The Earl of Mansfield, K.T., Scone Palace, Perth, . .	0 10 0
53.	DUCKS—Any other Pure Breed. Drake—	
	1. R. G. Smith, Georgeville, Mid-Calder (Paradise), . .	1 0 0
	2. R. G. Smith, Georgeville, Mid-Calder (Pekin), . .	0 10 0
54.	DUCKS—Any other Pure Breed. Duck—	
	1. R. G. Smith, Georgeville, Mid-Calder (Paradise), . .	1 0 0
	2. R. G. Smith, Georgeville, Mid-Calder (Pekin), . .	0 10 0
	Carry forward,	£65 10 0

SECTION — Brought forward, £65 10 0

55. DUCKS—Any other Pure Breed. Drake (Young)—
   1. R. G. Smith, Georgeville, Mid-Calder (Pekin), . . 1 0 0
   2. John Cran, Keith (Pekin), ... 0 10 0

56. DUCKS—Any other Pure Breed. Duckling—
   1. R. G. Smith, Georgeville, Mid-Calder (Pekin), . . 1 0 0
   2. John Cran, Keith (Pekin), ... 0 10 0

57. TURKEYS—Any Pure Breed. Cock—
   1. Miss Agnes J. Watson, Inchyra, Perth (American Bronze), 1 0 0
   2. Robert Clark, Taybank, Errol, ... 0 10 0

58. TURKEYS—Any Pure Breed. Hen—
   1. John M. Martin of Auchendennan, Balloch (Bronze Cambridgeshire), ... 1 0 0
   2. Robert Clark, Taybank, Errol, ... 0 10 0

59. TURKEYS—Any Pure Breed. Cock (Poult)—
   1. John M. Martin, of Auchendennan, Balloch (Bronze Cambridgeshire), ... 1 0 0

60. TURKEYS—Any Pure Breed. Hen (Poult)—
   1. John M. Martin of Auchendennan, Balloch (Bronze Cambridgeshire), ... 1 0 0

61. GEESE—Any Pure Breed. Gander—
   1. Mrs J. G. Dick, Mountquharry, Abernethy (Emblen), . 1 0 0
   2. R. G. Smith, Georgeville, Mid-Calder (Toulouse), . . 0 10 0

62. GEESE—Any Pure Breed. Goose—
   1. R. G. Smith, Georgeville, Mid-Calder (Toulouse), . . 1 0 0
   2. John M. Martin of Auchendennan, Balloch (Grey Toulouse), . 0 10 0

63. GEESE—Any Pure Breed. Gander (Young)—
   1. The Earl of Mansfield, K.T., Scone Palace, Perth, . . 1 0 0
   2. George Reid, Clinterty, Blackburn, Aberdeen (Toulouse), . 0 10 0

64. GEESE—Any Pure Breed. Gosling—
   1. The Earl of Mansfield, K.T., Scone Palace, Perth, . . 1 0 0
   2. R. G. Smith, Georgeville, Mid-Calder (Toulouse), . . 0 10 0

£79 10 0

CLASS VI.—BUTTER.

SECTION

1. CURED BUTTER, not less than 28 lbs.—
   1. Henry Orr, Torrance, Bathgate, ... £6 0 0
   2. Archibald Cullen, Woodend Farm, Airdrie, ... 4 0 0
   3. David Longwill, Kendieshill, Linlithgow, ... 2 0 0
   V. H. C., Donald MacFarlane, Balmuldy, Bishopbriggs. H. C., Donald M'Laren, Middleton, Milngavie. C., Robert Jamieson, Enoch Farm, Girvan.

2. POWDERED BUTTER, not less than 7 lbs.—
   1. Sir James T. Stewart Richardson, Bart., Pitfour Castle, Perth, . 6 0 0
   2. Henry Orr, Torrance, Bathgate, ... 4 0 0
   3. Archibald Balloch, Milliken, Bishopbriggs, . . . 2 0 0
   V. H. C., David Ferguson, Burleigh, Milnathort. H. C., Thomas Watson Greig of Glencarse, Perth. C., James Blyth, Auchtermuchty.

3. FRESH BUTTER, Three 1-lb. Rolls—
   1. Sir James T. Stewart Richardson, Bart., Pitfour Castle, Perth, . 6 0 0
   2. Henry Orr, Torrance, Bathgate, ... 4 0 0
   3. Sir Thomas Gladstone of Fasque, Bart., Laurencekirk, . . 2 0 0
   V. H. C., Archibald Cullen, Woodend Farm, Airdrie. H. C., John Brewster, Pepperknowes, Perth. C., Thomas Watson Greig of Glencarse, Perth.

£36 0 0

Class VII.—IMPLEMENTS.

Henry Pooley & Son, Glasgow, for Cart and Cattle Weighing Machines,		£10 0 0
Ben. Reid & Co., Aberdeen, for Simplex Pump,		2 0 0
		£12 0 0

Class VIII.—BEE HUSBANDRY.

William Munn, Ardenadam—Observatory Hive,	Silver Medal,	0 14 0
Wm. M'Nally, Glenluce—Display of Honey,	Silver Medal,	0 14 0
		£1 8 0

ABSTRACT OF PREMIUMS.

Cattle,	£0 0 0
Horses,	598 14 0
Sheep,	500 16 0
Swine,	49 0 0
Poultry,	79 10 0
Butter,	36 0 0
Implements,	12 0 0
Bee Husbandry,	1 8 0
	£1277 8 0

JUDGES.

Stallions and Entire Colts.—Archibald Yuill, Netherside, Strathaven; Andrew Duncan, Upper Kinkell, Inverurie; Oliphant Brown, Mains of Duchrae, Castle-Douglas.

Mares, Fillies, and Geldings.—Robert Andrew, Smeaton, Dalkeith; Alexander Bean, Balquhain Mains, Pitcaple; A. B. Matthews, Newton-Stewart.

Hunters, Roadsters, and Ponies.—John Gilmour of Montrave, Kilmaron Castle, Cupar-Fife; William Munro of Marchbank, Balerno; A. H. Johnstone Douglas of Lockerbie.

Blackfaced.—Alexander Cowan, Spittalhill, Fintry, Glasgow; George Hamilton, Succoth Arrochar; James Moffat, jun., Gateside, Sanquhar.

Cheviot.—John Murray, Parkhall, Douglas; William Dickinson, Longcroft, Lauder; Herbert Brydon, Knocknarling, New Galloway.

Border Leicester and other Long-Woolled.—Duncan Cameron, Fettes, Inverness; William Ford, Fenton Barnes, Drem; L. C. Chrisp, Hawkhill, Alnwick.

Shropshire and other Short-Woolled.—J. E. Farmer, Felton, Ludlow, Salop; R. Thomas The Buildings, Baschurch, Salop.

Swine.—James Deans, Dalkeith Park, Dalkeith.

Poultry.—Enoch Hutton, Columbarian House, Pudsey, Yorkshire.

Butter.—Thomas Baillie, 15 Victoria Street, Edinburgh.

ATTENDING MEMBERS.

Stallions and Entire Colts.—James Park, Dechmont; Colonel Erskine, yr. of Cambo; James Carnegie of Aytonhill.

Mares, Fillies, and Geldings.—Alexander Murdoch, Garteraig; Sir Robert Menzies of Menzies, Bart.; William Tod of East Brackly.

Hunters, Roadsters, and Ponies.—John Ballingall, Dunbog; Andrew Craig of Holeton; Thomas Richmond, Hilton.

Blackfaced.—Robert Paterson of Birthwood; Thomas Lawson of Carriston; James Chalmers, Sheilhill.

Cheviot.—James Hewetson, Auchenbainzie; John Robertson, Old Blair; John Beveridge, yr. of Kinneston.

Border Leicester and other Long-Woolled.—Donald Fisher, Jellyholm; Captain Clayhills Henderson of Invergowrie; John Black, Cortachy.

Shropshire and other Short-Woolled.—George R. Glendinning, Hatton Mains; George Prentice of Strathore; Treasurer Wilson, Perth.

Swine.—John Cran, Kirkton; Charles A. Murray, Taymount.

Poultry.—Lord Arthur Cecil, Orchardmains; John J. Moubray of Naemoor; Bailie Love, Perth.

Butter.—Bailie Fraser, Perth.

III.—DISTRICT COMPETITIONS.

HORSES, CATTLE, AND SHEEP.

NAME OF DIST.	PREMIUM AWARDED TO	FOR	AMOUNT.		
Garioch	Alex. M. Gordon of Newton	Shorthorn Bull	2	0	0
	Peter Bruce, Myreton	do.	1	0	0
	Alex. Scott, Towie Barclay	Shorthorn Cow	2	0	0
	Wm.A. Mitchell, Auchnagathle	do.	1	0	0
	George Wilken, Waterside of Forbes	Aberdeen-Angus Bull	2	0	0
	Alexander Beattie, Dunnydeer	do.	1	0	0
	James Mackie, Lewes	Polled Cow	2	0	0
	James Stephen, Conglass	do.	1	0	0
Dalbeattie	Jas. Cunningham, Tarbreoch	Aged Galloway Bull	2	0	0
	Maxwell Clark of Culmain	Two-year old Galloway Bull	2	0	0
	Andrew Montgomery of Netherhall	One-year old Galloway Bull	2	0	0
	Andrew Montgomery of Netherhall	Galloway Cow	2	0	0
	Jas. Cunningham, Tarbreoch	One-year old Galloway Heifer	2	0	0
	Andrew Montgomery of Netherhall	Two-year old Galloway Heifer	2	0	0
Gargunnock	Andrew Kay, Little Kerse	Ayrshire Cow	3	0	0
	Andrew Paterson, Townhead	Ayrshire Bull	3	0	0
	James Sands, Greenfoot	Brood Mare	3	0	0
	Robert C. Macfarlane, West Carse	Yeld Mare	3	0	0
Sutherland	Captain M'Intosh, Proncy	Mare and Foal	1	0	0
	J. B. Dudgeon, Crakaig	Mare	1	0	0
	W. Murray, Kirkton	Two-year old Filly	1	0	0
	Captain M'Intosh, Proncy	One-year old Filly	1	0	0
	G. Lawson, Clynelish	Shorthorn Bull	1	0	0
	G. Lawson, Clynelish	Shorthorn Cow	1	0	0
	J. B. Dudgeon, Crakaig	Cheviot Tup	1	0	0
	J. B. Dudgeon, Crakaig	Cheviot Shearling Tup	1	0	0
	G. Lawson, Clynelish	Cheviot Ewes	1	0	0
	J. B. Dudgeon, Crakaig	Cheviot Gimmers	1	0	0
	J. B. Dudgeon, Crakaig	Cheviot Tup Lambs	1	0	0
	G. Lawson, Clynelish	Cheviot Ewe Lambs	1	0	0
Stranraer and Rhins of Galloway	James Wither, Lagganmore	Ayrshire Bull	3	0	0
	William Murray, Borrowmoss	Ayrshire Cow	3	0	0
	Jas. Lockhart, Mains of Airies	Clydesdale Stallion	3	0	0
	Jas. Lockhart, Mains of Airies	Clydesdale Mare	3	0	0
Badenoch and Rothiemurchus	A. D. Macrae, Ruthven	Blackfaced Aged Tup	1	7	0
	A. D. Macrae, Ruthven	do.	0	12	0
	C. J. B. Macpherson of Belleville	do.	0	7	0
	R. M'Gregor, Kincraig	Blackfaced Shearling Tup	1	7	0
	A. D. Macrae, Ruthven	do.	0	12	0
	A. D. Macrae, Ruthven	do.	0	7	0
	A. D. Macrae, Ruthven	Blackfaced Ewes	1	7	0
	R. M'Gregor, Kincraig	do.	0	12	0
	A. D. Macrae, Ruthven	do.	0	7	0
	A. D. Macrae, Ruthven	Blackfaced Gimmers	1	7	0
	R. M'Gregor, Kincraig	do.	0	12	0
	C. J. B. Macpherson of Belleville	do.	0	7	0
		Carry forward,	£69	4	0

NAME OF DIST.	PREMIUM AWARDED TO	FOR	
		Brought forward,	£69 4 0
	A. D. Macrae, Ruthven	Blackfaced Tup Lamb	0 14 0
	A. M'Gillivray, Gordonhall	do.	0 7 0
	R. M'Gregor, Kincraig	do.	0 4 0
	C. J. B. Macpherson of Belleville	Blackfaced Ewe Lambs	0 14 0
	R. M'Gregor, Kincraig	do.	0 7 0
	A. D. Macrae, Ruthven	do.	0 4 0
	A. D. Macrae, Ruthven	Best Woolled Tup	0 6 0
Selkirk and Galashiels	Earl Cawdor, Stackpole Court	Stallion	15 0 0
Royal Northern	Earl of Strathmore	Aged Aberdeen-Angus Bull	Minor Silver Medal
	Lord Tweedmouth	Two-year old Bull	Minor Silver Medal
	Earl of Strathmore	Aberdeen-Angus Heifer	Minor Silver Medal
Strathbogie	D. C. Bruce, Broadland	Aged Shorthorn Bull	Minor Silver Medal
	Lohn Wilson, Lower Piries-mill	Two-year old Bull	Minor Silver Medal
	Alexander Geddes, Blairmore	Two-year old Polled Heifer	Minor Silver Medal
United Banff-shire	J. Main, Burns	Shorthorn Bull	Minor Silver Medal
	Alex. Simpson, Duff House	Polled Bull	Minor Silver Medal
	J. Leith, Glengerrack Mains	Shorthorn Heifer	Minor Silver Medal
Inverness	Jas. Macdonald, Braes of Findon	Stallion	15 0 0
Kinross-shire	John Macdonald, Boquhanran	Stallion	15 0 0
Dumbarton-shire	John Simpson, Drumfork	Brood Mare	4 0 0
	David Riddell, Kilbowie	do.	3 0 0
Lower Dist. of Wig-townshire	Robert Kerr, Broadwigg	Brood Mare	4 0 0
	William M'Connell, Glasnick	do.	3 0 0
Lower Ward of Renfrew-shire	Peter M'Aulay, Craigs	Two-year old Colt	1 0 0*
	Alexander Scott, Greenock	do.	0 10 0*
	Alexander Scott, Greenock	One-year old Colt	2 0 0
	R. Sinclair Scott, Skelmorlie	do.	1 0 0
	Sir M. R. Shaw Stewart, Bart.	Two-year old Filly	2 0 0
	Donald Black, Auchenfoyle	do.	1 0 0
	Sir M. R. Shaw Stewart, Bart.	do.	0 10 0
	William Howie, Finnochbog	One year-old Filly	2 0 0
	R. Sinclair Scott, Skelmorlie	do.	1 0 0
	James Mathie, Cove	do.	0 10 0
Vale of Alford	James Leys, Asloun	Two-year old Colt	1 0 0*
	George Innes, Whitehouse	do.	0 10 0*
	George Wilken, Waterside	One-year old Colt	1 0 0*
	George F. Barron, Meikle Endovie	do.	0 10 0*
	William Anderson, Wellhouse	Two-year old Filly	2 0 0
	James Strath, Greystone	do.	1 0 0
	James Reid, Greystone	do.	0 10 0
	James Lawson, Scotsmill	One-year old Filly	2 0 0
	William Benton, Crookmore	do.	1 0 0
	James Strath, Greystone	do.	0 10 0
Lower An-nandale	Hugh Crawford, Winterseugh	Two-year old Colt	2 0 0
	James Crawford, Bridekirk Mains	do.	1 0 0
	Hugh Crawford, Winterseugh	One-year old Colt	2 0 0
	John Hutchison, Oxgang	do.	1 0 0
		Carry forward,	£158 10 0

* Half Premiums awarded, the number of Lots being under five.

NAME OF DIST.	PREMIUM AWARDED TO	FOR	£	s.	d.
		Brought forward,	£158	10	0
	Robert Paterson of Robgili	Two-year old Filly	2	0	0
	J. C. Jardine, Broomhills	do.	1	0	0
	James Crawford, Bridekirk Mains	do.	0	10	0
	Peter Carruthers, Charlesfield	One-year old Filly	2	0	0
	D. W. Crichton, Limekilns	do.	1	0	0
	John Ramsay, Scotsfield	do.	0	10	0
Kirriemuir	Earl of Strathmore	One-year old Colt	2	0	0
	Andrew Ralston, Glamis House	do.	1	0	0
	John Nicoll, Reedie	Two-year old Filly	2	0	0
	James Gove, Ascreavie	do.	1	0	0
	Robert Myles, Coilamy	do.	0	10	0
	George Rough, Wardmill	One-year old Filly	2	0	0
	David Cowpar, Upper Migvie	do.	1	0	0
	William Rough, Longbank	do.	0	10	0
Dunblane, Doune, and Callander	James Sands, Greenfoot	One-year old Colt	2	0	0
	Matthew Lennox, Powblack	do.	1	0	0
	Col. Stirling of Kippendavie	Two-year old Filly	1	0	0*
	Robert Fotheringham, Blair Drummond	do.	0	10	0*
	James M'Lachlan, Doune Lodge	do.	0	5	0*
	Col. Stirling of Kippendavie	One-year old Filly	2	0	0
	James M'Lachlan, Doune Lodge	do.	1	0	0
	Walter Reid, Craigarnhall	do.	0	10	0
West Teviotdale	John Scott, West Deloraine	Cheviot Aged Tup	2	0	0
	James Moffat, Craik	do.	1	0	0
	John Scott, West Deloraine	Cheviot Shearling Tup	2	0	0
	Charles Scott, Milsington	do.	1	0	0
	David Pringle, Cleethaugh	Cheviot Ewes	2	0	0
	John Scott, West Deloraine	do.	1	0	0
	James Moffat, Craik	Cheviot Gimmers	2	0	0
	John Scott, West Deloraine	do.	1	0	0
Arran	William Tod, Glenree	Blackfaced Aged Tup	Minor Silver Medal		
	William Tod, Glenree	Blackfaced Shearling Tup	Minor Silver Medal		
	James Allan, jun., Balnacoole	Blackfaced Ewes	Minor Silver Medal		
	James Allan, jun., Balnacoole	Blackfaced Gimmers	Minor Silver Medal		

DAIRY PRODUCE.

Forth	John Gibb, Tarbrax	Sweet Milk Cheese	1	0	0†
	William Barr, Muirfoot	do.	0	10	0†
	James Smellie, Straven House	Cured Butter	2	0	0
	James Struthers, Butter Hole	do.	1	0	0
			£200	5	0
		13 Minor Silver Medals	3	7	2
			£203	12	2

SPECIAL GRANTS.

Glasgow Agricultural Society	Vote in aid of Premiums	£50	0	0
Ayrshire Agricultural Association	Vote to Dairy Produce Show at Kilmarnock	20	0	0
Orkney Agricultural Society	Vote in aid of Premiums	3	0	0
Rousay Agricultural Society	Vote in aid of Premiums	3	0	0
		£76	0	0

* Half Premiums awarded, the number of Lots being under five.

† Half Premiums awarded, the number of Lots being under eight.

MEDALS IN AID OF PREMIUMS GIVEN BY LOCAL SOCIETIES.

Minor Silver Medals were awarded to the following:—

ABERDEENSHIRE.

NAME OF DISTRICT.	MEDAL AWARDED TO	FOR
Insch	Mrs Kennedy, Wardhouse	Dairy Produce
Newhills and Dyce	James Henry, Howmoss	Potato Oats
North of Scotland Apiarian	Leslie Tait, Foveran	Honey
	A. Cockburn, Cairnie	Hives and Bee Furniture
Slains	James Cochrane, Waterside	Shorthorn Bull
	James Cochrane, Waterside	Draught Filly
Vale of Alford	Alexander Strachan, Wester Fowlis	Swedish Turnips
	R. O. Farquharson of Haughton	Yellow Turnips

AYRSHIRE.

NAME OF DISTRICT.	MEDAL AWARDED TO	FOR
Colmonell and Ballantrae	James Wilson, Macherquhat	Ayrshire Heifer
	Robert Weir, Knockdaw	Clydesdale Mare
	John Semple, Balkissock	Blackfaced Tup
Dalrymple	James Blair, Holmes	Ayrshire Cow
	George Murray, Milreoch	Clydesdale Mare
Darvel	Robert Loudoun, Darvel	Roots
	A. Lindsay, Dalwhatswood	Sweet Milk Cheese
	Hugh White, Wraise	Powdered Butter
Girvan	John Kay, Corseclays	Ayrshire Heifer
	Thomas Crawford, Drumbeg	Clydesdale Filly
Irvine	John Caldwell, Bogside	Ayrshire Cow
	John Kerr, Collenan	Clydesdale Mare
Kilmarnock	William Hunter, Foulton	Ayrshire Cow
	Robert Osborne, Drumjoan	Ayrshire Bull
	John Simpson, Drumfork	Clydesdale Mare
	Sir M. R. Shaw-Stewart, Bart.	Clydesdale Stallion
Monkton, Newton, &c.	James Wright, South Sanquhar	Ayrshire Heifer
	R. F. F. Campbell of Craigie, M.P.	Clydesdale Colt
Patna	Robert Mair, Hanniestone	Ayrshire Heifer
	Jacob Sloan, Clydenoch	Clydesdale Mare
	W. M. S. Howatson, Carskeoch	Blackfaced Ewes
Stewarton	William Hastings, Peacockbank	Ayrshire Cow
	A. R. Foulds of Clerkland	Ayrshire Bull
	William Whitford, Gabrockhill	Clydesdale Mare

BERWICKSHIRE.

NAME OF DISTRICT.	MEDAL AWARDED TO	FOR
East of Berwickshire	Archibald Grant, Blackadder West	Ayrshire Cow
	William Elliot, Ellemford	Clydesdale Mare
	George Simson, Courthill	Leicester Tup

DUMBARTONSHIRE.

NAME OF DISTRICT.	MEDAL AWARDED TO	FOR
Cumbernauld	Alexander Weir, Smithstone	Ayrshire Cow
	James Mather, Balloch	Ayrshire Bull
	James Mather, Balloch	Clydesdale Filly

DUMFRIESSHIRE.

NAME OF DISTRICT.	MEDAL AWARDED TO	FOR
Nithsdale	James Cranston, Tinwald House	Ayrshire Cow
	J. & J. Moffat, Gateside	Blackfaced Shearling Tup
	Robert Paterson, Robgill Tower	Clydesdale Filly
	James R. W. Wallace, Auchenbrack	Dunlop Cheese

NAME OF DISTRICT.	MEDAL AWARDED TO	FOR
	INVERNESS-SHIRE.	
Glen Urquhart	John Fraser, Temple House	Sandy Oats
	William Garland, Delshangie	Champion Potatoes
Inverness	P. G. M'Donald, Mile End	Polled Bull
	Duke of Sutherland, K.G.	Highland Bull
	Murdoch M'Rae, Kinbeachie	Shorthorn Cow
	James Mackessack, Earnside	Draught Mare
	J. H. M'Donald, Charleston	Draught Filly
Strathglass	Lord Tweedmouth	Sandy Oats
	Lord Tweedmouth	Potatoes
	LANARKSHIRE.	
Old Monkland	Robert Spittal, Kenmure	Clydesdale Mare
	NAIRNSHIRE.	
Nairnshire Ornithological	Miss Gray, Viewhill	Dorkings
	Even Mackenzie, Newlands	Langshans
	D. Cameron, Fort George Station	Hamburgs
	A. Fraser, Whitebridge	Spanish
	ORKNEY.	
Rousay	Lieut.-General Burroughs of Rousay, C.B.	Milch Cow
	George Learmonth, Westness	Draught Mare
	RENFREWSHIRE.	
Johnstone	Arthur Lang, West Kilbride	Ayrshire Cow
	David Riddell, Blackhall	Clydesdale Colt
Mearns	James Dunlop, Floak	Ayrshire Cow
	William Clark, Netherlee	Draught Gelding
Neilston	John Holm, Jaapston	Ayrshire Cow
	Robert Pollock, Braco	Ayrshire Bull
	ROSS-SHIRE.	
Dingwall Ornithological	George J. Ross, jun., Dingwall	Game Fowls
	Donald Fraser, Novar	Dorkings
Northern Pastoral Club	Walter Mundell, Moy	Cheviot Aged Tup
	Walter Mundell, Moy	Cheviot Shearling Tup
	Walter Mundell, Moy	Cheviot Ewes
	Walter Mundell, Moy	Cheviot Gimmers

70 Minor Silver Medals, £18, 1s. 8d.

PLOUGHING COMPETITIONS.

In 1886–87 the Society's Silver Medal was awarded at 150 Ploughing Competitions as follows:—

ABERDEENSHIRE.

NAME OF SOCIETY.	PLACE OF COMPETITION.	SILVER MEDAL AWARDED TO
Aboyne.	Haugh.	John Middleton, Manse of Birse
Buchan (South District).	Ednie.	Charles Smith, Dens.
Corgarff.	Luib.	John Tait, Ordgarf.
Cromar and Lochside.	Blelack.	John Farquharson, Galtown.
Cruden.	Yonderton.	Alexander Johnstone, Blackhills.
Echt, Skene, and Midmar.	Knockquharn.	William Machray, Bervie.
Leochel-Cushnie.	Wester Fowlis.	William Gilbert, Shiel.
Monymusk, &c.	Sauchen.	James Duthie, Gight.
Oyne.	Bogend.	John Moir, Blairbowie.
Peterhead.	Wellington	John Gray, Meikle Dens.
Strathbogie.	Robiestone.	Alexander Munro, Craigwillie.

NAME OF SOCIETY.	PLACE OF COMPETITION.	SILVER MEDAL AWARDED TO
	ARGYLLSHIRE.	
Benderloch.	Kentallon.	Donald Carmichael, Barcaldine Mill.
Coll.	Ardleod.	John Lawrence, Breachacha.
Gigha.	Ardlaney.	Archibald M'Millan, Leim.
Glenorchy.	Corryghoil.	William Brown, Edendonich.
Islay, Jura, and Colonsay.	Bridgend.	William H. Weir, Daill.
Kilberry.	Cretshegan.	Alexander Dewar, Craig.
Kintyre.	Knocknaha.	Hector Galbraith, Backs.
Largieside.	Culfuar.	Angus M'Allister, Dalmore.
Lorn.	South Connel.	Hugh Macphail, Achleven.
Muckairn.	Taynuilt.	Duncan M'Gregor, Brochroy.
Nether Lorn.	Dunmore.	Duncan M'Cowan, Oban-Seil.
Strath of Appin.	North Ardnaclach.	D. Cameron, Elerick.
	AYRSHIRE.	
Ayr and Alloway.	Mount Oliphant.	William Orr, Monkwood Mains.
Beith.	Southridgehill.	John Dickie, Lyonshields.
Coylton.	Milncraig.	William Cunningham, Byres.
Cumnock.	Changue.	William Brown, Bridgend.
Dalry.	Hardcroft.	Robert Smith, Craighead.
Dalrymple.	Malcolmstone.	James Dinnan, Thornhill.
Fenwick.	Guardrum.	Hugh M'Fadyen, North Craig.
Galston.	Little Sorn.	James Ferguson, Clune.
Girvan.	Low Craighead.	Charles Blackley, Cairnhill.
Glenmuir and Bello Waters.	Rigg.	David Auld, High Garleffan.
Kilmarnock.	Wardneuk.	Robert Auld, Dykes.
Kirkmichael.	Balsaggart.	Donald M'Callum, Montgowrieston.
Monkwood and Minishant.	Pinmore.	William Murdoch, Corton.
Monkton, Prestwick, &c.	Aitkenbrae.	James Meikle, Powburn.
New Cumnock.	House o' Water.	Alexander Pearson, Lanemark.
Sorn.	Daldorch.	Robert Morton, Dykeneuk.
Straiton.	Culdoch.	William Jamieson, Balminoch.
Tarbolton.	Millburn.	James Ferguson, Clune.
West Kilbride.	Overton.	Henry Strong, Biglees.
	BANFFSHIRE.	
Braes of Glenlivet.	Demick.	Charles M'Hardy, Scanlan.
	BERWICKSHIRE.	
Lauderdale.	Whiteburn.	Alexander Brockie, Dods.
	BUTE AND ARRAN.	
Arran.	Glenkill.	Robert Kelso, jun., Carriegills.
Bute.	Windyhall.	Hugh M'Lean, Ascog.
	CLACKMANNANSHIRE.	
Clackmannan Union.	Aitkenhead.	William Reid, Kennet.
	DUMBARTONSHIRE.	
Kilmaronock and Bonhill.	Tillechewan.	J. Miller, Third.
Kirkintilloch.	Easter Bedcow.	William Paterson, Bedcow.
	DUMFRIESSHIRE.	
Penpont.	Bog.	Thomas Collart, Tibbers.
	EDINBURGHSHIRE.	
West Calder.	Birniehill.	William Stirling, Pottieshaw.
	ELGINSHIRE.	
Dallas.	Blackhills.	Duncan Cameron, Branchil.
Morayshire.	Wester Manbeen.	Robert Thomson, Bogs of Mayne.
	FIFESHIRE.	
Crossgates,	South Balyeoman.	David M'Laren, Urquhart.
East of Fife.	Gordonhall.	Alexander Thomson, Pitcorthie.
Leslie.	Auchmuir.	James Morris, Strathendry.
Windygates.	Balfarg.	James Wann, Bighty.

NAME OF SOCIETY.	PLACE OF COMPETITION.	SILVER MEDAL AWARDED TO
	FORFARSHIRE.	
Forfar, &c.	Gask.	James Hill, Hatton.
Kirriemuir.	Cortachy.	James Denchar, Kintyrie.
Lunan, &c.	West Mains.	Andrew Suttie, Letham Grange.
Mains and Strathmartine.	Balgillo.	William Kerr, West Craigie.
Monifieth, &c.	Affleck.	Charles Leonard, Kirkton.
Panbride and Arbirlot.	Hatton.	James Dorward, Auchrennie.
Tannadice, &c.	West Mains.	Joseph Kettles, Battledykes.
	HADDINGTONSHIRE.	
Salton.	East Salton.	James Scott, Samuelston Mains.
	INVERNESS-SHIRE.	
Badenoch, &c.	Ruthven.	Duncan Meldrum, Kerrow.
Glen Urquhart.	Drumbuie.	John M'Donald, Balmacaan.
Inverness Junior.	Hilton.	Francis Cameron, Muckovie.
Laggan.	Middleton.	John M'Killop, Blargie.
Lochaber.	Claggan.	Donald M'Bean, Fortwilliam.
Nether Lochaber, &c.	North Ballachulish.	Donald Black, Ballachulish
Strathglass.	Comar.	William Fraser, Kerrow.
	KINCARDINESHIRE.	
Arbuthnott, &c.	Bogatyhead.	Alexander Sutherland, Lumgair.
Banchory-Devenick	Greenhow.	George Chalmers, Tillyhowes.
Durris	West Funach.	Charles M'Hardy, Cairnfauld.
Maryculter.	Millbank.	John Smith, Hillbrae.
Marykirk.	Craig of Garvock.	James Findlater, Oatyhill.
Portlethen.	Mains.	Wm. Beattie, jun., Scatterburn.
Strachan.	Bowbutts.	William Forbes, Croftfoddie.
	STEWARTRY OF KIRKCUDBRIGHT.	
Corsock.	Drumhumphry.	John M'Minn, Hallcroft.
Crossmichael.	Little Ernambrie.	William Davidson, Hillowton.
Kelton.	Lodge of Kelton.	Anthony M'Guffie, Whitepark.
Kirkpatrick-Durham.	Boghall.	Richard Corrie, Crofts.
Penninghame.	Machermore.	Thomas Sanders, Barnkirk.
Rerrick.	Rerrick Park.	George Docherty, Arroland.
St Mary's Isle.	Cannee.	Samuel Caldow, Milton.
Troqueer.	Flatts of Cargen.	John Linnwood, Carruchan.
Urr.	Waterside.	William Cavet, Little Larg.
	LANARKSHIRE.	
Cadder.	Bogleshole.	Robert M'Kellor, Springfield.
East Kilbride.	High Mains.	Peter Morrison, Newlandmoor.
Old Monkland.	Kirkwood.	Daniel Baker, Kirkshaws.
	LINLITHGOWSHIRE.	
Kinneil.	Northbank.	John Jackson, Kinneil Mills.
	NAIRNSHIRE.	
Ardclach.	Fleenas-na-Gael.	Alexander Fraser, Wester Belivat.
	ORKNEY.	
Egilshay.	Wattin.	George Garsen, Grugar.
Evie and Rendall.	Georth.	Frank Cruickshank, Tingwall.
Holm.	Hartiso.	Alexander Muir, Biggings.
Orkney.	New Holland.	Alexander Winnock, Craigiefield.
Orkney.	Westness.	G. Gibson, Langskail.
St Andrews.	Hall of Essenquoy.	John Anderson, Campston.
St Ola.	Seatter.	William Mowat, Barns.
Sanday.	Elsness.	Alexander Thomson, Stove.
Shapansay.	Strathore and Parkhall.	John Scott, Quoymorhouse.
South Ronaldshay.	Widewall.	Peter M'Mannen, Burwick.
Stronsay.	Airly.	William Cooper, Housebay.
West Mainland.	West Quoys.	James Anderson, Overbigging.

NAME OF SOCIETY.	PLACE OF COMPETITION.	SILVER MEDAL AWARDED TO
	PEEBLESSHIRE.	
Peebleshire (open).	Bonnington.	Andrew Johnson, Mailingsland.
	PERTHSHIRE.	
Blairdrummond, &c.	West Drip.	Robert Duncan, Westwood.
Breadalbane (Eastern Dist.)	Comrie Farm.	John Campbell, Comrie Farm.
Comrie.	Easter Dalginross.	Robert Jack, Braincroft.
Culross.	Muirside.	Alexander Campbell, Cadgerford.
Drummond Castle.	Parkhead.	John Gow, Standingfauld.
Dunblane.	Dunblane.	A. Cairns, Greystone.
Fortingall.	Glenlyon House.	John M'Dougall, Drumcharry.
Foss and Strathtummel.	Foss Home Farm.	Angus Campbell, Lochtummel Inn.
Glen yon.	Roromore.	Donald M'Pherson, Balantyre.
Grandtully.	Lundin.	John M'Donald, Ballintaggart.
Isla.	Leitfie.	William Morrison, Jordanstone.
Logiealmond and Lyndoch.	Drumharrow.	William Duncan, Pitcairngreen.
Mid. Dist. of Athole, &c.	Guay.	Jas. Borrie, Mains of Kilmorich.
Monzievaird and Strowan.	Carse of Trowan.	Andrew Donaldson, Lochlane.
Moulin.	Auchnahyle.	James Smith, Tomdachoil.
Port of Monteith.	Lochend Farm.	Duncan Gardner, Braeval.
Rannoch.	Finnart.	Duncan Cameron, Camghonran.
St Martins.	St Martins Home Farm.	John M'Andrew, Pitskelly.
Stormont Union.	Little Fardle.	William Ramsay, Meikle Fardle.
Strathbraan.	Deanshaugh.	William M'Dougall, Tirfuack.
Strathearn Central.	Inverdunning.	John Devilin, Williamston.
Struan.	Calvine.	Charles Reid, Auchleeks.
Thornhill.	Powblack.	John Blair, Little Ward.
Weem.	Castle Menzies.	Robert Menzies, Carse.
	RENFREWSHIRE.	
Cathcart and Eastwood (open).	Eastwood Park.	Alexander Ferguson, Govan.
Cathcart and Eastwood (local).	Eastwood Park.	Alexander Miller, Darnley.
Erskine and Inchinnan.	Glenshinnoch.	Robert Munn, Commonside.
Greenock, Gourock, &c.	Cove.	Robert M'Lachlan, Mathernock.
Renfrewshire.	Blackbyres.	John Roberts, Crooks.
	ROSS-SHIRE.	
Easter Ross.	Arabella.	George M'Leod, Meddat. John Sutherland, Polnicol.
	STIRLINGSHIRE.	
Arnprior.	Angus Step.	William Wingate, Lochend.
Bannockburn, &c.	Cowie Hall.	Peter Muirhead, Pirnhall.
Eastern Dist. of Stirlingshire.	Blinkbonny.	Walter Weir, Inches.
Strathendrick.	Finnich Blair.	James Miller, Cameron.
Touch and Craigforth.	Old Mills.	William Bryson, Shaws of Touch.
	SUTHERLANDSHIRE.	
Lairg and Gruids.	Balloan.	George Mackay, Balloan.
Rosehall.	Auchengill.	Alexander Ross, Auchengill.
	WIGTOWNSHIRE.	
Kirkmaiden.	Tirally.	John Cain, Auchness.
Machars.	Barglass.	John Rodger, Broadwigg.
New Luce.	Galdenoch.	Anthony Agnew, Airyhemming.
Old Luce.	Back of the Wall.	William M'Dowall, Bankfield.
Stoneykirk.	Blair.	David Blain, Cairnhandy.
Whithorn and Glasserton.	Dinnans.	William M'Cutcheon, Appelby.

150 Minor Silver Medals, £38, 15s.

IV.—COTTAGES AND GARDENS.

1. BEST KEPT COTTAGES AND GARDENS.

	Fifeshire.		
Kingskettle	John Young	Garden	£1 0 0
	John Dowie	do.	0 10 0
Markinch	Mrs S. Herd	Cottage	1 0 0
	Mrs Hunter	do.	0 10 0
	Peter Galloway	Garden	1 0 0
	David Spence	do.	0 10 0
	Inverness-shire.		
Inverness	Mrs Hull	Cottage	1 0 0
	Mrs Dunlop	do.	0 10 0
	Alexander Fraser	Garden	1 0 0
	William Fraser	do.	0 10 0
	Stewartry of Kirkcudbright.		
Corsock	John Johnston	Garden	1 0 0
	Miss Grace Henderson	do.	0 10 0
	Lanarkshire.		
Larkhall	Mrs Davidson	Cottage	1 0 0
	Mrs Bruce	do.	0 10 0
	William Bruce	Garden	1 0 0
	Robert Crow	do.	0 10 0
	Perthshire.		
Alyth	Mrs John Stoddart	Cottage	1 0 0
	Mrs George Souter	do.	0 10 0
	James Robb	Garden	1 0 0
	George Christie	do.	0 10 0
	Renfrewshire.		
Erskine	James Stoddart	Garden	1 0 0
	John M'Farlane	do.	0 10 0
	Ross-shire.		
Norar	John Reader	Cottage	1 0 0
	Alexander Graham	do.	0 10 0
	Mrs Mackenzie	Garden	1 0 0
	John Reader	do.	0 10 0
			£19 10 0

2. MEDALS FOR COTTAGES AND GARDENS AND GARDEN PRODUCE.

Minor Silver Medals were awarded to the following:—

	Aberdeenshire.	
Insch	James Eddie	Garden Produce
	Argyllshire.	
Tighnabruaich	Neil Turner	Garden Produce
	Neil Turner	Garden
	Ayrshire.	
Carrick	Thomas Shields	Garden
	John Kirkland	Cut Flowers
Dailly	Thomas Smith	Garden
	Miss Shaw	Cut Flowers
Darvel	Matthew Mair	Flowers
Loudoun	Thomas Mair	Garden Produce
	Hugh Brown	Flowers

	DUMFRIESSHIRE.	
Kirkpatrick-Fleming	James Johnstone	Garden
	EDINBURGHSHIRE.	
Ratho	William Barton	Garden
	FIFESHIRE.	
Strathmiglo	James M'Kenzie	Vegetables
	Richard Alison	Garden
	HADDINGTONSHIRE.	
Pencaitland	Andrew Hogg	Garden
Salton	George Richardson	Garden
	INVERNESS AND NAIRN SHIRES.	
Croy, &c.	Mrs Ralph	Cottage
	James D. M'Gregor	Garden
	STEWARTRY OF KIRKCUDBRIGHT.	
Kirkpatrick-Durham	Alexander Roxburgh	Flower Plot
	John M'Craith	Garden
	LANARKSHIRE.	
East Kilbride	John M'Coll	Flower Garden
	William Fraser	Vegetable Garden
Law	John Weir	Flower Plot
	William Rogerson	Vegetable Plot
Rutherglen Victoria Gardens	John M'Millan	Garden
	Archibald Paterson	Garden
Rutherglen Horticultural and Apiarian	John Findlay	Vegetables
	William M'Nally	Honey
Stonehouse	George Hamilton	Garden
	LINLITHGOWSHIRE.	
Abercorn	William Wilson	Garden
	NAIRNSHIRE.	
Cawdor	Mrs Alexander Ross	Cottage
	Robert Greigor	Garden
	PERTHSHIRE.	
Almond Valley	John Kyles	Cottage
	William Panton	Garden
Coupar-Angus	Mrs Pirnie	Cottage
	Peter Myles	Garden
Menzies Show	James Stewart	Vegetables and Fruit
	James Stewart	Flowers
	RENFREWSHIRE.	
Kilbarchan	William Mason	Vegetables
	John Meiklem	Farm Produce
Renfrew	Robert Weir	Vegetables
	Robert Weir	Garden
	STIRLINGSHIRE.	
Camelon	Peter Lawless	Garden
Campsie	William Young	Garden
	J. Stewart	Garden
	SUTHERLANDSHIRE.	
Golspie	J. W. Cameron	Garden
	John Fraser	equal Garden
	John F. Gunn	equal Garden

48 Minor Silver Medals, £12, 8s.

V.—VETERINARY DEPARTMENT.

CLASS EXAMINATIONS—APRIL 1887.

Silver Medals were awarded to the following:—

DICK'S VETERINARY COLLEGE.

E. C. Winter,	Horse Pathology.	J. Cowan,	Morbid Anatomy.
W. Skinner,	Cattle Pathology.	G. Sinclair,	Botany.
R. Edmondson,	Physiology.	J. Cowan,	Chemistry.
W. Skinner,	Anatomy.	J. Cowan,	Materia Medica.

NEW VETERINARY COLLEGE, EDINBURGH.

W. C. Hazelton,	Horse Pathology.	John Matthews,	Morbid Anatomy.
J. Clarkson,	Cattle Pathology.	J. Murray,	Botany.
Alfred Bate,	Anatomy.	Ernest de Yong,	Chemistry.
S. Cameron,	Physiology.	J. Murray,	Materia Medica.

GLASGOW VETERINARY COLLEGE.

Hugh Begg,	Horse Pathology.	J. Beanland,	Botany.
William Grinton,	Cattle Pathology.	David Warnock,	Chemistry.
John Ferguson,	Anatomy.	David Warnock,	Materia Medica.
James M'J. M'Call,	Histology&Physiology.		

23 Large Silver Medals, £16, 2s.

VI.—AGRICULTURAL CLASS, EDINBURGH UNIVERSITY.

1.	J. R. C. Smith, Mowhaugh, Kelso,	£6	0	0
2.	Daniel Steele, Merkland, New Cumnock,	4	0	0
		£10	0	0

ABSTRACT OF PREMIUMS.

1. ESSAYS AND REPORTS,				£40	0	0
2. PERTH SHOW, 1887,				1277	8	0
3. DISTRICT SHOWS:—						
Stock and Dairy Produce,	£203	12	2			
Special Grants,	76	0	0			
Local Societies—70 Medals,	18	1	8			
Ploughing Associations—150 Medals,	38	15	0			
				336	8	10
4. COTTAGES AND GARDENS—Money Premiums, £19, 10s.; 48 Minor Silver Medals, £12, 8s.,				31	18	0
5. VETERINARY DEPARTMENT—Medals to Students,				16	2	0
6. AGRICULTURAL CLASS, EDINBURGH UNIVERSITY,				10	0	0
				£1711	16	10

STATE OF THE FUNDS
OF
THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND
As at 30th NOVEMBER 1887.

I. Bonds—		
Heritable, £3,300 at 4 per cent., £3,500 at 3¾ per cent., and £11,479, 16s., at 3½ per cent., ...		£18,279 16 0
Debenture Bonds by Clyde Navigation Trustees at 4 per cent.,		2,450 0 0
Railway Debenture Bonds at 4 per cent., ...		500 0 0
		£21,229 16 0
II. Debenture Stock—		
£3,000 North British Railway Company, 4¼ per cent., at £122, 7s. 6d.	£3,671 5 0	
£2,727 Caledonian Railway Company, 4 per cent., at £119, 5s.	3,251 18 10	
£1,000 London and North-Western Railway Company, 4 per cent., at £126, . .	1,260 0 0	
		8,183 3 10
III. Bank Stocks—		
£6,407, 7s. 8d. Royal Bank of Scotland, at £219, . . .	£14,032 3 0	
2,218, 6s. 5d. Bank of England, at £303, .	6,721 10 3	
2,000, 0s. 0d. British Linen Company Bank, at £328, . . .	6,560 0 0	
1,250, 0s. 0d. National Bank of Scotland, at £312, . . .	3,900 0 0	
1,080, 0s. 0d. Commercial Bank of Scotland, at £55, 15s. per share of £20, or at £278, 15s. on £1,080, ...	3,010 10 0	
1,091, 13s. 4d. Bank of Scotland, at £324, .	3,537 0 0	
£14,047, 7s. 5d.		37,761 3 3

Note.—The original cost of these Bank Stocks was £22,360, 19s. 6d., showing a profit, at present prices, of £15,400, 3s. 9d.

IV. Ten Shares (£500) of the British Fishery Society, valued at		200 0 0
V. Arrears of Members' Subscriptions, considered recoverable, .		49 18 6
		£67,424 1 7
Deduct—Balance due to Royal Bank on Account Current,		1,055 6 1
Amount of Funds, . . .		£66,368 15 6
VI. Building Fund—		
1. Estimated value of Building, No. 3 George IV. Bridge, .		£3,100 0 0
2. Sum lent on Heritable Bond, at 3½ per cent., . .		350 0 0
3. Deposit with Royal Bank, ...		62 7 4
Amount of Building Fund, .		£3,512 7 4
VII. Tweeddale Medal Fund—		
Debenture Bond with Caledonian Railway Company, at 4 per cent., ...		£500 0 0
VIII. Furniture—		
Estimated Value of Furniture, Paintings, Books, &c., . .		£1,000 0 0

W. S. WALKER, *Treasurer.*
JAS. AULDJO JAMIESON, *Chairman of Finance Committee.*
WM. HOME COOK, C.A., *Auditor.*

Edinburgh, *3rd January* 1888.

ABSTRACT of the ACCOUNTS of the HIGHLAND and

CHARGE.

1. DEPOSIT with Royal Bank in name of Building Fund, . .			£49 6 11
2. ARREARS of Annual Subscriptions at 30th Nov. 1886,		£36 14 6	
Whereof due by Members who have now compounded for life, and are thereby extinguished, .	£2 0 0		
Sums ordered to be struck off, .	16 11 0		
		18 11 0	
			18 3 6
3. INTEREST AND DIVIDENDS—			
(1) Interest on Heritable Bonds, less Income-Tax,		£590 1 5	
(2) Interest on Debenture Bonds—			
On £2,950 at 4 per cent., less tax,	£114 6 5		
On £1,500 at $3\frac{1}{2}$ per cent., less tax,	50 17 8		
		165 4 1	
(3) Interest on Debenture Stock—			
On £3,000 at $4\frac{1}{4}$ per cent., less tax,	£123 11 6		
On £3,727 at 4 per cent., less tax,	144 8 7		
		268 0 1	
		£1,023 5 7	
Deduct—			
Interest on Account current with Royal Bank of Scotland, for year to 30th Nov. 1887, .		6 1 8	
		£1,017 3 11	
(4) Dividends on Bank Stock—			
£6,407, 7s. 8d. Royal Bank of Scotland,	£576 13 2		
2,218, 6s. 5d. Bank of England,	216 6 7		
2,000, 0s. 0d. British Linen Co. Bank, . .	280 0 0		
1,250, 0s. 0d. National Bank of Scotland, .	187 10 0		
1,080, 0s. 0d. Commercial Bank of Scotland, .	151 4 0		
1,091, 13s. 4d. Bank of Scotland,	141 18 4		
£14,047, 7s. 5d.		1,553 12 1	
			2,570 16 0
4. INCOME from Building Fund—			
Interest on Heritable Bond for £350, less tax, .		£11 17 7	
Interest on Deposits with Royal Bank, . .		1 2 10	
			13 0 5
5. SUBSCRIPTIONS—			
Annual Subscriptions, ...		£822 13 0	
Life Subscriptions, ...		619 9 0	
			1,442 2 0
6. CHEMICAL DEPARTMENT—Proceeds of Sale of Crops—			
Pumpherston Station, ...		£84 18 0	
Harelaw Station, ...		213 16 1	
			298 14 1
7. RECEIPTS in connection with former Shows, ...			153 10 0
8. TRANSACTIONS—Proceeds of Sales from Messrs Blackwood & Sons,			17 10 0
9. BALANCE of Receipts from Perth Show, ...			1,013 7 0
10. BALANCE due to Royal Bank on Account Current, as at 30th November 1887, ...			1,055 6 1
SUM OF CHARGE, . .			£6,631 16 0

EDINBURGH, 3*rd January* 1888.

AGRICULTURAL SOCIETY of SCOTLAND for the YEAR 1886-87.

DISCHARGE.

1. BALANCE due to Royal Bank of Scotland on account current as at 30th November 1886,			£414 0 7
2. ESTABLISHMENT EXPENSES—			
Salary to Secretary,		£850 0 0	
Salary to Clerk, £300; Second Clerk, £150,		450 0 0	
Wages to Messenger,		72 0 0	
Feu-Duty, £28; Water Duty, £2, 3s. 4d.; Taxes, £35, 10s. 4d.,		65 13 8	
Coals, £10, 11s. 6d.; Gas, £6, 15s. 10d.; Insurance, £8, 14s. 8d.,		26 2 0	
Repairs and Furnishings,		26 11 0	
			1,490 6 8
3. FEE to Auditor of Accounts for year 1885-86,			50 0 0
4. FEE to Practical Engineer,			20 0 0
5. AGRICULTURAL EDUCATION— Grant to Professor of Agriculture, £150; Prizes to Class, £10; Bursaries, £110; Fees to Examiners and Expenses, £46, 17s.,			316 17 0
6. CHEMICAL DEPARTMENT—			
Salary and allowance to Chemist,		£600 0 0	
Experimental Stations—			
Harelaw—Rent for Half-year, £15; Taxes, £1, 11s. 11d.; Superintendent's Allowance, £15, 15s.; Manure, £13, 18s. 11d.; Seed, £8, 10s.; Working Expenses, £85, 11s.,		140 6 10	
Pumpherston—Rent, £13; Superintendent's Allowance, £15, 15s.; Seed, £5, 10s.; Working Expenses, £65, 2s.,		99 7 0	
Grants to Analytical Associations,		96 0 0	
			935 13 10
7. VETERINARY DEPARTMENT—Fee to Professor Williams, £26, 5s.; Medals to Students, £16, 2s.,			42 7 0
8. BOTANICAL DEPARTMENT—Fee to Botanist for year,			25 0 0
9. SPECIAL GRANT—Vote to Dairy Department,			100 0 0
10. VOTE to H. M. Jenkins' Memorial Fund,			50 0 0
11. SOCIETY'S TRANSACTIONS—Printing, £391; Binding and Postages, £182, 2s. 6d.; Comparing Proof Sheets, £12, 10s.; Miscellaneous, £4, 11s. 9d.,			590 4 3
12. ESSAYS AND REPORTS—Farm Produce Report: Tabulating Returns as to Price of Farm Produce, £21; Translating Reports, £24, 19s.; Condensing and transcribing Returns as to Silos and Silage, £10, 10s.; Prizes for Essays and Reports, £131, 10s.,			187 19 0
13. ORDINARY Printing and Lithographing, £79, 13s. 6d.; Advertising, £37, 19s. 3d.; Stationery, Books, &c., £59, 3s. 3d.; Postages, £53; Bank Charges and Telegrams, £12, 13s.,			242 9 0
14. SUBSCRIPTIONS to Public Societies—Scottish Meteorological Society, £20; Society for Prevention of Cruelty to Animals, £5,			25 0 0
15. BUSINESS ACCOUNT to Messrs Tods, Murray, & Jamieson, W.S.,			4 13 0
16. MISCELLANEOUS PAYMENTS—Expenses of Deputation of Directors to Privy Council in connection with Pleuro-Pneumonia Inquiry, £40, 14s. 6d.; Secretary's Travelling Expenses attending Nomination of Directors, £22, 9s. 6d.; Reporting Board and General Meetings, £21; Luncheons to Directors, £12, 5s. 6d.; Repairing and Storing Turnstiles and Storing Sheep Pens, £7, 13s.; Handsels, £1, 10s.; Sundry, £1, 15s.,			107 7 6
17. PREMIUMS—			
Dumfries Show, 1886,	£269 10 0		
Perth Show, 1887,	1,179 8 0		
		£1,448 18 0	
District Competitions,	£324 15 0		
Cottages and Gardens,	33 13 4		
Ploughing Competitions,	38 15 0		
		397 3 4	
			1,846 1 4
18. PAYMENTS in connection with former Shows,			1 2 0
19. LIFE and ANNUAL SUBSCRIPTIONS repaid,			6 5 0
20. ARREARS of Subscriptions struck off as irrecoverable,			34 4 0
21. ARREARS considered recoverable,			49 18 6
22. DEPOSIT with Royal Bank, of date 11th Nov. 1887, in name of Building Fund,			62 7 4
SUM OF DISCHARGE,			£6,631 16 0

W. S. WALKER, *Treasurer.*
JAS. AULDJO JAMIESON, *Chairman of Finance Committee.*
WM. HOME COOK, C.A., *Auditor.*

VIEW OF THE INCOME AND EXPENDITURE

For the Year 1886 87.

INCOME.

1. Annual Subscriptions and Arrears received.		£756 14 0
2. Life Subscriptions received.		619 9 0
		£1,376 3 0
3. Interests and Dividends received—		
Interests,	£1,017 3 11	
Dividends.	1,553 12 1	
		2,570 16 0
4. Income from Building Fund.		13 0 5
5. Chemical Department Sales from Experimental Stations,		298 14 1
6. Receipts in connection with former Shows.		153 10 0
7. Transactions—Proceeds of Sales from Messrs Blackwood.		17 10 0
8. Balance of Receipts from Perth Show.		1,013 7 0
Sum of Income.		£5,443 0 6

EXPENDITURE.

1. Establishment—			
Salaries and Wages,		£1,372 0 0	
Feu-Duties, Taxes, Coals, Gas, Insurance, Repairs and Furnishings,		118 6 8	
		£1,490 6 8	
2. Fee to Auditor for 1885-86,		50 0 0	
3. Fee to Practical Engineer.		20 0 0	
4. Agricultural Education (including Bursaries and Fees to Examiners),		316 17 0	
5. Chemical Department,		935 13 10	
6. Veterinary Department,		42 7 0	
7. Botanical Department,		25 0 0	
8. Special Grants,		150 0 0	
9. Transactions, £590. 1s. 3d. ; Essays and Reports, £187. 19s.,		778 3 3	
10. Ordinary Printing, Advertising, Stationery, Postages, and Bank Charges,		242 9 0	
11. Subscriptions to Public Societies,		25 0 0	
12. Business Account.		4 13 0	
13. Miscellaneous Payments,		107 7 6	
14. Premiums—			
Dumfries Show, 1886,	£269 10 0		
Perth Show, 1887,	1,179 8 0		
District Competitions,	324 15 0		
Cottages and Gardens,	33 13 4		
Ploughing Competitions.	38 15 0		
		1,846 1 4	
15. Payments in connection with former Shows.		1 2 0	
16. Life and Annual Subscriptions repaid,		6 5 0	
Sum of Expenditure.			6,041 5 7
Balance of Expenditure.			£598 5 1

W. S. WALKER, *Treasurer*.
JAS. AULDJO JAMIESON, *Chairman of Finance Committee*.
WM. HOME COOK, C.A., *Auditor*.

EDINBURGH, *3rd January* 1888.

ABSTRACT of the ACCOUNTS of the ARGYLL NAVAL FUND for 1886-87.

CHARGE.

1. FUNDS as at 30th November 1886—		
Debenture Stock of the North British Railway Company, .		£1,200 0 0
Funded Debt of the Clyde Navigation Trustees, £3000, purchased at		2,970 0 0
Stock of the Royal Bank of Scotland, £305, purchased at .		671 0 0
Loan on Heritable Security at 4 per cent.		1,200 0 0
		£6,041 0 0
BALANCE in Bank at 30th November 1886.		
On Deposit Receipt, ...	£50 0 0	
On Current Account, ...	245 0 10	
		295 0 10
2. INCOME received—		£6,336 0 10
On £1200 North British Railway Company Debenture Stock at 4¼ per cent., £51, less tax £1, 11s. 5d.,	£49 8 7	
On £3000 Funded Debt Clyde Navigation Trustees at 4 per cent., £120, less tax £3, 15s., . .	116 5 0	
On £305 Royal Bank Stock, . . .	27 9 0	
On £1,200 lent on Heritable Security, at 4 per cent., £48, less tax £1, 9s. 6d., ...	46 10 6	
	£239 13 1	
On Bank Account, ...	1 6 6	
		240 19 7
SUM OF CHARGE, . .		£6,577 0 5

DISCHARGE.

1. ALLOWANCES to the five following Recipients—			
E. W. Elphinstone Wemyss, eighth year, . .			£40 0 0
Lewis Wentworth Chetwynd, eighth year, . .			40 0 0
G. P. W. Hope, fifth year, ...			40 0 0
Archibald Peers MacEwan, fourth year, ...			40 0 0
Edward A. Baird, third year, . . .			40 0 0
			£200 0 0
2. FUNDS as at 30th November 1887—			
Debenture Stock of the North British Railway Company, ...		£1,200 0 0	
Funded Debt of the Clyde Navigation Trustees, £3000, purchased at . . .		2,970 0 0	
Stock of the Royal Bank of Scotland, £305, purchased at		671 0 0	
Loan on Heritable Security, at 4 per cent., .		1,200 0 0	
		£6,041 0 0	
Balance in Bank at 30th November 1887—			
On Deposit Receipt, . . .	£50 0 0		
.. Current Account, . . .	286 0 5		
		336 0 5	
			6,377 0 5
SUM OF DISCHARGE, . .			£6,577 0 5

W. S. WALKER, *Treasurer.*
JAS. AULDJO JAMIESON, *Chairman of Finance Committee.*
WM. HOME COOK, C.A., *Auditor.*

EDINBURGH, *3rd January* 1888.

ABSTRACT of ACCOUNTS of the PERTH SHOW, 1887.

CHARGE.

1. LOCAL SUBSCRIPTIONS—		
Voluntary Assessment on Proprietors—		
Eastern Division of Perthshire,		£447 6 0
Western Division of Forfarshire,		200 0 0
Fifeshire (not yet received),		0 0 0
Kinross-shire,		37 0 0
		£684 6 0
2. AMOUNT COLLECTED DURING SHOW—		
Drawn at Gates,	£1,525 17 6	
Drawn at Grand Stand,	114 1 0	
Season Tickets sold,	10 0 0	
Catalogues and Awards sold,	121 5 6	
Working Dairy—Admission, £7, 8s.; Sales, £59, 19s. 5d.,	67 7 5	
Drawn at Lavatory,	2 19 6	
		1,841 10 11
3. RENT OF STALLS,		1,189 13 6
4. RENT OF REFRESHMENT BOOTHS,		175 0 0
5. INTEREST FROM TWEEDDALE MEDAL FUND,		19 7 8
6. AMOUNT SUBSCRIBED FOR JUBILEE PRIZES,		191 10 0
7. INTEREST FROM ROYAL BANK,		3 15 4
		£4,105 6 5
Balance of Payments,		166 1 0
		£4,271 7 5

Note.—From the Amount of Subscriptions to be received from Fifeshire, estimated at		£260 0 0
Deduct the above Balance of	£166 1 0	
And the Premiums undrawn at 30th November, amounting to	98 0 0	
		264 1 0
MAKING THE PROBABLE LOSS,		£4 1 0

EDINBURGH, *3rd January* 1888.

ABSTRACT of ACCOUNTS of the PERTH SHOW, 1887.

DISCHARGE.

1.	SHOWYARD EXPENDITURE—						
	Fitting up Showyard,				£1,780	0	0
	Clerk of Works,				16	0	0
	Fire Brigade,				5	10	0
	Carriage of Turnstiles and Cartages,				8	7	3
	Telephone,				2	0	0
	Miscellaneous,				6	3	0
					£1,818	0	3
2.	FORAGE AND BEDDING FOR STOCK,				187	2	8
3.	POLICE,				48	7	6
4.	TRAVELLING EXPENSES of Judges, Stewards, &c.,				94	1	2
5.	ALLOWANCE to Judges in lieu of Hotel Accommodation,				88	0	0
6.	HOTEL and other Bills for Directors, and Luncheons for Judges and attending Members, &c.,				249	14	4
7.	BANQUET,				14	12	6
8.	MUSIC,				40	13	0
9.	PRINTING Catalogues and Awards, and Lithographing,				154	13	3
10.	ADVERTISING and Bill-Posting,				37	14	9
11.	VETERINARY INSPECTION,				10	0	0
12.	LOCAL SECRETARY,				20	0	0
13.	PRACTICAL ENGINEER—Fee and Travelling Expenses,				35	5	6
14.	WORKING DAIRY—						
	Milk and Cream,	£34	0	0			
	Strawberries,	15	1	6			
	Engine and Shafting and Engineers,	24	15	8			
	Hire of Utensils,	32	11	4			
	Cheese Maker,	8	8	0			
	Attendants,	21	7	0			
	Railway Carriages,	8	1	5			
	Miscellaneous,	3	10	6			
					147	15	5
15.	CLERKS, Assistants, and Attendants at Turnstiles, Gates, &c.,				109	2	6
16.	POSTAGES,				35	1	6
17.	MISCELLANEOUS Outlays,				1	15	1
	AMOUNT OF GENERAL EXPENSES,				£3,091	19	5
18.	PREMIUMS drawn at 30th November 1887,				1,179	8	0
					£4,271	7	5

W. S. WALKER, *Treasurer.*
JAS. AULDJO JAMIESON, *Chairman of Finance Committee.*
WM. HOME COOK, *Auditor.*

APPENDIX (B).

PREMIUMS

OFFERED BY

THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND IN 1888.

CONTENTS.

CONSTITUTION AND MANAGEMENT.

The general business of THE HIGHLAND AND AGRICULTURAL SOCIETY is conducted under the sanction and control of a Royal Charter, which authorises the enactment of Bye-Laws. Business connected with Agricultural Education is conducted under the authority of a supplementary Royal Charter, also authorising the enactment of Bye-Laws.

The Office-Bearers consist of a President, Four Vice-Presidents, Thirty-two Ordinary and Twenty Extraordinary Directors, a Treasurer, an Honorary and an Acting Secretary, an Auditor, and other Officers.

The Directors meet on the first Wednesday of each month from November to June; seven being a quorum. The proceedings of the Directors are reported to General Meetings of the Society, held in January and in June or July.

With reference to motions at General Meetings, Bye-Law No. 10 provides—"That at General Meetings of the Society no motion or proposal (except of mere form or courtesy) shall be submitted or entertained for immediate decision unless notice thereof has been given a week previously to the Board of Directors, without prejudice, however, to the competency of making such motion or proposal to the effect of its being remitted to the Directors for consideration, and thereafter being disposed of at a future General Meeting."

The Council on Education, under the Supplementary Charter, consists of Sixteen Members—Nine nominated by the Charter, and Seven elected by the Society. The Board of Examiners consists of Ten Members.

Candidates for admission to the Society must be proposed by a Member, and are elected at the half-yearly General Meetings in January and June or July, but it is not necessary that the proposer should attend the meeting. The ordinary subscription is £1, 3s. 6d. annually, which may be redeemed by one payment, varying, according to the number of previous annual payments, from £7, 1s. to £12, 12s. Proprietors farming the whole of their own lands, whose rental on the Valuation Roll does not exceed £500 per annum, and all Tenant-Farmers, Secretaries or Treasurers of Local Agricultural Associations, Factors resident on Estates, Land Stewards, Foresters, Agricultural Implement Makers, and Veterinary Surgeons, none of them being also owners of land to an extent exceeding £500 per annum, are admitted on a subscription of 10s. annually, which may be redeemed by one payment, varying, according to the number of previous annual payments, from £3 to £5, 5s. Subscriptions payable on election, and afterwards annually in January. According to the Charter, a Member who homologates his election by paying his first subscription cannot retire until he has paid in annual subscriptions, or otherwise, an amount equivalent to a life composition. Members having candidates to propose are requested to state whether the candidate should be on the £1, 3s. 6d. or 10s. list.

Members of the Society receive the *Transactions* free on application to the Secretary, and are entitled to apply for District Premiums—to report Ploughing Matches for the Medal—to free admission to the Showyard, and to exhibit Stock at reduced rates. Firms are not admitted as Members, but if one partner of a firm becomes a Member, the firm is allowed to exhibit at Members' rates.

Orders, payable at the Royal Bank of Scotland, Edinburgh, are issued by the Directors, in name of the persons in whose favour Premiums have been awarded.

All communications must be addressed to "FLETCHER NORTON MENZIES, Esq., Secretary of the Highland and Agricultural Society of Scotland, No. 3 George IV. Bridge, Edinburgh."

ESTABLISHMENT FOR 1888.

President.

HIS GRACE THE DUKE OF PORTLAND, Wellbeck Abbey, Notts.

Vice-Presidents.

The MARQUIS OF BUTE, K.T., Mount Stuart, Rothesay.
Sir M. R. SHAW STEWART of Greenock and Blackhall, Bart., Ardgowan, Greenock.
JAMES MURRAY, Catter House, Drymen.
F. E. VILLIERS, Closeburn Hall, Thornhill.

Ordinary Directors.

ALEXANDER MURDOCH, Gartcraig, Shettleston.
WALTER ELLIOT, Hollybush, Galashiels.
Sir JAMES R. GIBSON MAITLAND of Barnton, Bart., Craigend, Stirling.
ALLAN R. MACKENZIE, yr. of Kintail, Clunes, Kirkhill, Inverness.
JOHN KERR, Broomhouse, Corstorphine.
W. H. LUMSDEN of Balmedie, Aberdeen.
WILLIAM J. MAXWELL, yr. of Munches, Terraughtie, Dumfries.
JOHN BALLINGALL, Dunbog, Newburgh, Fife.
Hon. ROBT. BAILLIE HAMILTON of Langton, Duns.
DONALD FISHER, Jellyholm, Alloa.
JOHN CRAN, Kirkton, Bunchrew, Inverness.
Sir DAVID BAIRD of Newbyth, Bart., Prestonkirk.
JOHN MILNE, Inverurie.
JAMES HEWETSON, Auchenbainzie, Thornhill.
Sir ROBERT MENZIES of Menzies, Bart., Farleyer, Aberfeldy.
JOHN BAIRD of Knoydart, Inverie House, Isle Ornsay, Skye.
DAVID BUTTAR, Corston, Coupar-Angus.
JAMES PARK, Dechmont, Cambuslang.
Lord ARTHUR CECIL, Orchard Mains, Innerleithen.
PATRICK STIRLING of Kippendavie, Dunblane.
CAMPBELL MACPHERSON GRANT of Drumduan, Forres.
GEORGE R. GLENDINNING, Hatton Mains, Wilkieston.
Sir JOHN INNES of Balveny and Edengight, Bart., Keith.
ROBT. F. DUDGEON, yr. of Cargen, Kirkcudbright.
JOHN LORNE STEWART of Coll, Oban.
ROBERT HENRY ELLIOT of Clifton Park, Kelso.
DAVID BUCHANAN, Garscadden Mains, New Kilpatrick.
ANDREW MACKENZIE, Dalmore, Alness.
Sir JAMES H. GIBSON CRAIG of Riccarton, Bart., Currie.
JOHN MARR, Cairnbrogie, Old Meldrum.
Rev. JOHN GILLESPIE, Mouswald Manse, Ruthwell R.S.O.
ALEXANDER MACDUFF of Bonhard, Perth.

Extraordinary Directors.

Sir JAMES KING, Lord Provost of Glasgow.
Lt.-Col. Sir ARCHD. C. CAMPBELL of Blythswood, Bart., M.P., Renfrew.
Capt. BOYLE of Shewalton, R.N., The Pavilion, Ardrossan.

Colonel W. W. Hozier of Mauldslie, Carluke.
Colonel John W. Malcolm, yr. of Poltalloch, M.P., Lochgilphead.
J. H. Turner, The Dean, Kilmarnock.
David M'Gibbon, Ardnacraig, Campbeltown.
Bailie James M'Lennan, 40 St Andrew Street, Glasgow.
John Speir, Newton Farm, Newton, Glasgow.
J. Windsor Stuart, Bute Estate Office, Rothesay.
George J. Walker, Portlethen, Aberdeen.
Chas. Howatson, House of Glenbuck, Glenbuck.
Andrew Allan, Munnoch, Dalry, Ayrshire.
Colin J. Mackenzie of Portmore, Eshiels, Peebles.
Alexr. Dudgeon, Easter Dalmeny, Edinburgh.
James M'Queen of Crofts, Dalbeattie.
John T. S. Paterson, Plean Farm, Bannockburn.
John M. Martin of Auchendennan, Alexandria, N.B.
Jonathan Middleton, Clay of Allan, Fearn, Ross-shire.
James T. S. Elliot of Wolfelee, Hawick.

Office-Bearers.

Sir William Stuart Walker of Bowland, K.C.B., *Treasurer.*
Sir G. Graham Montgomery of Stanhope, Bart., *Honorary Secretary.*
Fletcher Norton Menzies, *Secretary.*
Rev. James Grant, D.C.L., D.D., *Chaplain.*
Andrew P. Aitken, D.Sc., *Chemist.*
William Home Cook, C.A., *Auditor.*
Tods, Murray, & Jamieson, W.S., *Law Agents.*
A. N. M'Alpine, *Consulting Botanist.*
James D. Park, *Practical Engineer.*
Thomas Duncan, *Recorder and Clerk.*
John Macdiarmid, *Second Clerk.*
Gourlay Steell, R.S.A., *Animal Portrait Painter.*
William Williams, F.R.C.V.S., *Professor of Veterinary Surgery.*
Thomas Walley, M.R.C.V.S., *Professor of Cattle Pathology.*
William Blackwood & Sons, *Publishers.*
Neill & Company, *Printers.*
G. Waterston & Sons, *Stationers.*
James Crichton & Co., *Silversmiths and Medallists.*
John Watherston & Sons, *Inspectors of Works.*
William Simpson, *Messenger.*

Chairmen of Committees.

1.	*Argyll Naval Fund,* .	Admiral Maitland Dougall of Scotscraig, Tayport.
2.	*Botanical Department,*	Dr Cleghorn of Stravithy, St Andrews.
3.	*Chemical Department,* .	Colin J. Mackenzie of Portmore, Eshiels, Peebles.
4.	*Cottages and Gardens,* .	Lieut.-Col. Hare of Calder Hall.
5.	*Dairy Department,* .	James M'Queen of Crofts, Dalbeattie.
6.	*District Shows,* . .	F. E. Villiers, Closeburn Hall, Thornhill.
7.	*Finance,* . . .	James Auldjo Jamieson, W.S.
8.	*Forestry,* . . .	Sir Robert Menzies of Menzies, Bart.
9.	*General Shows,* . .	Patrick Stirling of Kippendavie.
10.	*Hall and Chambers,* .	Colin J. Mackenzie of Portmore.
11.	*Highland Industries,&c.*	Sir James H. Gibson-Craig of Riccarton, Bart.
12.	*Law,*	Thomas Graham Murray, W.S.
13.	*Machinery,* . . .	John Scott Dudgeon, Longnewton, St Boswells.
14.	*Ordnance Survey,* .	Robert Dundas of Arniston, Gorebridge.
15.	*Publications, &c.,* .	Alexander Forbes Irvine of Drum.
16.	*Veterinary Department,*	James Hope, East Barns, Dunbar.

General Meetings.—By the Charter the Society must hold two General Meetings each year, and, under ordinary circumstances, they are held on the third Wednesday of the months of January and June, at one o'clock, in the Society's Hall, 3 George IV. Bridge, for the election of Members and other business.

Meeting at Glasgow.—By a resolution of the General Meeting on 15th January 1879, a General Meeting of Members is held in the Showyard on the occasion of the Annual Show. This year it will be held at Glasgow, on Wednesday 25th July, at 2.30 P.M.

General Show at Glasgow—24th, 25th, 26th, and 27th July.—Entries close for Implements, 11th May—Stock, Poultry, and Dairy Produce, 8th June.

Directors' Meetings.—The Board of Directors meet on the first Wednesday of each month from November till June inclusive, at *one* p.m., and occasionally as business may require, on a requisition by three Directors to the Secretary, or on intimation by him.

Nomination of Directors.—Meetings of Members, for the purpose of nominating Directors to represent the Show Districts on the Board, will be held at the places and on the days after mentioned :—

1. Glasgow, George Hotel, ...	Wednesday, 1st Aug., at 1.
2. Perth, Salutation Hotel, . . .	Friday, 3rd August, at 1.
3. Stirling, Golden Lion Hotel, . . .	Friday, 10th August, at 1.
4. Edinburgh, 3 George IV. Bridge, . .	Wednesday, 15th Aug., at 2.
5. Aberdeen, Imperial Hotel, . . .	Friday, 17th August, at 1.
6. Dumfries, King's Arms Hotel, . .	Wednesday, 22nd Aug., at 1.
7. Inverness, Caledonian Hotel, . . .	Friday, 24th Aug., at 12.30.
8. Kelso, Secretary's Tent, Ram Sale Ground,	Friday, 14th Sept., at 1.

The nomination of Proprietors or other Members paying the higher subscription must be made in the 3rd, 5th, 6th, and 7th Districts; and the nomination of Tenant Farmers or other Members paying the lower subscription, in the 1st, 2nd, 4th, and 8th Districts.

Committee Meetings.

Highland Industries.—First Tuesday in November, at 12 noon.

Machinery.—First Tuesday in November, at 1 P.M.

General Shows.—First Tuesday in November, at 2 P.M., and third Tuesday in June, at 2 P.M.

Publications.—First Wednesday in November, at 12 noon, and second Wednesday in January, 12 noon.

Cottages and Gardens.—First Tuesday in December, at 12 noon.

District Shows.—First Tuesday in December, at 12.30 P.M.

Chemical.—First Tuesday in December, at 2 P.M., and first Tuesday in March, at 2 P.M.

The other Standing Committees—ARGYLL NAVAL FUND, BOTANICAL, DAIRY, FINANCE, FORESTRY, HALL AND CHAMBERS, LAW, ORDNANCE SURVEY, and VETERINARY, meet when required.

Examinations for the Society's Diploma and Certificates in Agriculture and Certificates in Forestry are held annually in the end of March or beginning of April.

Examinations for the Society's Bursaries are held annually in October.

COMMITTEES FOR 1888.

1. ARGYLL NAVAL FUND.

Admiral Maitland Dougall of Scotscraig, R.N., Tayport, *Convener.*
Lord Elphinstone, Carberry Tower, Musselburgh.
Admiral Sir William Edmonstone of Duntreath, Bart.
The Hon. Robert Baillie Hamilton of Langton, Duns.
Sir David Baird of Newbyth, Bart., Prestonkirk.

2. BOTANICAL DEPARTMENT.

Dr Cleghorn of Stravithy, St Andrews, *Convener.*
John Scott Dudgeon, Longnewton.
James M'Queen of Crofts, Dalbeattie.
Dr A. P. Aitken, 8 Clyde Street, Edinburgh.
Professor Wallace, University, Edinburgh.
John Cran, Kirkton, Bunchrew, Inverness.
David Buttar, Corston, Coupar-Angus.
R. H. Elliot of Clifton Park, Kelso.
A. N. M'Alpine, Minto House, Chambers Street, Edinburgh, *Botanist.*

3. CHEMICAL DEPARTMENT.

C. J. Mackenzie of Portmore, Eshiels, Peebles, *Convener.*
P. B. Swinton, Holyn Bank, Gifford.
John Scott Dudgeon, Longnewton, St Boswells.
George R. Glendinning, Hatton Mains, Wilkieston.
Lieut.-Col. Hare of Calder Hall, Philpston House, Winchburgh.
Robert Shirra Gibb, Boon, Lauder.
Thomas Gibson, Haymount, Kelso.
James M'Queen of Crofts, Dalbeattie.
John Marr, Cairnbrogie, Old Meldrum.
Jonathan Middleton, Clay of Allan, Fearn.
David Wilson, yr. of Carbeth, Killearn.
R. F. Dudgeon, yr. of Cargen, Kirkcudbright.
Andrew Mackenzie, Dalmore, Alness.
David Buttar, Corston, Coupar-Angus.
John Speir, Newton Farm, Newton, Glasgow.
Dr Andrew P. Aitken, 8 Clyde Street, Edinburgh, *Chemist.*

4. COTTAGES AND GARDENS.

Col. Hare of Calder Hall, Philpston House, Winchburgh, *Convener.*
C. J. Mackenzie of Portmore, Eshiels, Peebles.
John Kerr, Broomhouse, Corstorphine.
Walter Elliot, Hollybush, Galashiels.
James T. S. Elliot of Wolfelee, Hawick.
Hon. R. Baillie Hamilton of Langton, Duns.

5. DAIRY DEPARTMENT.

James M'Queen of Crofts, Dalbeattie, *Convener.*
Sir James T. S. Richardson of Pitfour, Bart., Perth.
Rev. John Gillespie, Mouswald Manse, Ruthwell R.S.O.
Andrew Allan, Munnoch, Dalry, Ayrshire.
M. J. Stewart of Southwick, M.P., Ardwell.
James Murray, Catter House, Drymen.
J. M. Aitken, Norwood, Lockerbie.
James Drew of Craigencallie, Doonhill, Newton-Stewart.
Dr Aitken, 8 Clyde Street, Edinburgh.
R. F. Dudgeon, yr. of Cargen, Kirkcudbright.
John Milne, Inverurie.
Wm. H. Ralston, Culmore, Stranraer.
Joseph H. Turner, The Dean, Kilmarnock.
Alex. Cross, jun., Eastbank, Langbank, Renfrewshire.
Robert Wallace, Auchenbrain, Mauchline.
John Speir, Newton Farm, Newton, Glasgow.

6. DISTRICT SHOWS.

F. E. Villiers, Closeburn Hall, Thornhill, *Convener.*
Lord Arthur Cecil, Orchard Mains, Innerleithen.
Sir James H. Gibson-Craig of Riccarton, Bart., Currie.
Lieut.-Col. Hare of Calder Hall, Philpston House, Winchburgh.
J. T. S. Paterson, Plean Farm, Bannockburn.
James M'Queen of Crofts, Dalbeattie.
Walter Elliot, Hollybush, Galashiels.
W. H. Lumsden of Balmedie, Aberdeen.
James Park, Dechmont, Cambuslang.
W. J. Maxwell, yr. of Munches, Terraughtie, Dumfries.
Niven Matthews, Newton-Stewart.
John Cran, Kirkton, Bunchrew, Inverness.
Charles Howatson, House of Glenbuck, Glenbuck.
Rev. John Gillespie, Mouswald Manse, Ruthwell R.S.O.
Alexander Murdoch, Gartcraig, Shettleston.
John Marr, Cairnbrogie, Old Meldrum.
C. Macpherson Grant of Drumduan, Forres.
David Buttar of Corston, Coupar-Angus.
Alexander Macduff of Bonhard, Perth.
Patrick Stirling of Kippendavie, Dunblane.
Andrew Mackenzie, Dalmore, Alness.

7. FINANCE.

James Auldjo Jamieson, W.S., 66 Queen Street, Edinburgh, *Convener.*
Sir William S. Walker of Bowland, K.C.B., *Treasurer.*
Sir G. Graham Montgomery of Stanhope, Bart., *Honorary Secretary.*
Sir James H. Gibson-Craig of Riccarton, Bart.
Patrick Blair, W.S., 27 St Andrew Square.
W. J. Maxwell, yr. of Munches, Terraughtie, Dumfries.
Rev. John Gillespie, Mouswald Manse, Ruthwell R.S.O.
Patrick Stirling of Kippendavie, Dunblane.
Alexander Macduff of Bonhard, Perth.
F. E. Villiers, Closeburn Hall, Thornhill.
Hon. R. Baillie Hamilton of Langton, Duns.
William Home Cook, C.A., 1 Albyn Place, *Auditor.*

8. FORESTRY.

Sir Robert Menzies of Menzies, Bart., Farleyer, Aberfeldy, *Convener.*
Sir Herbert E. Maxwell of Monreith, Bart., M.P., Whauphill.
Dr Cleghorn of Stravithy, St Andrews.
W. J. Maxwell, yr. of Munches, Terraughtie, Dumfries.
Dr Aitken, 8 Clyde Street, Edinburgh.
John Macgregor, Ladywell, Dunkeld.
John M. Aitken, Norwood, Lockerbie.
John Methven, 15 Princes Street, Edinburgh.
Robert Lindsay, Royal Botanic Gardens, Edinburgh.

9. GENERAL SHOWS.

Patrick Stirling of Kippendavie, Dunblane, *Convener.*
Lord Arthur Cecil, Orchard Mains, Innerleithen, *Vice-Convener.*
Colonel Gillon of Wallhouse, Bathgate.
Sir Robert Menzies of Menzies, Bart., Farleyer, Aberfeldy.
Sir James H. Gibson-Craig of Riccarton, Bart.
William Ford, Fentonbarns, Drem.
Rev. John Gillespie, Mouswald Manse, Ruthwell R.S.O.
James Hope, East Barns, Dunbar.
C. J. Mackenzie of Portmore, Eshiels, Peebles.
James Cunningham, Tarbreoch, Dalbeattie.
Andrew Allan, Munnoch, Dalry, Ayrshire.
Fred. E. Villiers, Closeburn Hall, Thornhill.

James M'Queen of Crofts, Dalbeattie.
Adam Smith, Camelon House, Falkirk.
Thomas Elliot, Blackhaugh, Galashiels.
Jonathan Middleton, Clay of Allan, Fearn.
J. M. Martin of Auchendennan, Alexandria, N.B.
William J. Maxwell, yr. of Munches, Terraughtie, Dumfries.
John Marr, Cairnbrogie, Old Meldrum.
W. H. Lumsden of Balmedie, Aberdeen.
Allan R. Mackenzie, yr. of Kintail, Clunes, Kirkhill, Inverness.
John Kerr, Broomhouse, Corstorphine.
John Cran, Kirkton, Bunchrew, Inverness.
Alexander Murdoch, Garteraig, Shettleston.
Charles Howatson, House of Glenbuck, Glenbuck.
James T. S. Elliot of Wolfelee, Hawick.
James Park, Dechmont, Cambuslang.
David Buttar, Corston, Coupar-Angus.
Thomas Ferguson, Kinnochtry, Coupar-Angus.
J. H. Turner, The Dean, Kilmarnock.
Campbell Macpherson Grant of Drumduan, Forres.
Andrew Mackenzie, Dalmore, Alness.
Robert Frederick, Drumflower, Dunragit.
John Gilmour of Lundin, Kilmaron Castle, Cupar Fife.
James D. Park, Engineer, Greenside Lane, Edinburgh.
Stewards of General Shows, *ex officio*.

10. HALL AND CHAMBERS.

Colin J. Mackenzie of Portmore, Eshiels, Peebles, *Convener*.
Sir William S. Walker of Bowland, K.C.B.
John Kerr, Broomhouse, Corstorphine.
John T. S. Paterson, Plean Farm, Bannockburn.

11. HIGHLAND INDUSTRIES AND FISHERIES.

Sir James H. Gibson-Craig of Riccarton, Bart., *Convener*.
Sir James Ramsay Gibson-Maitland of Barnton, Bart.
Sir Kenneth S. Mackenzie of Gairloch, Bart.
Lieut.-General Burroughs of Rousay, C.B., Orkney.
Alexander Forbes Irvine of Drum.
Archibald Young, 22 Royal Circus, Edinburgh.
Alexander Henderson of Stemster, 2 Glencairn Crescent, Edinburgh.
William Anderson Smith, Ledaig, Argyllshire.
Duncan Forbes of Culloden, Inverness.
John Cran, Kirkton, Bunchrew, Inverness.

12. LAW.

Thomas Graham Murray, W.S., 11 Randolph Crescent, *Convener*.
Sir William S. Walker of Bowland, K.C.B.
Hew Crichton, S.S.C., 13 Nelson Street, Edinburgh.
James Auldjo Jamieson, W.S., 66 Queen Street, Edinburgh.
Patrick Blair, W.S., 27 St Andrew Square, Edinburgh.
W. J. Maxwell, yr. of Munches, Terraughtie, Dumfries.

13. MACHINERY.

John Scott Dudgeon, Longnewton, St Boswells, *Convener*.
John Munro of Kinloss, Cupar Fife.
P. B. Swinton, Holyn Bank, Gifford.
C. J. Mackenzie of Portmore, Eshiels, Peebles.
John Kemp, Stirling.
John Marshall, Maybole.
John Young, jun., Ayr.
Alexander Dudgeon, Easter Dalmeny, Edinburgh.
J. T. S. Paterson, Plean Farm, Bannockburn.
James T. S. Elliot of Wolfelee, Hawick.

Walter Elliot, Hollybush, Galashiels.
John Kerr, Broomhouse, Corstorphine.
John Milne, Inverurie.
Donald Fisher, Jellyholm, Alloa.
Jonathan Middleton, Clay of Allan, Fearn.
Alexander Macduff of Bonard, Perth.
David Buchanan, Garscadden Mains, New Kilpatrick.
James D. Park, Greenside Lane, Edinburgh, *Practical Engineer*.

14. ORDNANCE SURVEY.

Robert Dundas of Arniston, *Convener*.
C. J. Mackenzie of Portmore, Eshiels, Peebles.
Sir William S. Walker of Bowland, K.C.B.
William J. Maxwell, yr. of Munches, Terraughtie, Dumfries.

15. PUBLICATIONS AND PREMIUMS FOR REPORTS.

Alexander Forbes Irvine of Drum, *Convener*.
Sir William S. Walker of Bowland, K.C.B.
Robert Scot Skirving, 29 Drummond Place, Edinburgh.
P. B. Swinton, Holyn Bank, Gifford.
Dr Cleghorn of Stravithy, St Andrews.
C. J. Mackenzie of Portmore, Eshiels, Peebles.
Rev. John Gillespie, Mouswald Manse, Ruthwell, R.S.O.
F. E. Villiers, Closeburn Hall, Thornhill.
John Scott Dudgeon, Longnewton, St Boswells.
James T. S. Elliot of Wolfelee, Hawick.
William J. Maxwell, yr. of Munches, Terraughtie, Dumfries.
Dr Aitken, 8 Clyde Street, Edinburgh.
James M'Queen of Crofts, Dalbeattie.
James Macdonald, Editor, *Farming World*, Edinburgh.

16. VETERINARY DEPARTMENT.

James Hope, East Barns, Dunbar, *Convener*.
Lord Arthur Cecil, Orchard Mains, Innerleithen.
Sir Robert Menzies of Menzies, Bart.
Sir James H. Gibson-Craig of Riccarton, Bart.
Colonel Gillon of Wallhouse, Bathgate.
Sir William S. Walker of Bowland, K.C.B.
Lieut.-Colonel Hare of Calder Hall, Philpston House, Winchburgh.
Jonathan Middleton, Clay of Allan, Fearn, Ross-shire.
James Murray, Catter House, Drymen.
Allan R. Mackenzie, yr. of Kintail, Clunes, Kirkhill, Inverness.
Patrick Stirling of Kippendavie, Dunblane.
William J. Maxwell, yr. of Munches, Terraughtie, Dumfries.
Rev. John Gillespie, Mouswald Manse, Ruthwell R.S.O.
W. H. Lumsden of Balmedie, Aberdeen.
Hon. R. Baillie Hamilton of Langton, Duns.
John Marr, Cairnbrogie, Old Meldrum.
John Gilmour of Lundin, Kilmaron Castle, Cupar Fife.
Professor Williams, Professor of Veterinary Surgery to the Society.

REPORTS OF GENERAL MEETINGS.

Rev. John Gillespie, Mouswald Manse, Ruthwell R.S.O.
Alexander F. Irvine of Drum, 25 Castle Terrace, Edinburgh.
Colin J. Mackenzie of Portmore, Eshiels, Peebles.
The Secretary.

The President, Vice-Presidents, and Honorary Secretary are members *ex officio* of all Committees.

HIGHLAND AND AGRICULTURAL SOCIETY.

AGRICULTURAL EDUCATION.

CERTIFICATES AND DIPLOMA IN AGRICULTURE.

COUNCIL ON EDUCATION.

By a Supplementary Charter under the Great Seal, granted in 1856, the Society is empowered to grant Diplomas.

Members of Council named by Charter.

The PRESIDENT of the HIGHLAND AND AGRICULTURAL SOCIETY—*President.*
The LORD JUSTICE-GENERAL—*Vice-President.*

The LORD ADVOCATE.
The DEAN OF FACULTY.
The PROFESSOR OF AGRICULTURE.
The PROFESSOR OF ANATOMY.
The PROFESSOR OF BOTANY.
The PROFESSOR OF CHEMISTRY.
The PROFESSOR OF NATURAL HISTORY.

Members of Council nominated by Society.

The MARQUIS OF LOTHIAN, K.T.
Sir WILLIAM S. WALKER of Bowland, K.C.B.
ROBERT DUNDAS of Arniston.
JOHN MUNRO of Kinloss.
JAS. HOPE, East Barns, Dunbar.
A. CAMPBELL SWINTON of Kimmerghame.
Rev. JOHN GILLESPIE, Mouswald, Ruthwell R.S.O.

Board of Examiners.

1. *Science and Practice of Agriculture.*—Professor WALLACE, University, Edinburgh; JOHN MUNRO of Kinloss; JAMES HOPE, East Barns, Dunbar; and JAS. BIGGAR, yr. of Chapelton, Dalbeattie.
2. *Botany.*—Dr CLEGHORN of Stravithy, St Andrews, and A. N. M'ALPINE, Edinburgh.
3. *Chemistry.*—Dr A. P. AITKEN, Edinburgh, and Dr WILLIAM CRAIG, Edinburgh.
4. *Natural History.*—Professor COSSAR EWART, Edinburgh, and Dr RAMSAY H. TRAQUAIR, Edinburgh.
5. *Veterinary Science.*—Professor WILLIAMS, Edinburgh, and FINLAY DUN, F.R.C.V.S., Edinburgh.
6. *Field Engineering.*—DAVID ALAN STEVENSON, C.E., Edinburgh, and A. W. BELFRAGE, C.E., Edinburgh.
7. *Book-keeping.*—WILLIAM HOME COOK, C.A., Edinburgh, and JOHN BRODIE, C.A., Edinburgh.

Standing Acting Committee.

The LORD JUSTICE-GENERAL—*Convener.*

The PROFESSOR OF AGRICULTURE.
The PROFESSOR OF BOTANY.
The PROFESSOR OF CHEMISTRY.
JOHN MUNRO of Kinloss.
A. CAMPBELL SWINTON of Kimmerghame.
Rev. JOHN GILLESPIE, Mouswald.

BYE-LAWS.

I. That, in terms of the Charter, the Society shall nominate seven members to act on the Council on Education.

II. That the Council shall appoint a Board of Examiners on the following subjects:—Science and Practice of Agriculture; Botany; Chemistry; Natural History; Veterinary Science; Field Engineering; and Book-keeping.

III. That the examinations shall be both written and oral, that the value of the answers shall be determined by numbers, and that the oral examinations shall be public.

IV. That there shall be three examinations,* to be styled respectively the "Second Class Certificate Examination," the "First Class Certificate Examination," and the "Diploma Examination."

V. That to pass the "Second Class Certificate Examination," a Candidate must be acquainted with the science and practice of agriculture, elementary chemistry, field engineering, and book-keeping; and that a certificate in the following terms, bearing the corporate seal and arms of the Society, signed by the President or Vice-President of the Council on Education, the Examiners, and by the Secretary, shall be granted to a candidate passing this examination:—

"These are to certify that on the , A. B. was examined, and has been found to possess a knowledge of the science and practice of agriculture, elementary chemistry, field engineering, and book-keeping."

VI. That to pass the "First Class Certificate Examination," a candidate must be acquainted with the science and practice of agriculture, botany, chemistry, natural history, veterinary science, field engineering, and book-keeping; and that a certificate in the following terms, bearing the corporate seal and arms of the Society, signed by the President or Vice-President of the Council on Education, the Examiners, and by the Secretary, shall be granted to candidates passing this examination:—

"These are to certify that on the , A. B. was examined, and has been found to possess a knowledge of the science and practice of agriculture, botany, chemistry, natural history, veterinary science, field engineering, and book-keeping."

VII. That to pass the "Diploma Examination," a candidate must possess a *thorough knowledge* of the science and practice of agriculture, botany, chemistry, natural history, veterinary science, field engineering, and book-keeping; and that a diploma in the following terms, bearing the corporate seal and arms of the Society, and signed by the President and Vice-President of the Council on Education, the Examiners, and by the Secretary, shall be granted to candidates passing this examination:—

"These are to certify that on the , A. B. was examined, and has been found to be proficient in the science and practice of agriculture, botany, chemistry, natural history, veterinary science, field engineering, and book-keeping."

VIII. That each successful candidate for the Society's Agricultural Diploma shall thereby become eligible to be elected a free life member of the Society.

IX. That the Society shall grant annually fifteen bursaries, viz.:—Five of £10 each, and ten of £20 each,† to be competed for by candidates intending to pursue agriculture or estate management, and who pass examinations in chemistry, physical geography, botany, and geology.

X. That the £10 bursaries shall be tenable for one year, to enable the holders to obtain further preparatory study at schools; and the £20 bursaries‡ to be tenable for the same period, for the purpose of enabling the holders to

* It has been resolved that, under ordinary circumstances, the examination shall be held annually in the end of March or beginning of April, candidates being required to lodge intimation before the 10th of March.

† Applicants for all the Bursaries must be qualified by birth or residence in Scotland, and the Council are entitled to consider each case on its own merits—their decision to be final. Candidates for Bursaries must sign a Declaration to the effect that it is their intention to pursue Agriculture as an avocation.

‡ The £20 Bursaries are not due till the holder presents himself for examination for the certificate or diploma.

take the classes at the University of Edinburgh necessary to qualify for the Society's certificates or diploma.

XI. That the examinations shall be conducted by examiners appointed by the Council. That there shall be one examination for the fifteen bursaries, and the value of the answers determined by numbers. The ten candidates gaining the highest numbers to receive the £20 bursaries, provided they are up to the required standard for these bursaries; and the five next in order the £10 bursaries, if also up to the required standard for the second class bursaries.

XII. That a Standing Acting Committee of the Council on Agricultural Education shall be appointed by the Directors.

Note.—The list of Diploma Free Life Members was published in vol. xix. of the Society's *Transactions*.

The following have since obtained

DIPLOMAS.

1887. NOGENDRO NATH BANERJEE, Calcutta.
1887. GEORGE CARRINGTON, M.R.A.C., Missenden Abbey, Gt. Missenden, Bucks.
1887. HARRY REID MAITLAND, Muiryfold, Grange, Banffshire.
1887. DANIEL STEELE, Merkland, New Cumnock.
1887. EDWARD SMITH DAVIES, Claverley, Bridgenorth, Shropshire.
1887. ANDREW T. L. DUNLOP, Morriston. Maybole.
1887. ROBERT HAIG, Dollarfield, Dollar.
1887. WILLIAM SOMERVILLE, 46 Findhorn Place, Edinburgh.

The following have obtained

FIRST CLASS CERTIFICATES.

1867. J. C. BOWSTEAD, M.R.A.C., Halkthorpe Hall, Penrith.
1868. JAMES TAYLOR, Clashfarquhar, Aberdeen.
1873. R. C. B. WILLIS, M.R.A.C., Cheltenham.
1875. GEORGE H. CATT, 44 Middle Street, Brighton.
1875. ROBERT EWING, Reporter, late Edinburgh.
1875. JOHN SCOTT, 63 Princes Street, Edinburgh.
1876. CECIL C. BAKER, 2 Bloomsbury Place, London.
1876. PERCY H. CATHCART, 16 Oakley Square, London.
1876. JOHN M'CAIG, Kilhilt, Stranraer.
1876. C. E. M. RUSSELL, Ballielisk, Dollar.
1878. W. M. ANDERSON, Pirntaton, Stow.
1879. M. FALCON, Stainburn, Workington.
1880. WILLIAM BROWN, Watten Mains, Caithness.
1880. ALEX. INGLIS, Cloverport, Kentucky, U.S.A.
1880. JAMES M'LAGGAN, Cobbleheugh, Dinnet, Aberdeenshire.
1880. R. A. MALLOCH, Balhaldie, Braco, Perthshire.
1881. DANIEL BAIN, Wick.
1881. ALFRED HARDIE, Oxford House, Stockport.
1882. DANIEL FINLAYSON, Wick.
1882. BENJAMIN HEPBURN, Preston Mains, Prestonkirk.
1882. J. RODGER, Mertoun, St Boswells.
1883. ALEX. H. GIBSON, Kirkcaldy.
1883. ARTHUR HERBERT KERR, Crookham, Farnham.
1883. PATRICK L. MAITLAND, Perrymead House, Bath.
1883. HENRY B. MAYNE, Brantridge, Balcomb, Sussex.
1883. ROBERT ROUSE PETER, Buenos Ayres, South America.
1884. W. A. SANDERS, Sanders Park, Co. Cork.
1884. W. STIRLING, Dean's Court, St Andrews.
1885. HENRY CHAVASSE, Castle Townshend, Cork.
1885. A. R. DUNNET, Auchengill, Keiss, Caithness.
1885. ALEX. EDWARD, 1 Macdonald St., Dundee.
1885. C. H. HOOPER, Elmleigh, Beckenham, Kent.
1885. JOHN M. RAMSAY, Hope Park, Cupar-Fife.
1886. BASIL S. CAVE, Queensberry House, Richmond, Surrey.
1886. EDGAR DUDLEY, 37 Thornhill Road, Barnsbury, London.
1886. JOHN EDWIN MACKENZIE, 15 Albany Street, Edinburgh.
1886. J. RENNIE, Wellcroft, Helensburgh.
1886. WILLIAM R. RICHARDSON, Collyhurst Lodge, Whalley Range, Manchester.
1886. C. G. FREER THONGER, Lordswood Place, Harborne, Staffordshire.

1887. Alfred Henry Inman, Muirpark, Eskbank, Dalkeith.
1887. Khosheroo B. Jadhava, Baroda, Bombay.
1887. Walter Frank Perkins, Portswood House, Southampton.
1887. Pandit Srilal, Misra, Mahaban, Dist. Muthra, N.W.P., India.

The following have obtained

Second Class Certificates.

1876. Andrew Catton, Couston, Aberdour, Fife.
1876. John Fleming, Coates, Penicuik.
1877. John T. T. Scoular, Edinburgh.
1877. Robert H. Wallace, Newton Hall, Windygates.
1878. James Gillespie, Halfmark, Corsock, Dalbeattie.
1878. James S. Innes, Edinburgh.
1879. Robert M. Traill, Hobbister, Orkney.
1880. Andrew Chapman, Breckonhill, Lockerbie.
1880. James Sutherland, Wick.
1880. William R. Tait, Wick.
1880. Francis Underwood, Sywell Hall, Northampton.
1881. John M. Little, jun., Bonnington House, Blackheath, London.
1881. Samuel Naismith, Edinburgh.
1881. John S. Peter, 5 Ravelston Place, Edinburgh.
1883. Herbert G. Aylen, Hazeldean Farm, St Albans.
1883. John K. Ledingham, Slap, Turriff.
1884. Alex. Johnstone, Edinburgh.
1884. W. M'Lennan, Lewis Estate Office, Stornoway.
1885. Donald Brims, Knapperfield, Watten.
1886. Robert D. Davidson, Cogle, Watten, Caithness.
1887. John Barker, Cockden, Briercliffe-Burnley, Lancashire.
1887. Christopher Drieberg, Colombo, Ceylon.
1887. Patrick R. Murison, Forfarshire.
1887. C. T. A. Robertson, Kensworth Lodge, Merchiston, Edinburgh.
1887. Robert Gordon, Gordonston, Clatt, Kennethmont.
1887. James Kerr, Mid Kelton, Castle-Douglas.

SYLLABUS OF EXAMINATION

FOR CERTIFICATES AND DIPLOMA.

I.—SCIENCE AND PRACTICE OF AGRICULTURE.

1. Geological strata—surface geology—formation of soils—their classification—chemical and physical characters and composition—suitability for cultivation. 2. The principle of rotations—rotations suitable for different soils—systems of farming. 3. The composition of (*a*) manures—general and special—amounts used per acre—period and mode of application. The composition of (*b*) feeding substances—their suitability for different classes of farm stock—considerations affecting their use. 4. "How crops grow"—our farm crops—their cultivation—diseases—insect injuries and remedies—their chemical composition. The formation and management of plantations. 5. The principles on which drainage, irrigation, and warping operations should be based and carried out. The application of lime—marl—clay, &c. 6. Meteorology, or the laws of climate as affecting plant life—the influence of light and heat on cultivation—of absorption and retention of heat and moisture—of porosity and capillarity in soils. 7. The breeding, rearing, feeding, and general treatment of farm stock—the different breeds of horses, cattle, sheep, and pigs—their characteristics—the districts where they are generally met with. 8. The machines and implements used in farming—their uses, prices, and the principal points to be attended to in their construction. 9. The "prime movers," or sources of power used in agriculture: man—horse—wind—water—steam—their relative values and advantages. *Text-books*—Morton's "Cyclopedia of Agri-

culture," Blackie & Son; Wallace's "Farm Live Stock," Oliver & Boyd; Harris's "Cheese and Butter Maker's Handbook," Dunn & Wright; M'Connell's "Agricultural Note-Book," Crosby, Lockwood, & Co.; "Our Farm Crops," Blackie & Son; "How Crops Grow," Macmillan & Co.; Warington's "Chemistry of the Farm," Bradbury, Agnew, & Co.; M'Alpine's "Grasses"; Geikie's "Outlines of Geology."

II.—BOTANY.

1. Nutritive Organs of Plants—root, stem, leaves. Functions of roots. Various kinds of stem, with examples. Use of the stem. Structure of leaves. Different kinds of leaves. Arrangement and functions of leaves. 2. Reproductive Organs—Flower and its parts. Arrangements of the whorls of the flower—calyx, corolla, stamens, pistil. Ovule. Mature pistil or fruit. Pruning and grafting. Seed. Young plant or embryo. Sprouting of the seed, or germination. 3. General Principles of Classification—meaning of the terms Class, Order, Genus, and Species. Illustrations of natural orders taken from plants used in agriculture, such as grain-crops, grasses, clovers, vetches, turnips, mangel-wurzel, peas, beans, &c. Practical examination in fresh specimens and models; some of the latter may be seen in the Museum, at the Royal Botanic Garden, which is open daily to the public, free. *Text-book*—Balfour's "Elements of Botany," A. & C. Black, 1876, price 3s. 6d.

III.—CHEMISTRY.

The general principles of chemical combination. The chemistry of the more commonly occurring elements, and their more important compounds. The chemical processes concerned in agriculture generally. The changes which take place in the germination, growth, and maturation of plants, in the weathering and manuring of soils, &c. The composition and chemical character of the common mineral manures. *Text-books*—Roscoe's "Lessons in Elementary Chemistry," Macmillan & Co., London, price 4s. 6d. Johnston and Cameron's "Elements of Agricultural Chemistry and Geology." Johnston's "How Crops Grow," Macmillan & Co., London. Warington's "Chemistry of the Farm," Bradbury, Agnew, & Co., London.

IV.—NATURAL HISTORY.

1. Zoology.

1. The Primary Divisions of the Animal Kingdom, with examples of each. 2. The Vertebrate Kingdom. The peculiarities and functions of the alimentary canal, distinguishing the Ruminants. 3. The orders—Hymenoptera, Diptera, and Coleoptera—with examples of insects injurious to farm crops belonging to each of the orders—the preservation of birds which prey upon these insects, drawing a distinction between those which are beneficial and those which are destructive to crops. *Text-book*—Nicholson's "Introductory Text-book of Zoology," William Blackwood & Sons, Edinburgh and London.

2. Geology.

4. The various strata forming the earth's crust in their order of deposition. 5. Their influence on the surface soils of the country. 6. The meaning and application of Disintegration, Drift, Alluvium, Dip, Strike, Fault. *Text-books*—Page's "Introductory Text-Book of Geology" and Lyell's "Students' Elements of Geology."

V.—VETERINARY SCIENCE.

1. Anatomy of the digestive organs of horse and ox, describing their structural differences. 2. The process of digestion in the above animals, and food most proper for each in quantity and quality. 3. The management of stock before, at, and after parturition. The time of utero-gestation in the domesticated animals. 4. The general principles to be followed in the treatment of acute and common diseases before assistance of the veterinary surgeon can be procured.

VI.—FIELD ENGINEERING.

1. Land-Surveying with the Chain. 2. Mensuration of Areas of Land, in Imperial and Scotch acres, from a Chain Survey or from a Plan. 3. Levelling with the ordinary levelling instrument and staff, and calculating levels and gradients. *Text-books*—"Rudimentary Treatise on Land and Engineering Surveying," by T. Baker, C.E.; "Weale's Series," price 2s. part i. chaps. 1, 2, 3, and 6, and part ii. chap. 1, to be read.

VII.—BOOK-KEEPING.

1. Questions in Practice and Proportion. 2. Book-keeping—Describe books to be kept; give examples—taking of stock. *Text-book*—Stephen's "Practical System of Farm Book-keeping," Wm. Blackwood & Sons, Edinburgh, price 2s. 6d.

EXAMINATION FOR BURSARIES.

Candidates are examined in the Elements of Botany, Chemistry, Physical Geography, and Geology. *Text-books*—Balfour's "Elements of Botany," Roscoe's "Lessons in Elementary Chemistry," Page's "Introductory Text-Book of Geology," Geikie's "Primer of Physical Geography," and Lyell's "Students' Elements of Geology."

It has been resolved that, under ordinary circumstances, the examinations shall be held annually in the end of October, and candidates must enter their names with the Secretary before the 10th of that month, and produce the necessary certificates from the teachers of the schools they have attended.

The bursaries are open to candidates not less than fourteen years of age.

EXAMINATION PAPERS, 1887.

SCIENCE AND PRACTICE OF AGRICULTURE.

1. Where are the heaviest clay soils found in Britain? Describe the properties of clay soils, and name the crops which grow best on such soils.

2. Write an account of your experience of the advantages and disadvantages of Steam Cultivation.

3. Explain briefly the principles of rotation of crops, and give an example of a good 6 course rotation.

4. In the case of a farm extending to 600 acres of medium arable land at a rent of 30s. per acre, What might be the amount, yearly, of the bills

for (1) labour; (2) purchased cakes and feeding stuffs; (3) purchased manures; (4) implements? How much capital would be necessary? Name the district in which you suppose the farm to be situated, and say what rotation is adopted and what kind of live stock is kept, or if all the produce is sold.

5. Describe the cultivation and harvesting of a crop of oats to be followed by turnips. Give the cost of and time taken by each operation.

6. Name the more common varieties of purchased manures and feeding stuffs, and append a recent average price for a good sample of each.

7. Give the management of a flock of Ewes as carried out in the district where you studied Practical Agriculture.

8. Write a short paper on the breeding, rearing, breaking and feeding of work horses.

N.B.—All the questions to be answered.

(*Three hours allowed.*)

BOTANY.

1. What are the functions of leaves? Give an example of a simple and a compound leaf. What is the difference between *aerial* and submerged leaves?

2. Describe botanically the parts of rye-grass seeds as sold by seedsmen.

3. Enumerate some adaptations for intercrossing and close fertilisation.

4. What are the characters of the Order *Umbelliferæ*. Mention the plants cultivated for food, and the poisonous species found in Britain.

5. Describe the structure of an Anther, with its contents and the process of fertilisation. What damage is produced on cereal crops by high winds?

(*One and a half hour allowed.*)

CHEMISTRY.

1. Define a Salt. Distinguish between a basic and an acid salt, and give examples of each, with their formulæ.

2. How is caustic potash prepared? What are its chief characters?

3. What is the action of caustic lime upon the following substances?—
   (*a*) Sal ammonia.
   (*b*) Superphosphate.
   (*c*) Acetic acid.

4. Describe the effects of caustic lime on
   (*a*) Clay land.
   (*b*) Moor land.
   (*c*) Farm-yard manure.

5. What are the sources of fat in the animal body? What are the chief conditions required for the rapid production of fat?

6. What are the chief impurities occurring in drinking water, and how may they be detected?

(*One and a half hour allowed.*)

NATURAL HISTORY.

Geology.

1. What rocks are said to be of organic origin? Describe their chemical composition and mode of formation.

2. What ores of iron are most commonly used in this country? Describe their chemical composition, and give the geological formations in which they occur.

3. Explain the terms "*conformability*" and "*unconformability*," and give two examples from the Geology of Scotland.

4. Briefly describe a *Graptolite*, a *Trilobite*, and an *Ammonite*, and state what great geological epochs are characterised by those fossils.

Zoology.

1. What is *cœnurus cerebralis?* State what you know regarding its structure and life history, and how it comes to be interesting to the Agriculturist.

2. How do you distinguish the Orders *Diptera* and *Hymenoptera?* Name an insect from each order which is destructive to agricultural produce.

3. Explain the chief structural and developmental points which prevent us from classing a *frog* with *reptiles*.

4. Contrast the Orders *Rodentia* and *Insectivora*. Give two native British examples of each.

(*One and a half hour allowed.*)

VETERINARY SCIENCE.

1. Amongst what cows does milk fever occur? Describe its symptoms and treatment.

2. What is quarter-ill? At what age does it generally attack? Give the best methods for its prevention, also its symptoms and treatment.

3. What is scab in sheep? Describe its causes, symptoms, and treatment.

4. What are the most common causes of diseases of the digestive organs in farm horses?

5. What is "swine plague"? Give its causes, symptoms, and the method to be pursued on its appearance in a piggery.

6. Give a brief description of the points of a good, strong, 3 year old shorthorn bull.

(*One and a half hour allowed.*)

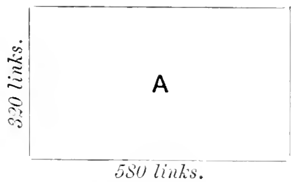
MENSURATION AND FIELD ENGINEERING.

Note.—Candidates must work out the questions on sheets of paper which will be supplied to them, which sheets must be signed by the Candidates, and lodged, along with this Examination Paper, with the Secretary. The Answers to the questions, excepting Nos. 4 and 7, are also to be filled in on this paper.

Note of Imperial Measure.

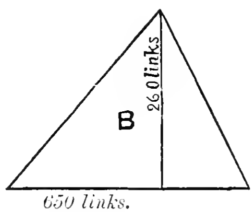
10,000 square links	=	1 square chain.							
625 do.	=	0·0625 do.	=	1 pole.					
25,000 do.	=	2·5 do.	=	40 do.	=	1 rood.			
100,000 do.	=	10 do.	=	160 do.	=	4 do.	=	1 acre.	

The imperial is to the Scotch acre as 1 : 1·261 nearly.



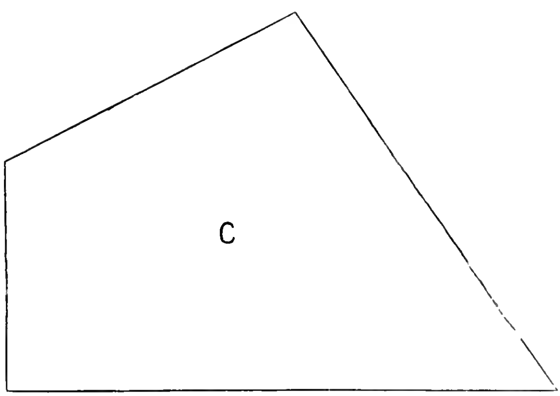
Question No. 1.—Calculate the area of the right-angled enclosure A, in imperial acres, roods, and poles, and also in acres and decimals.

Answer.



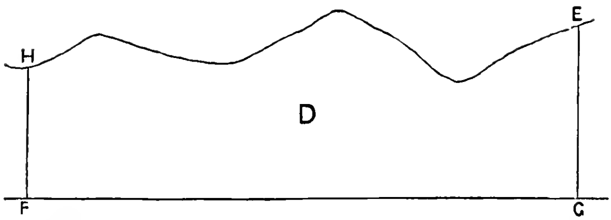
Question No. 2.—Calculate the area of the triangular enclosure B, in decimals of an imperial acre.

Answer.



Question No. 3.—Measure by the scale on the next page the enclosure C, mark the measurements in links on the paper, and calculate from them the area in imperial acres and decimals.

Answer.



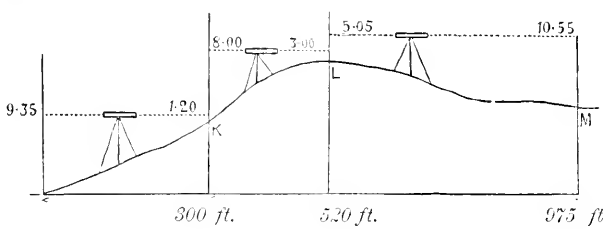
Question No. 4.—In the figure **D**, HE is an irregular boundary; FG a straight station-line; FH and EG perpendiculars to FG. Measure by the scale, and mark in links on the paper the measurements required in order to survey the boundary HE.

Question No. 5.—Calculate from these measurements the area of the piece of land FHEG, in imperial acres and decimals.

Answer.

Question No. 6.—The contents of a piece of land being 320 Scotch acres, required the area in imperial acres and decimals.

Answer.



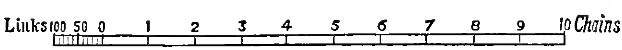
Question No. 7.—Write down, as if in a level-book, the staff-readings in feet and decimals shown in the above sketch section; then reduce the levels beginning at H, so as to calculate the heights of K, L, and M above H; all in feet and decimals.

Question No. 8.—Calculate the gradients or rates of inclination of the ground between the points H and K, K and L, and L and M.

$$\textit{Answer}\begin{cases}\text{H and K} = \\ \text{K and L} = \\ \text{L and M} = \end{cases}$$

Scale of Imperial Chains for Figures **C** and **D**.

N.B.—*The measurements to be taken to the accuracy of the nearest five links.*



ARITHMETIC AND BOOK-KEEPING.

1. Add together $\frac{1}{5}$, $13\frac{3}{10}$, and $\frac{2}{7}$ of $9\frac{2}{5}$.

2. Find the difference between 10 and ·0002. Multiply ·562 by ·00074, and divide ·7644 by ·0052.

3. I buy a field for £1000, for which I receive £30 a year of rent, which I invest as soon as I receive it at 4 per cent. compound interest. At the end of three years I sell the field for £1030—What have I lost or gained by buying the field, instead of investing the purchase money on the same terms that I invested the rent?

4. If 144 men can dig a trench 40 yards long, 1 foot 6 inches broad, and 48 feet deep, in three days of 10 hours each, how long must another trench 5 feet deep and 2 feet 3 inches broad be, in order that 51 men may dig it in 15 days of 9 hours each?

*5. A and B rent a field for £60. A puts in 10 horses for $1\frac{1}{2}$ months, 30 oxen for 2 months, and 100 sheep for $3\frac{1}{4}$ months. B puts in 20 horses for 1 month, 40 oxen for $1\frac{1}{2}$ months, and 200 sheep for 4 months. If the food consumed by a horse, an ox, and a sheep in the same time be in the proportion of 3, 2, and 1, find how much of the rent each should pay.

6. Find the value of 11 tons 17 cwts. 1 qr. at £7, 7s. $4\frac{1}{2}$d. per ton. Also 45 acres 3 roods 20 poles at £111, 11s. 4d. per acre.

7. Name the different books a farmer ought to keep, so as to have an accurate note of his transactions; also their nature and use. Assuming the books you have named were to be adopted by a farmer, to what particular book or books, and to what particular account or accounts would the following entries appearing in his note-book be transferred:—

On farm 1st January 1887—

1.	8 Cattle,	at £30	0	0 each,	. £240	0	0
2.	5 Horses,	„ 35	0	0 „	175	0	0
3.	10 Pigs,	„ 1	10	0 „	15	0	0
4.	150 Sheep,	„ 2	0	0 per head,	300	0	0
5.	4 Stacks wheat, each of 30 qrs.,	„ 2	0	0 per qr.,	300	0	0
6.	15 Stacks oats, each of 35 qrs.,	„ 2	0	0 „	1050	0	0
7.	50 tons turnips,	„ 2	0	0 per ton,	100	0	0
8.	Implements per valuation,				300	0	0
9.	Balance at credit of Bank Account,				250	0	0
10.	Cash on hand,				25	6	8
11.	Jan. 5.—Bought from Todd & Co., Leith, 35 tons oil cake at £2, 10s. per ton, payable on delivery,				87	10	0
12.	„ 8.—Drawn from bank,				100	0	0
	Todd & Co. for oil cake,	£87	10	0			
13.	„ 8.—Paid wages,				23	4	0
14.	„ 12.—Sold at Haddington Market to-day 50 sheep to T. Torrance, butcher, at nett £2, 10s. p. head, and received his acceptance therefor at 3 mos.,	£125	0	0			
15	„ 13.—Discounted T. Torrance acceptance, dated 12th inst. at 3 mos.,	125	0	0			
	Less discount,	1	16	8			
		£123	3	4			

* This question need only be answered if time permits.

16. Jan. 13.—Paid Income Tax,		£6 4 4
17. „ 19.—Bought from Swan & Co. 6 cattle for feeding at £15 each—£90, and granted them a Bill at 3 mos.		
18. „ 19.—Paid into bank,		80 0 0
19. „ 19.—30 qrs. wheat, at £2 per qr.,	£60 0 0	
20. „ 19.—5 tons turnips, at £2 per ton,	10 0 0	

(Used on farm during month for feeding purposes.)

To March 18.—8 Lambs born to date. 2 Ewes died.

(One and a half hour allowed.)

VETERINARY DEPARTMENT.

The Society established a Veterinary Department in 1823, but by an arrangement made with the Royal College of Veterinary Surgeons, the Society's examination ceased in 1881. Holders of the Society's Veterinary Certificate are entitled to become Members of the Royal College of Veterinary Surgeons on payment of certain fees, without being required to undergo any further examination. The number of Students who have passed for the Society's Certificate is 1183.

In 1874, the Society resolved to vote annually eight silver medals for Class Competition to each of the two Veterinary Colleges in Edinburgh, and to the one in Glasgow.

FORESTRY DEPARTMENT.

The Society grants FIRST and SECOND CLASS CERTIFICATES in FORESTRY.

BOARD OF EXAMINERS.

1. *Forestry and Practical Management of Woods.*—Dr CLEGHORN of Stravithy, St Andrews; JOHN MACGREGOR, Ladywell, Dunkeld; WILLIAM M'CORQUODALE, Scone Palace, Perth; J. GRANT THOMSON, Grantown, Strathspey.
2. *Elements of Botany.*—Dr CLEGHORN.
3. *Elements of Chemistry.*—Dr WM. CRAIG and Dr A. P. AITKEN, Edinburgh.
4. *Land and Timber Measuring and Surveying; Mechanics and Construction, as applied to Fencing, Drainage, Bridging, and Road-Making; Implements of Forestry.*—A. W. BELFRAGE, C.E., Edinburgh.
5. *Book-keeping and Accounts.*—WM. HOME COOK, C.A., Edinburgh.

Candidates must possess—1*st*, A thorough acquaintance with the theory and practice of Forestry. 2*nd*, A general knowledge of the following branches of study, so far as these apply to forestry:—The Elements of Botany; Elementary Chemistry, especially as applied to Atmosphere, Water, Soil, and Vegetation; Land and Timber Measuring and Surveying; Mechanics and Construction, as applied to fencing, draining, bridging, and road-making; Implements of Forestry; Book-keeping and Accounts. The examinations are open to candidates of any age.

The following have obtained First Class Certificates :—

GEORGE YOUNG WALL, M.R.A.C., Durham,	1870
WILLIAM BAILLIE, Forester, Whittinghame, East Lothian,	1871
WILLIAM ROBERTSON, Forester's House, Lauder,	1871
PETER LONEY, Marchmont, Duns,	1873
JOHN M. AITKEN, Ravenshill, Lockerbie,	1880
RICHARD HENDERSON, The Grange, Kirkcudbright,	1880
A. H. GIBSON, Kirkcaldy,	1882
ALEX. INGLIS, Cloverport, Kentucky, U.S.A.,	1882
PETER REID, Port Ellen, Islay,	1884
JOHN WILSON, St Andrews,	1884
CECIL HENRY HOOPER, Elmleigh, Beckenham, Kent,	1886
WILLIAM SOMERVILLE, 46 Findhorn Place, Edinburgh,	1886
JOHN BARDGETT, Sockbridge Mill, Tirril, Penrith,	1887

The following have obtained Second Class Certificates :—

JOHN M'EWEN, Yellow Cottage, Killin,	1880
THOMAS BERWICK, 56 North Street, St Andrews,	1885
DONALD C. CAMERON GRANT, Southleigh, Murrayfield,	1886

SYLLABUS OF EXAMINATION.

I.—SCIENCE OF FORESTRY AND PRACTICAL MANAGEMENT OF WOODS.

1. Structure, formation, and ripening of Wood. Predisposing causes of decay. 2. Restoration of Wood-lands :—(1) Natural reproduction ; (2) Artificial planting. 3. General management of plantations. Cropping by rotation. Trees recommended for different situations. 4. Season and methods of pruning, thinning, and felling. 5. Circumstances unfavourable to the growth of trees. 6. Mechanical appliances for conveying and converting timber. The different implements and tools used in planting, pruning, felling, barking, and working up timber trees, or preparing them for sale. Construction of saw-mills. 7. Qualities and uses of chief indigenous timbers. 8. Management of nurseries. Seed-sowing. 9. Collection of forest produce. 10. Mammals, birds, and insects which are destructive to trees.

BOOKS RECOMMENDED.—"Theory and Practice of Horticulture," Lindley; "Arboriculture," Grigor, 10s. 6d.; "Sylviculture," Bagneris, 5s.; "Coniferæ," Veitch ; "Injurious Insects," Ormerod, 3s.

Candidates are also obliged to undergo a Practical Examination in Forestry.

II.—ELEMENTS OF BOTANY.

1. Nutritive Organs of Plants.—Root, stem, leaves. Functions of roots. Various kinds of stems, with examples. Use of the stem. Structure of leaves. Different kinds of leaves. Arrangement and functions of leaves. 2. Reproductive Organs.—Flower and its parts. Arrangement of the whorls of the flower—calyx, corolla, stamens, pistil. Ovule. Mature pistil or fruit. Pruning and grafting. Seed. Young plant or embryo. Sprouting of the seed or germination. 3. General Principles of Classification—Meaning of the terms Class, Order, Genus, Species. Illustrations taken from common forest trees and shrubs. Practical examination on fresh specimens and models. These may be seen in the Museum at the Royal Botanic Garden, which is open to the public. Candidates may consult Professor Balfour's "Elements of Botany," A. & C. Black, Edinburgh, 3s. 6d.; Oliver's "Elementary Lessons in Botany," London, 4s. 6d.

III.—CHEMISTRY.

Candidates are required to have an elementary knowledge of Chemistry, such as to enable them to classify the most commonly occurring elements and their most familiar compounds, and to describe their chief characters.

They will be examined more particularly on the following subjects :—

Atmosphere.—Its composition and physical properties,—the causes of changes in its temperature and pressure, and the measurement of these changes by means of the thermometer and barometer. The formation of rain and dew. Gases injurious to vegetation.

Water.—The effects of heat upon it; its movements, its solvent properties, the methods of regulating the supply of water by drainage and irrigation. The characteristics of rain water, spring water, and surface water. The relations of water to the growth and health of plants, and to the climatic conditions of a district.

Soil.—The description and classification of soils and their suitability to the growth of different descriptions of timber trees. The composition of soils, with special reference to the constituents on which their fertility depends, or which are the cause of their sterility. The changes produced in the composition of soils by various physical operations, such as drainage, irrigation, mulching, removal of leaves, &c., and by liming, salting, and manuring.

Vegetation.—The influence of temperature, rainfall, altitude, aspect, and shelter, upon the growth of trees. The conditions favourable to germination. The effects of light, heat, and ventilation upon the growth of trees.

Forest Products.—The preparation and chemical characters of charcoal, potashes, tar, and turpentine.

Preservation of Timber.—Creosoting, kyanising, &c.

Books recommended.—"First Principles of Agriculture," Tanner (Macmillan & Co.); "Physics Primer," Balfour Stewart; "Inorganic Chemistry," by George Wilson (Chambers).

IV.—LAND AND TIMBER MEASURING AND SURVEYING; MECHANICS AND CONSTRUCTION AS APPLIED TO FENCING, BRIDGING, AND ROAD-MAKING: IMPLEMENTS OF FORESTRY.

1. The Use of the Level and Measuring Chain. Measuring and mapping surface areas. 2. The measurement of solid bodies—as timber, stacked bark, faggots, &c., earthwork. 3. The different modes of fencing and enclosing plantations; their relative advantages, durability, cost of construction, and repairs. 4. The setting out and formation of roads for temporary or permanent use. 5. The construction of bridges over streams and gullies; of gates or other entrances. Strachan's "Agricultural Tables," Oliver & Boyd, Edinburgh, price 2s. 6d.; or Horton's Tables.

V.—BOOK-KEEPING AND ACCOUNTS.

1. Questions in Practice and Proportion. 2. Book-keeping— describe books to be kept; give examples. Taking of stock.

EXAMINATION PAPERS, 1887.

SCIENCE OF FORESTRY AND PRACTICAL MANAGEMENT OF WOODS.

1. What is the best plan of managing hedges? Name the plants selected, and give particulars of height, shape, combination, and approximate cost of planting and maintenance.

2. At what seasons should the seeds of the various forest trees cultivated in Scotland be sown? and how should the operation be performed?

3. What forest trees are liable to dry rot in the growing state? and on what soil and under what circumstances does this condition usually occur?

4. What is the effect of pruning forest trees? How should the operation be performed, and at what season?

5. What evils follow the destruction of forests in a country (examples)? and what principles of cultivation would you suggest to prevent such effects?

(*Two hours allowed.*)

BOTANY.

1. What are the functions of leaves? Give an example of a simple and a compound leaf. What is the difference between *aerial* and submerged leaves?

2. Describe botanically the parts of rye-grass seeds as sold by seedsmen.

3. Enumerate some adaptations for intercrossing and close fertilisation.

4. What are the characters of the Order *Umbelliferæ?* mention the plants cultivated for food, and the poisonous species found in Britain.

5. Describe the structure of an Anther, with its contents and the process of fertilisation. What damage is produced on cereal crops by high winds?

(*One and a half hour allowed.*)

NATURE AND PROPERTIES OF SOILS, DRAINAGE, AND EFFECTS OF CLIMATE.

1. Describe the following kinds of soil.

a. Moorland.
b. Loam.
c. Marl.

2. Explain how it is that the climate of a wet district and also that of a dry district may be ameliorated by the growth of trees.

3. What are the conditions favourable to the deposition of dew?

4. How is it that a fall in the mercurial barometer indicates the approach of rain?

5. What are the chief gases frequently found in the air that are injurious to the health of trees? What are the specific injuries caused by them?

6. In what circumstances are trees most liable to be injured by frost?

(*One and a half hour allowed.*)

LAND AND TIMBER MEASURING AND SURVEYING; MECHANICS AND CONSTRUCTION AS APPLIED TO FENCING, DRAINAGE, BRIDGING, AND ROAD-MAKING; IMPLEMENTS OF FORESTRY.

1. What is required so as to be certain of the correct adjustment of a spirit-level for accurate sights?

2. Make form of level-book on separate paper, with four sights marked with imaginary lengths and remarks.

3. Make sketch section of same to imaginary scale, marking on total heights from datum with the imaginary lengths from starting point.

4. Describe the different kinds of fences, and where suitable, keeping expense in view.

5. Describe tools used for forestry purposes.

6. Draw sketch of best construction for wooden gate.

7. Draw sketch of wooden bridge of 30 feet span over ravine above burn.

8. Describe method of road-making of permanent character of 30 feet width.

(Two hours allowed.)

BOOK-KEEPING AND ACCOUNTS.

1. Reduce $\frac{1}{5}$ of $\frac{6}{7}$ of $\frac{15}{22}$ of $\frac{1}{3}$ of 33 to a simple fraction.

2. Multiply 84·728 by ·316, and divide ·0863547 by ·000713, and carry out the latter to three points of decimals.

3. How many tiles (15 inches) will be required to drain 1 acre, each drain being 30 feet apart?
(The side of an acre is, say, 210 feet.)

4. What is the cost of wire netting at 3d. per square yard, sufficient for a fence $3\frac{1}{2}$ miles long and 3 feet high?

5. How many bricks would be required to build a wall 20 yards long, $7\frac{1}{2}$ feet high, and 14 inches deep, supposing a brick to be 9 inches by $3\frac{1}{2}$ inches by $2\frac{1}{2}$ inches?

6. If a piece of wood 10 feet long, 18 inches broad, and 3 inches thick, cost 12s., what will another piece cost which is 25 feet long, 16 inches broad, and 4 inches thick?

7. Describe briefly the books a forester ought to keep, and their nature and use.

(One and a half hour allowed.)

CHEMICAL DEPARTMENT.

Chemist to the Society—Dr A. P. AITKEN, Chemical Laboratory, 8 Clyde Street, Edinburgh.

The object of the Chemical Department is to promote the diffusion of a knowledge of Chemistry as applied to agriculture among the members of the Society, to carry out experiments for that purpose, to assist members who are engaged in making local experiments requiring the direction or services of a chemist, to direct members in regard to the use of manures and feeding stuffs, to assist them to put the purchase of these substances under proper control, and in general to consider all matters coming under the Society's notice in connection with the Chemistry of Agriculture.

MEMBERS' PRIVILEGES IN RESPECT OF ANALYSES.

The fees of the Chemist for analyses made for members of the Society shall be as follow :—

The estimation of *one* ingredient in a manure or feeding stuff,	.	5s.
The estimation of *two or more* ingedients in do.	.	10s.

These charges apply only to analyses made for the sole and private use of members of the Highland and Agricultural Society who are not engaged in the manufacture or sale of the substances analysed.

If the sample represents a substance bought under a guarantee, and if it is found to be notably deficient, the Chemical Committee shall take cognisance of such deficiency in the same manner as they do in the case of deficient manures and feeding stuffs supplied to members of analytical associations (see page 31), provided that the Society's regulations as regards sampling are carried out, and that the seller's guarantee accompanies the sample.

Also, that valuations of manures, according to the Society's scale of units (see page 43), shall be supplied in all cases in which the cash price asked by the seller accompanies the sample.

The following analyses are made for *five shillings* :—

Simple Nitrogenous Manures,—viz., nitrate of soda, sulphate of ammonia, horn dust, dried blood, meat meal, shoddy, soot, &c.
Simple Phosphatic Manures,—viz., mineral phosphates, phosphatic guano, basic slag, &c., superphosphate (soluble phosphate only).
Simple Potassic Manures,—viz., sulphate of potash, muriate of potash, potashes, &c.

The following analyses are made for *ten shillings* :—

Manures,—viz., all compound and mixed manures, *e.g.*, bone meal, dissolved bones, guanos, composts, &c.
Feeding Stuffs,—viz., oil cakes, meals, and compounds.
Dairy Produce,—viz., milk, butter, and cheese.
Vegetable Products,—viz., corn, hay, roots, ensilage, &c.

MISCELLANEOUS.

Estimation of Fat and total solids in Milk,	5s.
,, Lime in limestone or mortar,	5s.
,, Hardness in water,	5s.
Analysis of Water to test fitness for domestic use,	10s.
Complete analysis of water,	60s.
Analysis of soil to discover chief deficiencies,	20s.
Complete analysis of a soil,	60s.
Examination of food or viscera for metallic poison,	30s.
,, ,, for alkaloids,	30s.
Consultation by letter,	2s. 6d.

Samples should be sent (carriage paid) to Dr A. P. Aitken, 8 Clyde Street, Edinburgh.

INSTRUCTIONS FOR SELECTING SAMPLES FOR ANALYSIS.

MANURES.

Four or more bags should be selected for sampling. Each bag is to be emptied out separately on a clean floor, worked through with the spade, and one spadeful taken out and set aside. The four or more spadefuls thus set aside are to be mixed together until a uniform mixture is obtained. Of this mixture one spadeful is to be taken, spread on paper, and still more thoroughly mixed, any lumps which it may contain being broken down with the hand. Of this mixture two samples of about half a pound each should be taken by the purchaser or his agent, in the presence of the seller or his agent or two witnesses (due notice having been given to the seller of the time and place of sampling), and these samples should be taken as quickly as possible, and put into bottles or tin cases to prevent loss of moisture, and having been labelled, should be sealed by the samplers—one or more samples to be retained by the purchaser, and one to be sent to the chemist for analysis.

FEEDING STUFFS.

Samples of feeding compounds should be taken in a similar manner.

Samples of cake should be taken by selecting three cakes, breaking each across the middle, and from the broken part breaking off a small piece. The three pieces thus obtained should be wrapped up and sealed by the samplers, and sent for analysis as in the case of manures, and three duplicate pieces similarly sealed and labelled should be retained by the purchaser.

SOILS.

Dig a little trench about two feet deep, exposing the soil and subsoil. Cut from the side of this trench horizontal scrapings of the soil down to the top of the subsoil. Similar sections of subsoil immediately below these samples should be taken and preserved separately. Five or six similarly drawn samples should be taken from different parts of the field, and kept separate while being sent to the chemist, that he may examine them individually before mixing in the laboratory.

VEGETABLE PRODUCTS.

Turnips, &c., 20 to 30 carefully selected as fair average bulbs.

Hay, straw, ensilage, &c., should be sampled from a thin section cut across the whole stack or silo, and carefully mixed about; about 10 lbs. weight is required for analysis.

Grain should be sampled like manures.

DAIRY PRODUCE.

Milk.—Samples of milk from individual cows should be taken direct from the milk-pail. Average samples from a number of cows should be taken immediately after milking. Samples to be tested for adulteration should not be drawn from the bottom or taken from the top of standing milk, but they should be ladled from the vessel after the milk has been thoroughly mixed.

For most purposes half a pint of milk is a large enough sample.

Butter and Cheese.—About quarter-pound samples are required.

WATERS.

Samples of water for analysis should not be put into ordinary wine bottles or stoneware jars stopped with corks, as these usually vitiate the samples. Clear glass Winchester quarts with glass stoppers should be used. Cases containing these, chemically cleaned, are forwarded from the laboratory on application.

Well water should be allowed to run for some time before the sample is drawn.

Standing water from cisterns, tanks, ponds, &c., should be sampled by immersing the bottle entirely under the water, and holding it, neck upwards, about four inches below the surface.

Spring or stream water should be sampled in dry weather, by immersion, if possible, but if not deep enough for that purpose, a perfectly clean cup or glass should be used for transferring the water to the bottle.

When the bottle has been filled the stopper should be rinsed in the water before replacing.

Samples should be despatched to the laboratory *immediately* after being taken.

HINTS FOR THE ADVANTAGEOUS PURCHASE OF MANURES AND FEEDING STUFFS.

Before making a purchase, obtain a written or printed guarantee showing the analysis of the material according to the forms recommended on page (41). (*Copies of these forms may be had on applying to F. N. Menzies, 3 George IV. Bridge, Edinburgh.*)

A sample of the material should be obtained at the same time.

If a number of samples of a similar kind are obtained from different sellers, the purchaser may be assisted in his selection by submitting these along with their guarantees to the chemist, to be arranged according to their order of merit, but the names of the sellers should not accompany the samples.

When the substance has been bought and received, it should be sampled in strict accordance with the Society's *instructions for sampling*, and due notice should be given to the seller of the place and date of sampling, in order that he or his agent may have the opportunity of witnessing the operation.

It should be no part of a bargain that deficiency in any one constituent of a substance may be compensated by excess in another.

Much more advantageous terms may be obtained, and expense of analysis saved, if farmers in the same neighbourhood would club together, and make a united purchase, to be delivered in bags according to their requirements at some convenient centre. Information regarding the composition and characteristics of manures and feeding stuffs will be found on pages (32 and 38).

In the case of feeding stuffs of a distinct kind, it will be advantageous to obtain a guarantee of *purity* along with the analytical guarantee.

If the analysis obtained shows a marked deficiency in any of the constituents guaranteed, the chemist should be asked to verify the accuracy of his analysis, and if the deficiency is confirmed the seller should be informed of it, and his explanation and the whole details of the transaction should be forwarded to the Secretary of the Society, who will submit the matter to the Chemical Committee.

LOCAL ANALYTICAL ASSOCIATIONS.

I. With the view of encouraging, as well as regulating the conduct of, Local Analytical Associations, the Society contributes from its funds towards their expenses a sum not exceeding £250 annually.

II. The amount of such contribution is to each association at the rate of 10s. for each full analysis, and 5s. for each partial analysis * of manure or feeding stuff affected, or such proportion thereof as the above annual contribution may permit of. The pecuniary assistance thus offered is subject to the following conditions being complied with to the satisfaction of the Chemical Committee:—

1. That the rules of the association are submitted to and approved of by the Chemical Committee.

2. That it is a condition of participating in the grant that the association make analyses for members of the Highland and Agricultural Society, being farmers and not members of the local association, charging them the cost price to the association, less the amount recovered from the Society.

3. That the association is managed by a committee of practical farmers owning or occupying land in the district.

4. That the analyst employed is of acknowledged standing.

5. That the benefits of the grant apply only to analyses made for farmers, and that these subscribe towards the expenses of the association, subject to the exception in No. 2.

6. That each analysis represents at least one ton of bulk actually purchased and delivered to one or more members under guarantee, or at a specified price per unit of valuable ingredients.

7. That the analysis has been made from a sample drawn after delivery, in accordance with the published instructions of the Society, and that a sealed duplicate sample has been retained.

8. That all analyses are reported according to forms furnished by the Highland and Agricultural Society, and that valuations of manures, if any are made, are calculated on a uniform standard to be issued periodically by the Society, and at least once a year.

III. (*a*) A general report regarding the analyses for which the Society has contributed payment is submitted to the general meeting in January, and full details concerning manures and feeding stuffs whose analyses show any of the valuable constituents to be deficient to the extent of one-tenth of the amount guaranteed, or whose total deficiencies represent as much as one-tenth of the value of the manure or feeding stuff, are published annually in the *Transactions*.

(*b*) In the case of every analysis showing the deficiency above described, the secretary of the association must obtain confirmation of the deficiency from the chemist. The deficiency having been confirmed, the duplicate sample must be forwarded to the Secretary of the Highland and Agricultural Society. A copy of the analysis must at once be sent to the seller, and any explanations received from him forwarded in due course to the Secretary of the Highland and Agricultural Society.

(*c*) Should the seller be dissatisfied with the results obtained by the analyst of the association, a further analysis may, at his option, be made from the duplicate sample by another analyst to be chosen by the Society, and at its cost if the further analysis exonerates the seller; if otherwise, at the seller's cost.

IV. The report of each analysis for which a grant is claimed must be sent to the Secretary of the Highland and Agricultural Society on or before the 1st November of each year, written on a schedule issued by the Society, and accompanied by a form of guarantee (also issued by the Society), which must be filled up and signed by the seller.

* A partial analysis is one in which only one important constituent has been determined by the chemist or guaranteed by the seller.

The schedules and guarantee forms are supplied by the Secretary of the Society on application, and no grant is given for any analysis whose schedule and guarantee form are not accurately filled up.

No grants will be given for analyses whose schedules are sent in later than 1st November.

The actual analytical reports of the association's analyst need not accompany the schedules, but must be forwarded if desired.

METHOD OF PROCEDURE TO BE FOLLOWED BY SECRETARIES AND MEMBERS OF ANALYTICAL ASSOCIATIONS APPLYING FOR GRANTS FROM THE HIGHLAND AND AGRICULTURAL SOCIETY.

1. When a Member makes a purchase he must obtain from the seller an analytical guarantee, written and signed by the seller, upon a form supplied by the Society.
2. When the Member receives delivery of the stuff bought he must inform the seller of the time and place at which the samples are to be taken for analysis, so that he may have an opportunity of being present.
3. In sampling a manure or feeding stuff the Society's printed instructions for sampling must be strictly complied with.
4. The sample (if it is to be analysed) must be sent to the chemist within a week of the date of sampling, so that any deficiency may be immediately detected.
5. The chemist must be asked to send in his report of analysis within a fortnight after receiving the sample.
6. When an analysis shows the sample to be deficient to such an extent as to require investigation by the Society, the Association's chemist must be asked to verify the accuracy of his analysis, and report the matter within a week.
7. When a deficiency has been confirmed the Secretary of the Association must immediately inform the seller thereof, and draw his attention to the provisions of Regulation III.
8. At the same time the duplicate sample must be sent to the Secretary of the Highland and Agricultural Society, and along with it must be sent the schedule relating to the purchase, and also the guarantee form, both accurately filled up in every particular.
9. Any correspondence that may ensue with the seller or buyer must be forwarded to the Secretary of the Highland Society as soon as received, so that the Committee may be able to investigate the matter with full knowledge of all the details.
10. The schedules (accurately filled up) of all samples for which the Association claims a grant, along with the signed guarantees appertaining to them, must be sent to the Secretary of the Highland and Agricultural Society on or before 1st November, or they will not be received.

MANURES—THEIR COMPOSITION AND CHARACTERISTICS.

Nitrate of Soda.—A most valuable nitrogenous manure. Perfectly soluble, and immediately available for the nourishment of the plant. Feebly retained by the soil. Rapidly goes down to the subsoil. When much nitrate of soda is frequently applied and unaccompanied by other manures, it causes the soil to be rapidly exhausted. Benefits deeply-rooting plants.

Good samples contain 95 per cent. or upwards of pure nitrate of soda, equivalent to about 19 per cent. of ammonia.

Five parts of nitrate of soda contain 1 of ammonia.

Sulphate of Ammonia.—A more concentrated nitrogenous manure than the preceding. Perfectly soluble, but not so rapid in its action as nitrate of soda. It is somewhat firmly retained by the soil, and not so liable as nitrate of soda to be washed out by heavy rains. It is therefore more suitable than nitrate for wet districts.

Good samples contain 95 per cent. or more of pure sulphate of ammonia, equivalent to from about $24\frac{1}{2}$ to 25 per cent. of ammonia.

About four parts of sulphate of ammonia contain 1 of ammonia.

Dried Blood.—A nitrogenous manure, which differs from the above in being insoluble. It must be decomposed in the soil before it yields up its nitrogen to the plant, and this it does only slowly. The nitrogen is in the form of albumen, and is capable of yielding from 12 to 16 per cent. of ammonia.

Horn Dust--Keronikon.—An insoluble nitrogenous manure, capable of yielding 16 to 18 per cent. of ammonia. When in the form of fine sawdust, it decomposes easily, and is a good nitrogenous manure even for cereals.

Horn, when in the form of chips or coarse shavings, decomposes extremely slowly, and is not suitable for application as a manure.

Shoddy or Wool Waste.—An insoluble nitrogenous material used by manure manufacturers as a source of ammonia in dissolved manures. It is capable of yielding from 5 to 10 per cent. of ammonia, but is unsuitable for direct application as a manure.

Leather.—A very insoluble nitrogenous material, yielding about 9 per cent. of ammonia, used by manure manufacturers after being melted and ground, but of little value until it has been dissolved.

Peruvian Guano.—A general manure formed of the excrements of fish-eating birds, and containing nitrogenous compounds, phosphates, and potash.

High-class Peruvian guano is rich in nitrogenous matter, a large proportion of which is soluble. As formerly imported, it was capable of yielding from 8 to 12 per cent. ammonia, part of which was derived from ammonia salts, and part (less than 1 per cent.) from nitrates. Phosphates were low, seldom exceeding 30 per cent., but from one-quarter to one-half of the phosphates were soluble. The amount of potash was usually from 3 to 5 per cent. Not now imported.

Low-class Peruvian guano, as now imported, is poor in nitrogenous matter, yielding only from 3 to 5 per cent. ammonia. The phosphates are correspondingly high, viz., from 30 to 50 per cent., but the proportion of soluble phosphate is much smaller than in high-class Peruvian guano. Potash occurs to a very small extent, viz., about 1 to 3 per cent.

Low-class guanos are formed originally from high-class guanos, by the washing out of soluble constituents by rain, &c., and their composition varies greatly according to the amount of washing they have undergone.

Genuine Peruvian guano frequently contains a large proportion of stony insoluble matter.

Standard Peruvian Guano,—also called by various names, such as *improved*, *equalised*, *fortified*,—such guanos are mixtures, with low-class Peruvian guano for a basis. Sulphate of ammonia is added, and perhaps also other nitrogenous matter, to bring them up to the guaranteed analysis, say from 8 to 10 per cent. ammonia.

Dissolved Peruvian Guano.—This is usually Peruvian guano dissolved in sulphuric acid, and fortified with sulphate of ammonia so as to make a strong, active manure.

Ichaboe Guano.—A true guano, but of recent formation. It is very rich in nitrogenous matter, which yields from 10 to 16 per cent. of ammonia, but a large part of the nitrogenous matter is in the form of feathers, which are insoluble and of low manurial value, otherwise it resembles high-class Peruvian guano.

The total phosphates vary from 18 to 30 per cent., of which from a fourth to a half is usually soluble. There is seldom more than 2 per cent. potash present.

Fish Guano.—Derived from fish-curing yards, and consisting of the heads and offal of fish, dried and ground. Properly speaking, it is not a guano. The name guano is properly applied only to the dung of birds.

High-class fish guano contains nitrogenous matter, yielding from 10 to 12 per cent. of ammonia, but it is in the form of insoluble albuminous compounds, which only very slowly decompose and become available as plant food. The phosphates range from 18 to 30 per cent., and are all insoluble.

Low-class fish guanos are substances like the preceding, but containing less nitrogenous matter and more phosphates. They are simply fish-bone manures, with somewhat more ammonia and less phosphate than ordinary bone meal, and having no real resemblance to a guano.

Fish guanos are usually impregnated with fish oil, which detracts from the value of the manure. The oil varies from 3 to 10 per cent.

Frey-Bentos Guano.—The dried and ground residue and débris of animals after the extraction of "Liebig's Extract." It is not a guano. It contains nitrogenous matter and phosphates, both of which are insoluble and slow in their action as manures. It varies in composition, yielding from 6 to 12 per cent. ammonia, from 16 to 35 per cent. phosphates, and a small proportion of potash. It should be mixed with other and quicker manures, such as superphosphate and a little nitrate.

Bone Meal.—Chiefly a phosphatic manure, but containing also nitrogenous matter. Phosphates range from 44 to 55 per cent. according to the purity of the bones, and are insoluble. The nitrogenous matter is capable of yielding from 4 to 5 per cent. ammonia, and is also insoluble. The higher the phosphates the lower the ammonia, and *vice versa*. There is usually 3 per cent. or more of oil in bones, and this may retard its action as a manure. The finer ground it is the more speedy is its action.

Bone Dust.—A coarser ground bone than the preceding.

Crushed Bones.—Still coarser ground.

Steamed Bone Flour.—Bones which have been subjected to steam at high pressure for the extraction of glue or gelatine. The residue contains from 56 to 65 per cent. phosphates and from 1 to 2 per cent. ammonia. It is white coloured and friable, and can be crushed with the hand. It is able to be, and ought to be, ground to a fine flour. Owing to this latter character, it is the most active form of bone manure.

Pure Dissolved Bones.—Bones dissolved in sulphuric acid and dried with bone ash or bone char, or other bone material. It contains usually less than 20 per cent. soluble phosphate, about 10 per cent. or upwards of insoluble phosphate, and yields from $2\frac{1}{2}$ to $3\frac{1}{2}$ per cent. ammonia.

Dissolved Bones.—A conventional name applied to compound manures, consisting of any mixture of phosphatic and nitrogenous materials which can be dissolved, with (or without) an admixture of bone, so as to produce a manure containing from 15 to 30 per cent. soluble phosphates, and from 1 to 3 per cent. ammonia. Dissolved bones has become a general name for a dissolved compound manure.

Pure Vitriolated Bones.—Bones which have been moistened with sulphuric acid, and thereafter allowed to heat in large heaps for a long time. Good samples contain from 6 to 12 per cent. soluble phosphate, with from 30 to 40 per cent. insoluble phosphate, and yield from 3 to 4 per cent. ammonia. It should consist of nothing but bones and sulphuric acid.

Superphosphates.—Phosphates dissolved with sulphuric acid. Their composition varies according to the richness of the phosphate from which they are made, and the extent to which they have been dissolved.

High-class Superphosphates are made from phosphates containing a high percentage of phosphate of lime, and are very thoroughly dissolved. They should contain between 30 and 40 per cent. soluble phosphate, and very little insoluble phosphate.

Medium Superphosphates contain at least 26 per cent. soluble phosphate, and all below that are

Low-class Superphosphates made from minerals poor in phosphate of lime, or insufficiently dissolved.

Mineral Phosphates exist in great variety, and contain very various proportions of phosphate of lime, viz., from 20 to 90 per cent. They are of use as manures only when they are ground to the finest flour.

Basic Cinder.—A substance obtained as a waste product in the dephosphorising of steel. It contains about 40 per cent. phosphate of lime, and is manufactured into a powder of extreme fineness. It is a good manure, and cheap. Especially appropriate for moory land.

Compound Manures.—These are general manures containing nitrogenous matter, phosphates, and potash, and their value depends not only on the amounts of these constituents, but also on their fineness of division, their solubility, and the sources from which their ingredients are derived.

The general character of a few of the more common of these may be indicated thus:—

Turnip Compounds.—These usually contain from 25 to 35 per cent. phosphates, of which the half or more is soluble, and nitrogenous matter, capable of yielding from 2 to 4 per cent. of ammonia, and sometimes 1 or 2 per cent. of potash.

Potato Compounds.—These are somewhat like the preceding, but contain usually less phosphate and a little more ammonia, from 3 to 6 per cent.; sometimes they contain no potash, but more frequently about 3 or 4 per cent. is present, and in some instances twice as much.

Bean Compounds.—These may contain from 10 to 20 per cent. phosphates, nitrogenous matter yielding from 2 to 4 per cent. of ammonia, and usually a considerable proportion of potash, often as much as from 10 to 20 per cent.

Cereal Compounds.—These usually contain about 20 per cent. phosphates, mostly soluble, and nitrogenous matter, partly as nitrates, yielding from 3 to 6 per cent. ammonia, and they may also contain potash.

Grass Compounds.—These are somewhat like the preceding, but may contain less phosphates and more nitrogen, part of which is usually in the form of nitrate.

RELATIVE ACTIVITY OF MANURES.

Nitrogen.—Most active in—1st, Nitrates; 2nd, Ammonia salts; 3rd, High-class Peruvian and Ichaboe guanos; 4th, High-class dissolved compounds; 5th, Dried blood; 6th, Steamed bone flour; 7th, Fish guano and fine bone meal; 8th, Rape cake and cotton cake dust; 9th, Bone dust and crushed bones.

Phosphates.—Most active in—1st, Superphosphates and dissolved phosphates derived from any source; 2nd, Precipitated and reverted phosphates; 3rd, Steamed bone flour; 4th, Bone ash; 5th, Charleston and similar phosphates ground to the finest flour; 6th, Bone meal and fish guano; 7th, Bone dust and crushed bones.

HINTS FOR THE APPLICATION OF MANURES.

Nitrogenous Manures.

Nitrate of Soda.—Apply as a top-dressing to the braird. Showery weather not disadvantageous. Heavy rains cause loss. Two half doses with fortnight interval better than one whole dose. Increases straw more than grain. Increases grass, diminishes clover.

Sulphate of Ammonia.—Apply as top-dressing at the time of sowing, not after brairding. Increases grass, diminishes clover very considerably. More suitable than nitrate for wet districts. Unsuitable for dry seasons. Not advantageously applied with dung.

High-Class Guanos.—Apply with the seed, or partly as top-dressing. Useful for young grass and early potatoes.

Low-Class Guanos.—Good general manures. Apply with the seed.

Dissolved Compounds.—Apply with the seed.

Dried Blood.—Apply a month or more before sowing, if possible. If applied with the seed, useful for root-crops only.

Fish Guano.—Best on warm, open land, and in moist climates. Apply as early as possible. Should not contain more than 3 per cent. oil.

Leather and Shoddy.—Of no value unless they are dissolved.

Phosphatic Manures.

Superphosphate.—Best phosphate for clayey soils. Suits medium soils. Makes early crop, therefore good for late districts. Increases grain more than straw.

Precipitated Phosphate.—Best on medium and light land.

Steamed Bone Flour.—Should be finely ground and applied early. Best on light soils or on moorland. Suits wet climates. Excellent improver of pastures. Quicker than bone meal in its action.

Bone Ash.—Generally applicable. Best on light land.

Bone Meal.—Should be as fine as possible, and applied early. Best on light, free soils, and on sandy soils.

Mineral Phosphate.—Must be ground to the finest flour, and feel soft and floury. Best on moorland and land rich in organic matter. Should be applied very early.

Bone Dust and Crushed Bones.—More suitable for vine borders than for agricultural purposes.

Phosphatic Manures.—When applied alone, frequently fail to give a full crop. Some nitrogenous manure ought as a rule to be mixed with them, or applied later as a top-dressing.

Potassic Manures.—Useful where potatoes or beans are grown, or where straw is sold. Increases clover. Seldom required where much dung is used. Sometimes injurious if applied with the seed. Should be applied in autumn or very early.

Lime.—Better slaked in large heap, and then carted on and spread, than slaked in small heaps on land. Better two small limings than one big one. Best results on clayey land and moorland. As a preventive of finger-and-toe, lime is better applied to the lea before the oat crop than to the stubble. It is of little use for that purpose when applied to the fallow immediately before turnip sowing.

NOTES REGARDING ANALYSES OF MANURES.

The three ingredients of greatest importance in manures are phosphoric acid, nitrogen, and potash.

1. Phosphoric Acid is present in manures as such, and also as phosphates of lime, magnesia, iron, and alumina.

Phosphate of Lime is most important, and exists in two states, insoluble and soluble.

Insoluble—

Insoluble phosphate of lime, called also Tricalcic phosphate, and Tribasic phosphate of lime,	contains about 46% phosphoric acid.

Soluble—

Soluble phosphate of lime, called also Monocalcic phosphate of lime, and *erroneously* Monobasic phosphate of lime,	contains about 61% phosphoric acid.

Some analysts prefer to state the soluble phosphate as

Biphosphate of lime, called also Monobasic phosphate,	contains about 72% phosphoric acid.

The soluble phosphates are usually stated as equivalent to so much tricalcic or insoluble phosphate.

Soluble phosphate, multiplied by $1\frac{1}{3}$ Biphosphate, „ „ $1\frac{1}{2}$	gives the equivalent of tricalcic phosphate nearly.

Much confusion has arisen from the various methods of stating soluble phosphate. To escape from this confusion, it has now become the custom to consider the term "soluble phosphate" *to mean* "phosphate of lime rendered soluble." In other words, soluble phosphate means the insoluble phosphate from which it was derived.

Phosphate of magnesia occurs in small quantity in bones, &c., and is usually reckoned as tricalcic phosphate.

Phosphates of iron and alumina, when occurring in *small quantity*, are usually reckoned as tricalcic phosphate, but if the quantity is considerable it should be separately estimated.

2. Nitrogen occurs in manures mostly in three forms—Ammonia salts, nitrates, and albuminoid matter.

Ammonia sulphate (pure), contains $25\frac{3}{4}$% ammonia.
Ammonium chloride (pure), „ $31\frac{3}{4}$% „
Nitrate of soda (pure), contains nitrogen equal to 20°/₀ ammonia.
Albuminoid matter contains about 16% nitrogen, equal to about 19% ammonia, most of which sooner or later becomes available as plant food.

3. Potash is found in small amount in most manures, and should be reckoned as anhydrous potash (K_2O).

Sulphate of potash (pure), contains potassium = 54% anhydrous potash.
Muriate of potash (pure), contains potassium = fully 63% anhydrous potash.

FEEDING STUFFS—THEIR COMPOSITION AND CHARACTERISTICS.

These are concentrated forms of fodder, whose value depends upon their *albuminoid matter* and *oil*, and in a subordinate degree upon their *carbohydrates*.

LINSEED (Seed of *Linum usitatissimum*, Common Flax).—Bombay seed large and pale ; Baltic seed smaller and dark brown, more liable to impurities than Bombay seed; should be crushed and plotted before feeding. Useful in calf-fodders, also for milk-giving, and in the last stage of masting. Quantity, 1 to 3 lbs. per 1000 lbs. L.W.

LINSEED CAKE.—Much approved feeding cake, merits well known. Home-made cake usually softer and more oily than foreign. Very hard pressed cake should be avoided, as it is low in oil, and not easily digested. Linseed cakes usually impure. Chief impurities, rape cake and locust beans, less frequently chaff, and weed seeds from badly screened seed. Should be broken to small pieces before feeding. Quantity, 2 to 12 lbs. per 1000 lbs. L.W.

RAPE CAKE (Seed of *Brassica Napus* and *B. campestris*.—It has a greenish mottled appearance, and a bitter taste, which renders it distasteful to cattle at first. Should be given in small quantity to begin with. Not suited for calves. When given to milch cows, the quantity should not exceed 2 or 3 lbs. per head per day, or it will give a disagreeable taste to milk and butter. Sometimes very impure. A dangerous impurity is mustard seed. May be detected by steeping in cold water for some hours, and noting smell of mustard. Danger may be avoided by steeping the ground cake in *boiling* water.

POPPY CAKE (Seed of *Papaver somniferum*).—Contains a savoury and easily digestible oil. May be fed to stock in considerable quantity—5 to 8 lbs per head per day. More than 5 lbs. per head per day to milch cows detracts from flavour of butter.

HEMP CAKE (Seed of *Cannabis sativa*).—Not much used for feeding. Not so digestible as the above, owing to abundance of woody fibre (25 per cent.). Fed chiefly to horses and sheep. To milch cows not more than 1 lb. per head per day. Apt to grow mouldy in summer.

SUNFLOWER CAKE (Seed of *Helianthus annuus*).—Relished by stock, and well digested.

COTTON CAKE (Seed of *Gossypium hirsutum*, &c.). *Undecorticated*.—Best quality from Egyptian and Sea Island seed. Inferior qualities are woolly, and to be avoided. Husk has astringent properties, and is a good cure for *scour*. Should be ground to the size of linseed. Not very digestible, owing to abundance of woody fibre (28 per cent.). Should be used freshly made, because liable to mould on keeping.

Decorticated, viz., cotton cake deprived of the husk.—A very concentrated and powerful bye-fodder. Should be given with caution, crushed fine, and mixed with Indian corn, oats, or other farinaceous food. Large quantity is injurious, and may even be fatal. Very variable in composition. Frequently very hard pressed, and therefore indigestible. When freshly made, softly pressed, and of good quality, it is a valuable bye fodder. Oil very bland and digestible, used to adulterate olive oil.

SESAME CAKE (Seed of *Sesamum orientale*).—Seed imported from India. Excellent bye-fodder, easily digested, much relished by all kinds of stock. Favourable for milk-giving, and also for masting. Oil bland and digestible, and much in favour for making butterine.

RICE MEAL (Seed of *Oryza sativa*).—The meal is a bye-product obtained in preparing rice for the market. A very good, safe, and acceptable fodder, but less concentrated than ordinary oil cakes. Varies very much in quality, and frequently adulterated with meal derived from rice husks. Much relished by stock, and useful for milch cows as well as fattening animals.

RYE MEAL.—Is the bran of rye, and rather more concentrated than wheat bran. It is very good fodder for cattle and sheep, but not for horses.

PALM-KERNEL CAKE.—An excellent, palatable, and easily digested bye-fodder. Especially good for milch cows. Increases the proportion of fat in milk. Puts a finish upon fattening stock. When ground to powder and most of the oil extracted, it is sold as *Palm-kernel meal*, a much relished and digestible bye-fodder. A useful addition to calf-meals.

FLESH MEAL.—Residue obtained in the manufacture of *Liebig's Extract of Beef*. A highly nitrogenous bye-fodder, most suitable for enriching a too farinaceous dietary, such as potatoes. Much used in that way as a swine fodder. Easily digested, and readily accepted by cattle.

FISH MEAL.—Bye-product of fish-curing yards, made chiefly from the heads of cod and tusk. Resembling fish guano in composition, but somewhat variable. Highly phosphatic, and therefore useful as a bye-fodder to young growing stock. Ratio, from 1 to 3 lbs. per head per day.

HERRING MEAL.—A very oily fodder, useful as an adjunct to the dietary of milch cows. Quantity 1 to 6 lbs. per head per day.

LOCUST BEANS—*Carob Bean*.—A sugary fodder, most palatable and acceptable to all kinds of stock. Used to mix with oil cakes and meals, so as to improve their flavour.

THE COMPOSITION OF FEEDING STUFFS.

The following is the average composition of genuine cakes and meals in common use :—

	Albuminoids.	Oil.	Carbohydrates.
Linseed cake,	29	11	32
Rape cake,	31	10	30
Poppy cake,	35	10	22
Hemp cake,	30	8½	17
Sunflower cake,	33	9	27
Cotton cake,	28	7½	30
„ (decorticated),	44	15	20
Sesamé cake,	37	13	21
Rice meal,	11	10	50
Paisley meal,	15	9	60
Rye meal,	14·5	3·5	60
Bran,	13·5	3·5	56
Palm-kernel cake,	17	10	41
Palm-kernel meal,	19	3½	44
Flesh meal,	71	13	...
Fish meal,	50	4	...
Herring meal,	40	20	...
Locust bean meal,	4	2	74
Linseed,	21	37	20

Useful Factors.

Amount of	Multiplied by	Gives corresponding amount of
Nitrogen, ...	1·214	Ammonia.
"	6·3	Albuminoid matter.
Ammonia, ...	3·882	Sulphate of Ammonia.
"	3·147	Muriate of Ammonia.
"	3·706	Nitric Acid.
"	5·0	Nitrate of Soda.
Potash (anhydrous), . .	1·85	Sulphate of Potash.
"	1·585	Muriate of Potash.
Phosphoric acid (anhydrous),	2·183	*Phosphate of Lime.
" "	1·4	Biphosphate.
" "	1·648	Soluble Phosphate (monocalcic tribasic).
Soluble Phosphate,† . .	1·325	Phosphate of Lime.
Biphosphate, . . .	1·566	Phosphate of Lime.
Lime, ...	1·845	Phosphate of Lime.
"	1·786	Carbonate of Lime.

The following are the forms in which analyses of *ordinary genuine* manures and feeding stuffs are usually reported:—

I. Reports of Analyses of *MANURES*.

(*On the left side are the analytical details which may vary in form, and on the right the valuable constituents which must not vary in form, and which alone are considered in estimating the value of a manure.*)

1. Form of Analysis for Superphosphates, Dissolved Bones, and the like.

	Capable of yielding as valuable constituents.
Phosphoric Acid, soluble......	Phosphates of Lime dissolved, . } ......
Do., in an insoluble state......	Do. undissolved, . . . }
Lime, . . . }	
Sulphuric Acid, Organic matter, &c., }	
Sand and insoluble matter......	Ammonia, ...

2. Form of Analysis for Bones, Bone Meal, Fish Guano, and the like.

	Capable of yielding as valuable constituents.
Phosphoric Acid, ...	Phosphate of Lime, ...
Lime, ...	
Alkalies, &c., ...	
Organic matter, ...	Ammonia, ...
Moisture, ...	
Sand and insoluble matter......	

* By phosphate of lime is meant tricalcic phosphate ($3CaO, P_2O_5$).
† Monocalcic tribasic phosphate ($CaO, 2H_2O, P_2O_5$).

3. Form of Analysis for Mixed Manures, Peruvian and Ichaboe Guanos, and the like.

	Capable of yielding as valuable constituents.	
Phosphoric Acid, soluble......	Phosphate of Lime dissolved, . .	......
Do., in an insoluble state......	Do. undissolved, . . .	
Lime, ...	Potash, ...	......
Alkalies, &c., ...	Total Nitrogen, = Ammonia, . .	......
Organic and Volatile matter, ...		
Moisture, ...		
Sand and insoluble matter......		

II. Reports of Analyses of *FEEDING STUFFS.*

Valuable Constituents,	Albuminoid compounds, .	......	= Nitrogen.
	Oil, ...	......	
	Carbohydrates, . . .	......	
	Woody Fibre, . . .	......	
	Moisture, ...	......	
	Ash, ...	......	

FORMS OF GUARANTEE.

Guarantee of Manure.

I guarantee that the Manure called........................and sold by me to ....contains a minimum of—

Soluble Phosphoric Acid = Phosphate of Lime (dissolved)............per cent.
Insoluble Phosphoric Acid = Phosphate of Lime (undissolved).........per cent.
Potash Salts . . = Potash (K_2O) . . . .per cent.
Total Nitrogen . . = Ammonia . . . .per cent.

Signature of Seller...........................

Date..................18...

Guarantee of Feeding Stuff.

I guarantee that the Feeding Stuff called..................and sold by me to ....contains a minimum of—

.... per cent. Albuminoids.
.... per cent. Oil.
.... per cent. Carbohydrates.

Signature of Seller........................

Date..................18...

LOCAL ANALYTICAL ASSOCIATIONS WHO HAVE RECEIVED THE SOCIETY'S GRANTS.

	County.	Name of Association.	Name and Address of Secretary.	Number of Analyses.			Grants obtained.		
				1885.	1886.	1887.	1885.	1886.	1887.
							£ s. d.	£ s. d.	£ s. d.
1	Aberdeen,	Alford Analytical Association,	C. M'Connach, Cairnballoch, Alford,	15	11	15	7 0 0	5 10 0	6 15 0
2	,,	Buchan Farmers' Analytical Association,	Thomas Forrest, Mains of Ludquharn, Longside,	8	12	10	4 0 0	5 10 0	4 10 0
3	,,	Turriff Analytical Association,	J. Durno, Jackston, Rothienorman,	20	32	23	9 15 0	13 15 0	10 15 0
4	Ayr,	Galston and Loudoun Farmers' Analytical Association,	Alexander Goldie, Darvel,	...	...	...	...	...	2 0 0
5	,,	Grougar Farmers' Analytical Association,	R. Whyte, East Raws, Kilmarnock,	4	5	4	1 15 0	2 5 0	1 10 0
6	Argyll,	Kintyre ,, ,,	R. Dickie, Kileonan, Campbeltown,	...	...	4	...	...	1 5 0
7	Caithness,	Caithness Farmers' Analytical Association,	G. Brown, Watten Mains, Caithness,	...	31	...	...	14 0 0	...
8	Dumfries,	Annandale Farmers' Club,	J. & J. Baird and J. Mackenzie, Lockerbie,	26	26	...	11 0 0	11 5 0	...
9	Forfar,	Arbroath Analytical Association,	D. Falconer, Carmyllie, Arbroath,	10	17	19	4 15 0	6 5 0	8 10 0
10	,,	Carse of Gowrie Farmers' Analytical Association,	A. Anderson, Berryhill, Dundee,	20	11	12	8 5 0	6 0 0	5 5 0
11	Inverness,	Inverness Farmers' Society,	William Ross, Seafield of Raigmore, Inverness,	9	7	...	3 15 0	3 0 0	...
12	Kincardine,	Kincardineshire Farmers' Club,	A. B. Annandale, Stonehaven,	5	5	...	2 0 0	1 15 0	...
13	Kirkcudbright,	Kirkcudbright Analytical Association,	R. Sproat, Lennox Plunton, Kirkcudbright,	19	21	15	9 5 0	9 5 0	6 5 0
14	Lanark,	Lanarkshire Analytical Association,	J. Lindsay, Eastfield, Thankerton,	18	20	20	7 15 0	8 0 0	7 15 0
15	,,	Avondale Farmers' Analytical Association,	John Paterson, Torfoot, Strathaven,	...	5	7	...	2 0 0	2 15 0
16	Orkney,	Orkney Agricultural Society,	James Johnston, Orphir House, Orphir,	6	...	...	3 0 0	...	...
17	Perth,	Strathearn Analytical Association,	Robert Gardiner, Henhill, Forteviot,	28	...	23	12 15 0	...	9 10 0
18	Ross,	Easter Ross ,, ,,	John Gordon, Balmuchy, Fearn,	33	14	9	13 5 0	4 15 0	2 15 0
19	,,	Wester Ross ,, ,,	Walter Arras, Fodderty Lodge, Dingwall,	13	6	19	5 15 0	2 15 0	8 0 0
20	Roxburgh,	Kelso Analytical Association,	T. Balmer Dove, Kelso,	21	...	36	8 5 0	...	14 15 0
				255	226	216	£112 5 0	£96 0 0	£92 5 0

UNITS TO BE USED IN DETERMINING THE COMMERCIAL VALUE OF MANURES.

Terms—CASH within THREE MONTHS, including Bags gross weight—not including Carriage.

N.B.—These units are based on the present MARKET PRICES, at such ports as LEITH or GLASGOW. When these units are multiplied by the percentages guaranteed or found in any manure, they will produce a value representing the price at which one SINGLE TON may be bought.

For Season 1888.

Items to be Valued.	Ichaboe Guano.	Peruvian Guano (Riddled).			Frey-Bentos and Fish Guanos.	Bones.			Steamed Bone Flour.	Pure Vitriolated Bones.	Superphosphates.		Dissolved Compounds.		
Classes		Genuine.		Fortified.		a.	b.	c.	a.		a.	b.	From	To	Average.
		a.	b.												
Phosphates dissolved,	...	...	...	....	...	...	...	...	...	3/-	2/-	1/8	1/9	2/6	2/2
„ undissolved,	1/9	1/10	1/8	1/9	1/6	1/8	1/6	1/4	1/6	1/6	...	...	1/-	1/6	1/3
Ammonia, . . .	13/6	14/-	13/-	11/-	10/-	10/-	10/-	10/-	10/-	10/-	...	...	8/-	12/-	10/-
Potash, . . .	...	3/-	3/-	3/-	...	...	...	...	...	...	...	...	3/-	3/6	3/3

CLASSIFICATION OF MANURES.

Peruvian Guano, . .	(*a*) 5 per cent. Ammonia or upwards. (*b*) Below 5 per cent. Ammonia. "Fortified," "standardised," or "prepared" Guano, is Peruvian Guano to which Sulphate of Ammonia has been added, and sometimes Phosphates and other ingredients.
Frey-Bentos and Fish Guanos, . . .	Frey-Bentos, also called "Liebig's Meat Guano" and "Meat Meal," varies much in composition. Fish Guano usually contains from 20 to 30 per cent. of Phosphate, and from 7 to 10 per cent. of Ammonia.
Bones, ...	(*a*) 90 per cent. passing ⅛ inch sieve. (*b*) 90 per cent. passing ¼ inch sieve. (*c*) Coarser. Genuine Bone Meal contains from 45 per cent. to 55 per cent. Phosphates, and from 4 per cent. to 5 per cent. Ammonia. If Phosphates are high Ammonia is low, and *vice versa*.
Steamed Bone Flour, .	Bones degelatinised and ground to flour containing about 60 per cent. Phosphates, and about 2 per cent. Ammonia.
Pure Vitriolated Bones, .	Containing nothing but Natural or Steamed Bones and Sulphuric Acid.
Superphosphates, . .	(*a*) Containing not less than 30 per cent. Dissolved Phosphates. (*b*) Containing less than 30 per cent. Dissolved Phosphates.
Dissolved Compounds, .	Including Ordinary "Dissolved Bones" and all Special Manures consisting of ingredients dissolved *together*. The "Average" units should be used in valuing manures of this kind for Associations, unless where the chemist is able to certify whether the sources are high or low class.
Mixtures, ...	To be valued according to the unit values (as given above) of the ingredients of which they are guaranteed *and also found* to be composed.

Local Analytical Associations receiving grants from the Society must not use other units than these in valuing manures.

AVERAGE CASH PRICES (for last three months).

Manures.	Guarantee.	Price per Ton.	Unit.
	Per cent.	£ s. d.	
Sulphate of Ammonia, 97 per cent.,	24 Am.	12 15 0	Am.=10/6
Nitrate of Soda, 95 per cent.,	19 ,,	9 0 0	,, = 9/6
Castor Cake Dust,	5·5 ,,	3 10 0	,, =12/6
Rape Cake Dust,	4·5 ,,	4 5 0	,, =17/
Horn Dust,	14 ,,	7 7 6	,, =10/6
Shoddy and Ground Leather,	12 ,,	3 0 0	,, = 6/
Dried Blood,	15 ,,	8 0 0	,, =10/9
Muriate of Potash, 80 per cent.,	50 Pot.	8 0 0	Pot. =3/3
Sulphate of Potash, 50 per cent.,	27 ,,	4 10 0	,, = 3/3
Kainit,	12 ,,	1 13 0	,, = 3/
Nitrate of Potash, 85 per cent.,	14 ,, / 10 ,,	16 10 0	Am. =12/6 / Pot. = 4/
Ground Charleston Phosphates,	54 Phos.	2 5 0	Phos. =10d.
Basic Slag Meal,	40 ,,	1 12 6	,, =10d.

Feeding Stuffs.	Guarantee.			Price per Ton.	Units. Rates of Alb., Oil, and CH. =as 5:5:1.		
	Album.	Oil.	Carbo-hydrates		Alb.	Oil.	CH.
				£ s. d.			
Linseed Cake,	28	10	35	7 7 6	3/4	3/4	8d.
Decorticated Cotton Cake,	40	14	20	6 10 0	2/3	2/3	5d.
Undecorticated do.	24	7	25	4 15 0	2/8	2/8	6d.
Hemp Cake,	30	7	17	4 15 0	2/4	2/4	6d.
Rape Cake,	32	10	27	5 15 0	2/3	2/3	5d.
Rice Meal,	12	12	46	4 12 0	2/8	2/8	7d.
Locust Bean Meal,	6	2	70	5 15 0	5/	5/	1/
Bran,	13·5	3·5	56	5 10 0	4/	4/	9d.
Cummins,	23	2	43	3 12 0	2/3	2/3	5d.
Rye Meal,	13·5	3	63	4 14 0	3/3	3/3	8d.
Indian Corn,	10	5	55	6 0 0	4/6	4/6	11d.
Paisley Meal,	15	9	60	4 12 6	2/3	2/3	6d.
Linseed (Whole),	20	35	14	10 17 6	3/9	3/9	9d.
Linseed Oil,	...	...	...	20 0 0	...	4/	...
Molasses,	...	...	...	6 5 0	...	...	...

INSTRUCTIONS FOR VALUING MANURES.

The commercial values of Manures are determined by means of the UNITS in the following manner:—

Take the Analysis of the Manure, and look for the following substances:—

Phosphates dissolved (or soluble phosphates), „ undissolved (or insoluble „), Ammonia, ... Potash, ...	No other items but these are to be valued.

Should the Analysis or the Guarantee not be expressed in that way, the Chemist or the Seller should be asked to state the quantities in these terms.

Let us suppose the Manure is Bone Meal:—

There are three classes of Bones, according to their fineness. An ordinary Bone Meal will fall under Class (*b*), and it will contain about 50 per cent. Phosphate and 4½ per cent. Ammonia. The units for Bones, Class (*b*), are 1/6 and 10/. Therefore the value is—

Insol. Phos., 50 times 1/6, equal to .	£3	15	0	
Ammonia, 4½ „ 10/, „ .	2	5	0	
Say	£6	0	0	per ton.

Let us suppose the Manure is pure Vitriolated Bones:—

It must be guaranteed "Pure."

The units in the Schedule are 3/, 1/6, and 10/.

The Analysis will be about 15 per cent. soluble Phosphate, 20 per cent. insoluble Phosphate, and 3½ per cent. Ammonia. In that case the value would be—

Sol. Phos., 15 times 3/, equal to . .	£2	5	0	
Insol. „ 20 „ 1/6, „ . .	1	10	0	
Ammonia, 3½ „ 10/, „ . .	1	15	0	
Say	£5	10	0	per ton.

If the Manure is a Superphosphate,—say an ordinary Superphosphate, with 28 per cent. soluble Phosphate and 3 per cent. insoluble Phosphate, it falls under Class (*b*) in the Schedule, and is valued thus—

Sol. Phos., 28 times 1/8, equal to . . £2 6 8 per ton.

Insoluble Phosphate is not valued in a Superphosphate.

If the Manure is a Dissolved Manure, such as Dissolved Bones not guaranteed pure, or a special Manure, such as a Turnip or Potato Manure, it will be valued according to the units under "Dissolved Manures," the *average* units for which are 2/, 1/3, 10/, and 3/3 in the Schedule. Thus, a Turnip Manure containing 20 per cent. sol. Phos., 10 per cent. insol. Phos., 4 per cent. Ammonia, and 2 per cent. Potash, would be valued thus—

Sol. Phos., 20 times 2/2, equal to . .	£2	3	4	
Insol. do., 10 „ 1/3, „ . .	0	12	6	
Ammonia, 4 „ 10/, „ . .	2	0	0	
Potash, 2 „ 3/3, „ . .	0	6	6	
	£5	2	4	per ton.

BOTANICAL DEPARTMENT.

Consulting Botanist to the Society—A. N. M'ALPINE, Minto House, Chambers Street, Edinburgh.

The Society have fixed the following rates of charge for the examination of plants and seeds for the *bona fide* and individual use and information of members of the Society (not being seedsmen), who are particularly requested when applying to the Consulting Botanist to mention the kind of examination they require, and to quote its number in the subjoined schedule. The charge for examination must be paid at the time of application, and the carriage of all parcels must be prepaid.

Scale of Charges.

1. A report on the purity, amount, and nature of foreign materials, 2s.
2. On the germinating power of a sample of seed, 2s.
3. Determination of the species of any weed or other plant, or of any vegetable parasite, with a report on its habits and the means for its extermination or prevention, 5s.
4. Report on any disease affecting farm crops, 5s.
5. Determination of the species of any natural grass or fodder plant, with a report on its habits and pasture or feeding value, 1s.

The Consulting Botanist's Reports are furnished to enable members—purchasers of seeds and corn for agricultural purposes—to test the value of what they buy, and are not to be used or made available for advertising or trade purposes by seedsmen or otherwise.

Instructions for Selecting and Sending Samples.

In sending seed or corn for examination, the utmost care must be taken to secure a fair and honest sample. In the case of grass seeds, the sample would be drawn from the centre of the sack or bag, and in all cases from the bulk delivered to the purchaser. If anything supposed to be injurious or useless exists in the corn or seed selected, samples should also be sent.

When possible, at least one ounce of grass and other small seeds should be sent, and two ounces of cereals or larger seeds. The exact name under which the seed has been bought (but preferable, a copy of the invoice) should accompany the sample.

Grass seeds should be sent at least four weeks, and clover seeds two weeks before they are to be used.

In collecting specimens of plants, the whole plant should be taken up and the earth shaken from the roots. If possible, the plants must be in flower or fruit. They should be packed in a light box, or in a firm paper parcel.

Specimens of diseased plants or of parasites should be forwarded as fresh as possible. Place them in a bottle, or pack them in tinfoil or oil silk.

All specimens should be accompanied with a letter specifying the nature of the information required, and stating any local circumstances (soil, situation, &c.) which in the opinion of the sender would be likely to throw light on the inquiry.

It is strongly recommended that members purchasing seeds should insist—

(1) Upon having from the seller a guarantee stating the purity and germination of the seed supplied.

(2) That the bulk be same as sample.

(3) That it contain not more than 5 per cent. other than the species ordered.

If the purity and germination of the seed is not known, then it is impossible to tell either its values, or the amount of seed to be sown.

It is also strongly recommended that the purchase of prepared mixtures should be avoided, and the different seeds to be sown should be purchased separately.

Parcels or letters containing seeds or plants for examination (carriage or postage paid) must be addressed to Professor M'Alpine, Botanical Laboratory, Minto House, Chambers Street, Edinburgh.

DAIRY DEPARTMENT.

The Society established in 1885 a Dairy Department, to promote the dairy interests.

During 1885, 1886, and 1887 the Society placed at the disposal of the Committee a sum of £100 to aid local efforts in the employment of itinerating Instructors and Demonstrators in Cheese and Butter making.

The grants have been appropriated among the different branches of the Scottish Dairy Associations as follows:—

Branch.	1885.	1886.	1887.
Ayrshire, . . .	£31 0 0	£42 17 6	£45 0 0
Wigtownshire, . .	29 3 0	21 6 6	22 10 0
Wigtownshire, Lower District,	...	6 15 0	...
Kirkcudbright, . .	13 16 0	10 10 0	10 0 0
Dumfriesshire, . .	12 18 0	8 17 0	10 0 0
Upper Ward of Lanarkshire,	10 0 0	7 4 0	10 0 0
Argyllshire, . . .	3 3 0	2 10 0	2 10 0
	£100 0 0	£100 0 0	£100 0 0

PREMIUMS.

GENERAL REGULATIONS FOR COMPETITORS.

1. It is to be distinctly understood that the Society is not responsible for the views, statements, or opinions of any of the writers whose papers are published in the *Transactions.*

2. All reports must be legibly written, and on one side of the paper only; they must specify the number and subject of the Premium for which they are in competition; they must bear a distinguishing motto, and be accompanied by a sealed letter similarly marked, containing the name and address of the Reporter—initials must not be used.

3. No sealed letter, unless belonging to a report found entitled to at least one-half of the Premium offered, will be opened without the author's consent.

4. Reports for which a Premium, or one-half of it, has been awarded, become the property of the Society, and cannot be published in whole or in part, nor circulated in any manner, without the consent of the Directors. All other papers will be returned to the authors if applied for within twelve months.

5. When a report is unsatisfactory, the Society is not bound to award the whole or any part of a Premium.

6. All reports must be of a practical character, containing the results of the writer's own observation or experiment, and the special conditions attached to each Premium must be strictly fulfilled. General essays, and papers compiled from books, will not be rewarded. Weights and measurements must be indicated by the Imperial standards.

7. The Directors, before awarding a Premium, shall have power to require the writer of any report to verify the statements made in it.

8. The decisions of the Board of Directors are final and conclusive as to all Premiums, whether for Reports or at General or District Shows; and it shall not be competent to raise any question or appeal touching such decisions before any other tribunal.

9. The Directors will welcome papers from any Contributor on any suitable subject not included in the Premium List; and if the topic and the treatment of it are both approved, the writer will be remunerated, and his paper published.

CLASS I.

REPORTS.

Section I.—THE SCIENCE AND PRACTICE OF AGRICULTURE.

FOR APPROVED REPORTS.

1. On the results of experiments for fixing and retaining the volatile and soluble ingredients in Farm-yard Manure—Twenty Sovereigns. To be lodged by 1st November in any year.

The Report must detail the treatment adopted to fix and retain these ingredients—the materials used for that purpose, and the quantity and cost thereof—comparative analyses of the manure with and without the treatment, and also a statement of the crops grown with manure and without such treatment, must be given by the Reporter. The experiments to have extended over at least two years and crops.

2. On the results of experiments for ascertaining the comparative value of Farm-yard Manure obtained from cattle fed upon different varieties of food, by the application of such manure to farm crops—Twenty Sovereigns. To be lodged by 1st November in any year.

The Report must state the effects produced on two successive crops by the application of manure obtained from cattle fed on different sorts of food, such as turnips and straw alone; and turnips and straw, with an addition of oil-cake, linseed, bean-meal, grain or other substances. The animals should be as nearly as possible of the same age, weight, condition, and maturity, and each lot should receive daily the same quantity of litter; and, except as to the difference of food, they must be treated alike.

The preparation of the manure, by fermentation or otherwise, should be in every respect the same; and it is desirable that not less than two several experiments be made with each kind, and that the ground to which it is to be applied be as equal as possible in quality and condition.

3. On the hardy and useful Herbaceous Plants of any country, where such climate exists as to induce the belief that the plants may be beneficially introduced into the cultivation of Scotland—The Gold Medal, or Ten Sovereigns. To be lodged by 1st November in any year.

Attention is particularly directed to the Grains and Grasses of China, Japan, the Islands of the Eastern Archipelago, the Himalaya country, the Falkland and South Sea Islands, California, and the high north-western district of America.

Reporters are required to give the generic and specific names of the plants treated of, with the authority for the same—together with the native names, so far as known; and to state the elevation of the locality and nature of the soil in which they are cultivated, or which they naturally inhabit, with their qualities or uses; and it is further requested that the descriptions be accompanied, in so far as possible, with specimens of the plants, and their fruit, seed, and other products.

4. On the comparative advantages of fattening Cattle in stalls, courts, or covered yards—Twenty Sovereigns. To be lodged by 1st November in any year.

The Report must detail the comparative result of actual experiments. The same quantities and kinds of food must be used. Information is required as to the comparative expense of attendance, the cost of erecting the buildings, and any other circumstances deserving of attention. The state of the weather during the experiment, in point of temperature and wetness, and the advantages or disadvantages of clipping cattle put up to feed, must be particularly noted and reported.

5. On experiments for ascertaining the actual addition of weight to growing or fattening Stock, by the use of different kinds of food—Twenty Sovereigns. To be lodged by 1st November in any year.

The attention of the Experimenter is directed to turnips, carrots, beet, mangold-wurzel, potatoes, cabbage, as well as to beans, oats, barley, Indian corn, linseed, oil-cake or rape-cake, and to the effect of warmth and proper ventilation, and the difference between food cooked and raw. The above roots and other kinds of food are merely suggested; competitors are neither restricted to them nor obliged to experiment on all of them.

When experiments are made with linseed and cake, attention should be paid to the comparative advantages, economically and otherwise, of the substance in these two states.

Before commencing the comparative experiments, the animals must be fed alike for some time previously.

The progress of different breeds may be compared. This will form an interesting experiment of itself, for Reports of which encouragement will be given.

N.B.—The experiments specified in the two previous subjects must be conducted over a period of not less than three months. No lot shall consist of fewer than four Cattle or ten Sheep. The animals selected should be of the same age, sex, and breed, and, as nearly as possible, of the same weight, condition, and maturity. The live weight before and after the experiment must be stated, and, if killed, their dead weight and quantity of tallow.

6. On Dairy Management, giving the most approved systems of Butter and Cheese Making, the use of the Thermometer, and the best Dairy Utensils—Ten Sovereigns. To be lodged by 1st November 1888.

The Report must be thoroughly practical, and embrace the writer's own experience of butter and cheese making.

7. On the Comparative Feeding Value of Ensilage alone or with other ordinary Farm produce—Fifteen Sovereigns. To be lodged by 1st February 1889.

The Report must detail the comparative result of actual experiments; and the same quantities and kinds of food must be used.

8. On Pasture Plants, indigenous or naturalised—The Gold Medal, or Ten Sovereigns. To be lodged by 1st November 1888.

The writer to give the results of his experience regarding the suitability of pasture plants for cultivation on various classes of land, and in different conditions of situation and climate.

9. On any useful practice in Rural Economy adopted in other countries, and susceptible of being introduced with advantage into Scotland—The Gold Medal. To be lodged by 1st November in any year.

The purposes chiefly contemplated by the offer of this premium is to induce travellers to notice and record such particular practices as may seem calculated to benefit Scotland. The Report to be founded on personal observation.

Section 2.—ESTATE IMPROVEMENTS.

FOR APPROVED REPORTS.

1. By the Proprietor in Scotland who shall have executed the most judicious, successful, and extensive Improvement—The Gold Medal, or Ten Sovereigns. To be lodged by 1st November in any year.

Should the successful Report be written for the Proprietor by his resident factor or farm manager, a Minor Gold Medal will be awarded to the writer in addition to the Gold Medal to the Proprietor.

The merits of the Report will not be determined so much by the mere extent of the improvements, as by their character and relation to the size of the property. The improvements may comprise reclaiming, draining, enclosing, planting, road-making, building, and all other operations proper to landed estates. The period within which the operations may have been conducted is not limited, except that it must not exceed the term of the Reporter's proprietorship.

2. By the Proprietor in Scotland who shall have erected on his estate the most improved Farm-buildings—The Gold Medal. Reports, Plans, and Specifications to be lodged by 1st November in any year.

3. By the Proprietor or Tenant in Scotland who shall have reclaimed within the ten preceding years not less than forty acres of Waste Land—The Gold Medal, or Ten Sovereigns. To be lodged by 1st November in any year.

4. By the Tenant in Scotland who shall have reclaimed within the ten preceding years not less than twenty acres of Waste Land —The Gold Medal, or Ten Sovereigns. To be lodged by 1st November in any year.

5. By the Tenant in Scotland who shall have reclaimed not less than ten acres within a similar period—The Medium Gold Medal, or Five Sovereigns. To be lodged by 1st November in any year.

The Reports in competition for Nos. 3, 4, and 5 may comprehend such general observations on the improvement of waste lands as the writer's experience may lead him to make, but must refer especially to the lands reclaimed—to the nature of the soil—the previous state and probable value of the subject—the obstacles opposed to its improvement—the details of the various operations—the mode of cultivation adopted—and the produce and value of the crops produced. As the required extent cannot be made up of different patches of land, the improvement must have relation to one subject; it must be of profitable character, and a rotation of crops must have been concluded before the date of the Report. *A detailed statement of the expenditure and return* and a certified measurement of the ground are requisite.

6. By the Proprietor or Tenant in Scotland who shall have improved within the ten preceding years the Pasturage of not less than thirty acres, by means of top-dressing, draining, or otherwise, without tillage, in situations where tillage may be inexpedient—The Gold Medal, or Ten Sovereigns. To be lodged by 1st November in any year.

7. By the Tenant in Scotland who shall have improved not less than ten acres within a similar period—The Minor Gold Medal. To be lodged by 1st November in any year.

Reports in competition for Nos. 6 and 7 must state the particular mode of management adopted, the substances applied, the elevation and nature of the soil, its previous natural products, and the changes produced.

SECTION 3.—HIGHLAND INDUSTRIES AND FISHERIES.

FOR APPROVED REPORTS.

1. On the best Means of developing the Eel Fishing of Scotland, and of conveying the Fish to English Markets—Medium Gold Medal, or Five Sovereigns. To be lodged by 1st November 1888.

2. On the Marine Life destroyed by the Trawl, and its influence on Fish Life—Gold Medal, or Ten Sovereigns. To be lodged by 1st November 1888.

SECTION 4.—MACHINERY.

FOR APPROVED REPORTS.

1. On the best and most improved Truck for conveying Dead Meats, Fish, &c., from long distances in hot weather—Twenty Sovereigns. To be lodged by 1st November 1888.

Reports must be accompanied by drawings and descriptions, or, if necessary, by a model.

Section 5.—FORESTRY DEPARTMENT.

FOR APPROVED REPORTS.

1. On Plantations of not less than eight years' standing formed on deep peat bog—The Medium Gold Medal, or Five Sovereigns. To be lodged by 1st November 1888.

The premium is strictly applicable to deep peat or flow moss; the condition of the moss previous to planting, as well as at the date of the Report, should, if possible, be stated.

The Report must describe the mode and extent of the drainage, and the effect it has had in subsiding the moss—the trenching, levelling, or other preliminary operations that may have been performed on the surface—the mode of planting—kinds, sizes, and number of trees planted per acre—and their relative progress and value, as compared with plantations of a similar age and description grown on other soils in the vicinity.

2. On the more extended introduction of hardy, useful, or ornamental Trees, which have not hitherto been generally cultivated in Scotland—The Medium Gold Medal, or Five Sovereigns. To be lodged by 1st November in any year.

The Report should specify as distinctly as possible the kind of trees introduced. The adaptation of the trees for use or ornament, and their comparative progress, should be mentioned. Attention is directed to the introduction of any tree as a nurse in young plantations, which by growing rapidly for several years, and attaining maturity when at the height of 20 or 25 feet, might realise the advantage and avoid the evils of thick planting.

3. On the varieties of Trees best adapted for planting as shelter in the Islands of Scotland—The Medium Gold Medal, or Five Sovereigns. To be lodged by 1st November 1888.

4. On the Diseases of the Larch—Fifteen Sovereigns. To be lodged by 1st November 1888.

The history, structural changes, and microscopic observations should be given. The description of the different phases of the disease and the manner in which it appears, and the parts affected, should be stated; also the situations as to soil, climate, elevation, and exposure most liable to attack. The Report to be accompanied with specimens and illustrations of the various forms of disease, insects, &c.

5. On the Life-History of any Insect or Tribe of Insects which is injurious to British Forest Trees (e.g., *Scolytus destructor*, of the Elm)—Fifteen Sovereigns. To be lodged by 1st November 1888.

The means for guarding against or destroying these pests to be mentioned, and the Report to be illustrated by original drawings and specimens of the insects and its ravages.

6. On the Utilisation of Waste Produce of Forests and Woodlands—Ten Sovereigns. To be lodged by 1st November 1888.

7. On Osier or Willow Cultivation in Scotland — Ten Sovereigns. To be lodged by 1st November 1888.

The Report must indicate the most valuable and suitable varieties of willow, and must state whether irrigation is employed. The area under crop must not be less than one acre.

CLASS II.

DISTRICT COMPETITIONS.

REGULATIONS, 1888.

The Money Premiums and Medals awarded at District Competitions will be sent direct to the winners in January next. No payments must, therefore, be made by the Secretary or Treasurer of any local Association.

Grants in aid of DISTRICT COMPETITIONS *for* 1889 *must be applied for before* 1*st November* 1888, *on Forms to be obtained from the Secretary.*

When a Grant has expired, the District cannot apply again for aid for two years.

SECTION 1.—GRANTS TO DISTRICT SOCIETIES FOR HORSES, CATTLE, SHEEP, AND PIGS.

1. CLASS OF STOCK—LIMIT OF GRANTS, £340.—The Highland and Agricultural Society will make Grants to District Societies to deal with, as in the opinion of the District Societies the need of each district may require, for such classes of breeding Stock of Horses, Cattle, Sheep, and Pigs as are embraced in the General Show Prize List of the Highland and Agricultural Society. The total sum to be expended by the Highland and Agricultural Society in such Grants shall not exceed the sum of £340 in any one year.

2. GRANT TO DISTRICT, £12.—The portion of the Grant to any one District Society shall not exceed the sum of £12 in any one year.

3. CONTINUANCE OF GRANT THREE YEARS—ADVERTISING.—The Grant shall continue for three alternate years, provided always that the District Society shall, in the two intermediate years, continue the competition by offering Premiums equal in amount to not less than one half the sum given by the Highland and Agricultural Society, and for the same class of Stock as that selected in each previous year to compete for the Highland and Agricultural Society's Prizes. The Prizes when given by the Highland and Agricultural Society must be announced as their gift.

4. MEDALS.—In the two alternate years the Highland and Agricultural Society will place three Minor Silver Medals at the disposal of the District Societies, for the same classes of Stock as those for which the Money Premiums are offered, provided that not less than three lots are exhibited in the same class.

5. RULES OF COMPETITION.—The Rules of Competition for the Premiums, the Funds for which are derived from Grants of the Highland and Agricultural Society, shall be such as are generally enforced by the Society receiving the Grant for Premiums offered by itself.

6. AREA AND PARISHES—FIVE PARISHES.—When making application for Grants from the Highland and Agricultural Society, the District Society must delineate the area and the number of Parishes comprised in the district, and, *except in special cases*, no District Society shall be entitled to a Grant whose show is not open to at least *five* Parishes.

7. NOMINATION OF MEMBERS.—At the time of making a Grant to a District Society, the Directors shall nominate one or more members of the

Highland and Agricultural Society resident in the district, whose duty it shall be to see that the conditions imposed by the Board are complied with.

8. Reports.—Blank Reports will be furnished to the Secretaries of the different District Societies. These Reports must in all details be completed and lodged with the Secretary of the Highland and Agricultural Society on or before the 1st of November next following the competition, both in the years when the Grant is given and in the two intermediate years, for the approval of the Directors of the Highland and Agricultural Society, against whose decision there shall be no appeal. All such Reports must be signed and certified by the Members of the Highland and Agricultural Society nominated under Rule 7.

9. Grants—When paid.—The Grants made to District Societies will be paid in the January following the competition, by Precepts issued by the Directors of the Highland and Agricultural Society to the winners of the prizes. No payments of these Grants must be made by the Secretary or Treasurer of any District Society. Medals will be issued at the same time.

10. Renewal of Application.—No application for renewal of a Grant to a District Society will be entertained until the expiration of *two years* from the termination of the last Grant.

11. Disposal of Applications.—In disposing of applications for District Grants, the Directors of the Highland and Agricultural Society shall keep in view the length of interval that has elapsed since the expiration of the last Grant, giving priority to those District Societies which have been longest off the list.

12. Dairy Produce.—Upon application being made by District Societies, a limited number of Medals will be placed at the disposal of District Societies for Dairy Produce.

N.B.—Existing Grants.—District Societies holding Grants under existing regulations shall have the option of continuing upon the present basis, or of placing themselves under the new regulations for the remaining years in which they are entitled to a Grant.

Districts.

1. Deeside Union Society.—*Convener*, Colonel Innes of Learney, Aberdeen; *Secretary*, James Shaw, Tillyching, Lumphanan. Granted 1888.
2. Turriff Agricultural Association.—*Convener*, A. Stuart of Laithers, Turriff; *Secretary*, Alex. Cowie, Bridgend Cottage, Turriff. Granted 1888.
3. Lammermoor Pastoral Society.—*Convener*, Richard Stephenson, Chapel, Duns; *Secretary*, A. M. Caverhill, Crichness, Duns. Granted 1888.
4. Biggar Farmers' Club.—*Convener*, Lord Lionel Cecil, Orchard Mains, Innerleithen; *Secretary*, John H. Wilson, Biggar. Granted 1888.
5. Breadalbane Society.—*Convener*, John Willison, Acharn, Killin; *Secretary*, R. A. Robertson, Bank of Scotland, Killin. Granted 1888.
6. Wester Ross Farmers' Club.—*Convener*, Major Randle Jackson of Swordale, Evanton; *Secretary*, David Ross, Dingwall. Granted 1888.
7. Eastern District of Stirlingshire Agricultural Society.—*Convener*, Ralph Stark of Summerford, Falkirk; *Secretary*, Thos. Binnie, Auctioneer, Falkirk. Granted 1888.
8. Garioch Farmers' Club.—*Convener*, Alex. M. Gordon, of Newton, Insch; *Secretary*, William Home, Newton of Ardoyne, Insch. Granted 1887.
9. Dalbeattie Agricultural Society.—*Convener*, Wellwood H. Maxwell of Munches; *Secretary*, R. W. Macnab, Union Bank, Dalbeattie. Granted 1887.

10. Gargunnock Farmers' Club.—*Convener*, John Lang, Bield, Gargunnock; *Secretary*, M. C. Stark, Westerton, Doune. Granted 1887.
11. Sutherland Farmers' Club.—*Convener*, J. B. Dudgeon, Crakaig, Golspie; *Secretary*, George R. Lawson, Golspie. Granted 1887.
12. Stranraer and Rhins of Galloway Agricultural Society.—*Convener*, R. Vans Agnew of Sheuchan, Park House, Stranraer; *Secretary*, Hugh Adair, National Bank, Stranraer. Granted 1887.

In 1888.

Nos. 1, 2, 3, 4, 5, 6 and 7 are in competitions for the first year.
Nos. 8, 9, 10, 11 and 12 compete for local Premiums.

Section 2.—GRANTS TO HORSE ASSOCIATIONS, &c. FOR STALLIONS FOR AGRICULTURAL PURPOSES.

1. Horses—Limit of Grant, £210.—The Highland and Agricultural Society will make Grants to Horse Associations and other Societies in different districts engaging stallions for agricultural purposes. The total sum expended by the Highland and Agricultural Society in such Grants shall not exceed the sum of £210 in any one year.

2. Grant to each, £15.—The portion of the Grant to any one Horse Association, &c., shall not exceed the sum of £15 in any one year.

3. Continuance of Grant Three Years—Intermediate Year.—The grant shall continue for three alternate years, provided always that the Horse Association or Society shall, in the two intermediate years, offer at least a sum equal in amount to that granted by the Highland and Agricultural Society for the hire of a Horse in connection with the Association or Society to whom the Grant is made.

4. Nomination of Members.—At the time of making the Grant to a Horse Association or Society, the Directors of the Highland and Agricultural Society shall nominate one or more members of the Highland and Agricultural Society, resident in the Districts in which the Society benefited is located, whose duty it shall be to see that the conditions imposed by the Board are complied with.

5. Reports—Penalty for not engaging Horse.—No grant by the Highland and Agricultural Society to Horse Associations, &c., will be paid unless a report, signed and certified by the members appointed under Rule 4, be furnished to the Highland and Agricultural Society not later than the 1st of November in each year in which the Grant is made, and also in the alternate years, stating that a Horse has been engaged by the Horse Association or other Society to whom the Grant is made, and in the event of a Horse not being engaged in any one year while the provisions of the Grant are in force, the Grant made by the Highland and Agricultural Society will cease.

Rules 9 (Time of Payment), 10 (Renewal of Grant), and 11 (Disposal of Applications), applicable to section 1, shall be applicable to Section 2.

Districts.

1. Lockerbie Agricultural Society.—*Convener*, D. J. Bell Irving, Waterside, Ecclefechan; *Secretaries*, Dobie & Cormack, Royal Bank, Lockerbie. Granted 1888.

2. WESTERN DISTRICT OF MID-LOTHIAN AGRICULTURAL SOCIETY.—*Convener*, James Paterson of Bankton, Mid-Calder; *Secretary*, John T. Mungle, Commercial Bank, West Calder. Granted 1888.
3. DALBEATTIE DISTRICT HORSE SOCIETY.—*Convener*, John Frazer, Maxwellfield, Dumfries; *Secretary*, Thomas Smith, Ladyland, Dumfries. Granted 1888.
4. SELKIRK AND GALASHIELS DISTRICT SOCIETY.—*Convener*, John Scott of Gala, Galashiels; *Secretary*, Andrew T. Elliot, Newhall, Galashiels. Granted 1887.

In 1888.

Nos. 1, 2, and 3 are in competition for the first year.
No. 4 competes for local Premium.

DISTRICT COMPETITIONS.

Premiums granted prior to 1887.

SECTION 1.—CATTLE.

Note.—The Society's Cattle Premiums were granted to each District for three alternate years, on condition that the District shall, in the two intermediate years, continue the Competitions by offering for the same description of Stock a sum not less than one-half of that given by the Society.

At the intermediate Competitions, three Minor Silver Medals will be placed at the disposal of the Committee, to be given along with the first prize in the three Classes of Cattle, provided there are not fewer than three lots exhibited in each Class.

The selection of the Breed is left to the local Committee.

DISTRICTS.

1. ROYAL NORTHERN AGRICULTURAL SOCIETY.—*Convener*, Alex. Forbes Irvine of Drum, Drumoak; *Secretary*, George Bruce, 35 Market Street, Aberdeen. Granted 1886.
2. STRATHBOGIE FARMERS' CLUB.—*Convener*, James Bruce, Collithy, Gartly; *Secretary*, Andrew Cruickshank, 37 Gordon Street, Huntly. Granted 1886.
3. UNITED BANFFSHIRE SOCIETY.—*Convener*, John Hannay, Gavenwood, Banff; *Secretary*, Alexander Duncan, Banker, Banff. Granted 1886.

PREMIUMS.

1. Best Bull, 3-year old and upwards, of any pure breed,	£3
Second best,	£2
Third best,	£1
2. Best Bull, 2-year old and under, of any pure breed,	£3
Second best,	£2
Third best,	£1
3. Best 2-year old Heifer (if Highland breed, 3 years), of any pure breed,	£3
Second best,	£2
Third best,	£1
	£18

The dates of calving of cattle will be counted as from on and after January 1, except Aberdeen-Angus, which will be counted as from on and after December 1.

In 1888.

Nos. 1, 2, and 3 are in competition for the second year.

Section 2.—HORSES.

FOR AGRICULTURAL PURPOSES.

The Society's Stallion Premiums were granted to each District for two years, and were followed by Premiums for other two years for Brood Mares, and again for a similar period by Premiums for Entire Colts and Fillies.

The Stallion Premiums have now dropped, but the Premiums for Mares and Fillies and Colts are continued till the course is finished.

1. Brood Mares.

1. Dumbartonshire Society.—*Convener*, John M. Martin of Auchendennan, Alexandria, N.B.; *Secretaries*, Thomas M'Lean and William Davie, jun., 99 Main Street, Alexandria, N.B. Granted 1887.
2. Lower District of Wigtownshire Horse Breeding Association.—*Convener*, James Drew of Craigencallie, Doonhill, Newton Stewart; *Secretary*, A. B. Matthews, British Linen Company Bank, Newton Stewart. Granted 1887.
3. Inverness Farmers' Society.—*Convener*, Duncan Forbes of Culloden, Inverness; *Secretary*, George A. Walker, Torbreck, Inverness. Granted 1888.
4. Kinross-shire Society.—*Convener*, Thomas Steedman, Kinross; *Secretary*, Thomas Beveridge, Cleish Mill House, Kinross. Granted 1888.

Premiums.

1. Best Brood Mare,	£4
Second best,	£3
	£7

In 1888.

Nos. 1 and 2 are in competition for the last year.
Nos. 3 and 4 for the first year.

2. Entire Colts and Fillies.

1. Lower Annandale.—*Convener*, A. H. Johnstone Douglas of Lockerbie, Comlongan Castle, Annan; *Secretary*, William Roddick, Annan. Granted 1887.
2. Kirriemuir District Agricultural Association.—*Convener*, T. M. Nicoll, Littleton, Kirriemuir; *Secretary*, Andrew Osler, Kintyrie, Kirriemuir. Granted 1887.
3. Dunblane, Doune, and Callander Farmers' Club.—*Convener*, Sir James R. Gibson-Maitland of Barnton, Bart., Craigend House, Stirling; *Secretary*, John Murray, Munnieston, Thornhill, Stirling. Granted 1887.

PREMIUMS.

1. Best Entire Colt, foaled after 1st January 1886,	£2	0	0
Second best,	£1	0	0
2. Best Entire Colt, foaled after 1st January 1887,	£2	0	0
Second best,	£1	0	0
3. Best Filly, foaled after 1st January 1886,	£2	0	0
Second best,	£1	0	0
Third best,	£0	10	0
4. Best Filly, foaled after 1st January 1887,	£2	0	0
Second best,	£1	0	0
Third best,	£0	10	0
	£13	0	0

In 1888.

Nos. 1, 2, and 3 are in competition for the last year.

SECTION 3.—SHEEP.

Note.—The Society's Sheep Premiums were granted to each District for three alternate years, on condition that the District shall, in the two intermediate years, continue the Competitions by offering for the same description of Stock a sum not less than one-half of that given by the Society.

At the intermediate Competitions, four Minor Silver Medals will be placed at the disposal of the Committee, to be given along with the first prize in the four Classes of Sheep, provided there are not less than three lots exhibited in each Class.

The selection of the Breed is left to the Local Committee. See Rule 6.

DISTRICTS.

1. DISTRICT OF LOCHABER.—*Convener*, D. P. M'Donald, Invernevis, Fort-William; *Secretary*, D. Sinclair, Achintee, Fort-William. Granted 1880. (In abeyance in 1884, 1885, 1886, and 1887.)
2. ARRAN FARMERS' SOCIETY.—*Convener*, Patrick Murray, Strabane, Brodick; *Secretary*, William Tod, Glenree, Lamlash. Granted 1886.
3. BADENOCH AND ROTHIEMURCHUS FARMERS' SOCIETY.—*Convener*, Cluny Macpherson, Cluny Castle, Kingussie; *Secretary*, A. F. Fyfe, Kingussie. Granted 1885.
4. WEST TEVIOTDALE.—*Convener*, W. Eliott Lockhart, Branxholme, Hawick; *Secretary*, James Oliver of Thornwood, Hawick. Granted 1885.

PREMIUMS.

1. Best Tup above One Shear,	£2
Second best,	£1
2. Best Shearling Tup,	£2
Second best,	£1
3. Best 3 Ewes above One Shear,	£2
Second best,	£1
4. Best 3 Gimmers or Shearling Ewes,	£2
Second best,	£1
	£12

In 1888.

No. 1 is in competition for last year.
No. 2 for the second year.
Nos. 3 and 4 compete for local Premiums.

Section 4.—DAIRY PRODUCE.

Upon application being made by District Societies, a limited number of Medals will be placed at the disposal of District Societies for Dairy Produce.

RULES OF COMPETITION.

Applicable to Grants prior to 1887.

1. The Members of the Highland and Agricultural Society connected with the respective districts are appointed Committees for arranging the Competitions, the Convener being appointed by the Directors; five members to be a quorum.

2. The Convener of each district shall summon a meeting of Committee for the purpose of determining the time and place of Competition, the nomination of Judges, and other preliminary arrangements. The time and place (which must be within the bounds of the District, unless in reference to Stallions) shall be publicly intimated by Conveners.

3. The Money Premiums awarded at District Competitions will be paid in January next, by precepts issued by the Directors. No payments must, therefore, be paid by the Secretary or Treasurer of any local Association. Medals will be issued at same time.

4. Stock must be the property of the Exhibitor at the date of Entry. *No entry shall be received later than one week previous to the Show.* Entry-Money shall not exceed $2\frac{1}{2}$ per cent. on the amount of the Premium to be competed for.

5. The Competitions (except for Stallions to serve in the District) must take place between the 1st of April and the 26th of October, and are open to general competition to all parties within the boundaries of the District of the local Society, whether members of local Association or not. The Stallion Premiums are open to all comers, or the Horses may be selected at the Glasgow Stallion Show on permission to that effect being obtained.

6. The Committee shall select the breed, and specify it in the returns. In Cattle the animals exhibited must belong to one of the following pure breeds—Shorthorn, Ayrshire, Polled (Galloway, Aberdeen-Angus), Highland. The Bulls may be of one breed, and the Heifers of another. In Sheep, the breeds must be Leicester, Cheviot, or Blackfaced.

7. Stock of an inferior description, or which does not fall within the prescribed regulations, shall not be placed for competition.

8. The Premiums shall not be divided. In Cattle, Horses (except Stallions to serve in the District), Sheep, and Swine, five lots in each Class will warrant the award of full, and three lots of half, Premiums. In Dairy Produce, eight Exhibitors in any one Class will warrant an award of full, and four of half, Premiums. A Competitor may exhibit two lots in each Class, except in Dairy Produce, where only one lot is allowed from the same farm. No animal to be allowed to compete in more than one section.

9. To authorise the award of the Medals in the intermediate year, there must be not less than three lots in each Class, and the Society's Regulations must be adhered to.

10. An animal which has gained the Highland and Agricultural Society's first Money Premium at a previous District or General Show is inadmissible in the same Class (except in the case of Stallions); and one which has gained a second Money Premium can only thereafter compete in that Class for the first.

11. A Bull the property of two or more Tenants may compete, although the Exhibitors may not be Joint-Tenants.

12. Bulls for which Money Premiums are awarded may be required to serve in the District at least one season; the rate of service to be fixed by the Committee, and the prizes may be withheld till the conditions are fulfilled. Premiums for the Heifers may be retained till the animals are certified to have calved.

13. Evidence must be produced that the Prize Stallions have had produce.

14. Mares must have foals at foot, or be entered as being in foal; in the latter case payment of the Premiums will be deferred till certificate of birth, which must be within 11 months from the date of the Show.

15. All Prize Tups must serve within the District during the season following the Competition. Ewes and Gimmers must be taken from the Exhibitor's stock, and must have been bred by him in the District; and Ewes must have reared Lambs during the ordinary season of the District.

16. Sheep must have been clipped bare during the season, and the Judges are instructed to examine the fleeces of the sheep selected for prizes, and to cast those on which they find any of the former fleece.

17. Should it be proved to the satisfaction of the Committee that an animal has been entered under a false name, pedigree, or description, for the purpose of misleading the Committee or Judges as to its qualification or properties, the case shall be reported to the Directors, and submitted by them to the first General Meeting, in order that the Exhibitor may be disqualified from again competing for the Society's Premiums, and his name, if he is a member, struck from the roll, or his case otherwise disposed of as the Directors may determine.

18. When an animal has previously been disqualified by the decision of any Agricultural Association in Great Britain or Ireland, such disqualification shall attach, if the Exhibitor, being aware of the disqualification, fail to state it and the grounds thereof, in his entry, to enable the Committee to judge of its validity.

19. Competitors must certify that the Butter and Cheese exhibited by them are average specimens of the produce of their dairies in 1888, and that the quantity produced during the season has not been less than 1 cwt. of Butter, or 2 cwt. of Cheese.

20. It is to be distinctly understood that in no instance does any claim lie against the Highland and Agricultural Society for expenses attending a show of stock beyond the amount of Premiums offered.

12. Blank reports will be furnished to the Conveners and Secretaries of the different Districts. These must, in all details, be completed, and lodged with the Secretary *on or before the* 1st *of November next*, for the approval of the Directors, against whose decisions there shall be no appeal.

22. A report of the Competitions and Premiums awarded at the *intermediate* local shows in the several Districts for Cattle and Sheep, signed by a member of the Society, must be transmitted to the Secretary *on or before the* 1st *of November in each year*, otherwise the Society's grants shall terminate.

Section 5.—SPECIAL GRANTS.

£50 to the Glasgow Agricultural Society.—*Joint-Secretaries*, David Inglis and Andrew Todd, 147 St Vincent Street, Glasgow. Granted 1884.

£20 to the Ayrshire Agricultural Association, to be competed for at the Dairy Produce Show at Kilmarnock.—*Convener*, The Hon. G. R. Vernon, Auchans House, Kilmarnock; *Secretary*, James M'Murtrie, Ayr. Granted 1872.

£3 to Orkney Agricultural Society.—*Convener*, Colonel Balfour of Balfour and Trenabie, Kirkwall; *Secretary*, James Johnston, Orphir House, Orkney. Granted 1883.

£3 to Rousay Agricultural Society.—*Convener*, General Burroughs of Rousay, C.B.; *Secretary*, R. Mainland, Banks, Frotoft, Rousay. Granted 1883.

£3 to Shetland Agricultural Society.—*Convener and Secretary*, Z. M. Hamilton, Symbister, Lerwick. Granted 1886.

Section 6.—MEDALS IN AID OF PREMIUMS GIVEN BY LOCAL SOCIETIES.

The Society, being anxious to co-operate with local Associations, will give a limited number of Minor Silver Medals annually to Societies, not on the list of Cattle, Horse, or Sheep Premiums, in addition to the Money Premiums awarded in the Districts for—

1. Best Bull, Cow, Heifer of any pure breed, or Ox.
2. Best Stallion, Mare, or Gelding.
3. Best Tup, or Pen of Ewes or Wethers.
4. Best Boar, Sow, or Pig.
5. Best Coops of Poultry.
6. Best Sample of any variety of Wool.
7. Best Sample of any variety of Seeds.
8. Best managed Farm.
9. Best managed Green Crop.
10. Best managed Hay Crop.
11. Best managed Dairy.
12. Best Sweet Milk Cheese.
13. Best Cured Butter.
14. Best sample of Honey, not less than 5 lbs., taken without destroying the bees.
15. Best collection of Roots.
16. Best kept Fences.
17. Male Farm Servant who has been longest in the same service, and who has proved himself most efficient in his duties, and to have invariably treated the animals under his charge with kindness.
18. Female Servant in charge of Dairy and Poultry who has been longest in the same service, and who has proved herself most efficient in her duties, and to have invariably treated the animals under her charge with kindness.
19. Best Sheep Shearer.

20. Most expert Hedge Cutter.
21. Most expert Labourer at Draining.
22. Most expert Farm Servant at trial of Reaping Machines.
23. Best Maker of Oat Cakes.

It is left to the local Society to choose out of the foregoing list the classes for which the Medals are to be competed.

The Medals granted previous to 1887 are for five years; those granted in 1887 and 1888 are for two years.

Aberdeenshire.

1. Insch Horticultural Society.—*Convener*, W. F. G. Dawson, Insch; *Secretary*, Alexander Henderson, Greenhaugh Cottage, Insch. 2 Medals. Granted 1887.
2. Monquhitter Society.—*Convener*, John Hutcheon, Lower Cotburn, Turriff; *Secretary*, James Cowie, Wester Haremoss, Turriff. 4 Medals. Granted 1888.
3. New Aberdour Society.—*Convener*, James Cruickshank, Ladysford, Fraserburgh; *Secretary*, Alex. Chapman, Bonnytownhill, Fraserburgh. 5 Medals. Granted 1888.
4. Newhills and Dyce Association.—*Convener*, George Reid, Clinterty, Blackburn; *Secretary*, John Dawson, Sunnybrae, Auchmill, Newhills. 1 Medal. Granted 1887.
5. North of Scotland Apiarian Society.—*Convener*, W. H. Lumsden of Balmedie, Aberdeen; *Secretary*, G. B. Black, 1 Laurelwood Avenue, Aberdeen. 2 Medals. Granted 1887.
6. Slains Association.—*Convener*, Ranald Macdonald, Cluny Castle, Aberdeen; *Secretary*, Alex. Sim, Clochton, Slains, Ellon. 2 Medals. Granted 1886.
7. Vale of Alford Turnip-Growing Association.—*Convener*, R. O. Farquharson of Haughton, Alford; *Secretary*, John Reid, Bents, Alford. 2 Medals. Granted 1885.

Ayrshire.

8. Colmonell and Ballantrae Society.—*Convener*, Robert P. Wright, Downan, Ballantrae; *Secretary*, William Douglas, Commercial Bank, Ballantrae. 3 Medals. Granted 1886.
9. Dalrymple Farmers' Society.—*Convener*, David Hunter, Guiltreehill, Maybole; *Secretary*, R. A. Blair, Holmes, Dalrymple. 2 Medals. Granted 1886.
10. Darvel Horticultural and Dairy Produce Society.—*Convener*, John Nisbet, Longgreen, Newmilns, Kilmarnock; *Secretary*, Peter Gorrie, Schoolhouse, Darvel. 4 Medals. Granted 1886.
11. Girvan Society.—*Convener*, The Earl of Stair, K.T., Bargany, Girvan; *Secretary*, Thomas M'Connochie, Royal Bank, Girvan. 2 Medals. Granted 1885.
12. Irvine Farmers' Society.—*Convener*, James Stewart, Heathfield, Irvine; *Secretary*, A. C. M'Jannet, Writer, Irvine. 2 Medals. Granted 1886.

13. MONKTON, NEWTON, PRESTWICK, AND ST QUIVOX SOCIETY.—*Convener*, Wm. Sloan, Brieryside, Monkton; *Secretary*, James Howat, The School, Prestwick. 2 Medals. Granted 1886.

14. PATNA FARMERS' SOCIETY.—*Convener*, W. M. S. Howatson, Carskeoch, Patna; *Secretary*, William Crosbie, Patna. 3 Medals. Granted 1885.

15. STEWARTON FARMERS' SOCIETY.—*Convener and Secretary*, John Lindsay, Fulshaw, Stewarton. 3 Medals. Granted 1887.

Dumbartonshire.

16. CUMBERNAULD SOCIETY.—*Convener*, J. W. Burns of Kilmahew, Cardross; *Secretary*, John Longwill, Royal Bank, Cumbernauld. 3 Medals. Granted 1886.

Dumfriesshire.

17. NITHSDALE AGRICULTURAL SOCIETY.—*Convener*, James Hewetson, Auchenbainzie, Thornhill; *Secretary*, Wm. Austin, Banker, Thornhill. 4 Medals. Granted 1887.

Edinburghshire.

18. DALKEITH AGRICULTURAL SOCIETY.—*Convener*, Sir James Gardiner Baird of Saughton Hall, Bart., Inch House, Liberton; *Secretary*, John Dobbie, Campend, Dalkeith. 4 Medals. Granted 1888.

Inverness-shire.

19. GLEN URQUHART FARMERS' SOCIETY.—*Convener and Secretary*, Major Grant, Glen Urquhart. 2 Medals. Granted 1887.

20. INVERNESS FARMERS' SOCIETY.—*Convener*, Duncan Forbes of Culloden; *Secretary*, George A. Walker, Torbreck, Inverness. 5 Medals. Granted 1884.

21. STRATHGLASS FARMERS' SOCIETY.—*Convener*, Allan R. Mackenzie, yr. of Kintail, Clunes, Kirkhill, Inverness; *Secretary*, James Fraser, Mauld, Beauly. 2 Medals. Granted 1886.

Kincardineshire.

22. FETTERCAIRN FARMERS' CLUB.—*Convener*, Colonel M'Inroy, of the Burn, Brechin; *Secretary*, William Crichton, Castleton of Kincardine, Laurencekirk. 3 Medals. Granted 1888.

Lanarkshire.

23. CADDER DISTRICT AGRICULTURAL SOCIETY.—*Convener*, ; *Secretary*, J. Stewart, 4 Parliamentary Road, Glasgow. 2 Medals. Granted 1887. (In abeyance in 1887.)

24. CARMUNNOCK FARMERS' SOCIETY.—*Convener and Secretary*, William Fleming, Windlaw, Carmunnock. 2 Medals. Granted 1883. (In abeyance in 1885, 1886, and 1887.)

Nairnshire.

25. NAIRNSHIRE ORNITHOLOGICAL ASSOCIATION.—*Convener*, R. Anderson of Lochdhu, Nairn; *Secretary*, A. Mackintosh, 1 Gordon Street, Nairn. 4 Medals. Granted 1885.

Orkney.

26. Rousay Society.—*Convener*, General Burroughs of Rousay, C.B.; *Secretary*, Robert Mainland, Banks, Rousay. 2 Medals. Granted 1886.

Perthshire.

27. Dunblane Poultry, &c., Society.—*Convener*, Peter M'Caull, Dykedale, Dunblane; *Secretary*, David Sword, Helensfield, Dunblane. 2 Medals. Granted 1884. (In abeyance in 1887.)

28. Dunblane Agricultural Society.—*Convener*, P. Stirling, of Kippendavie; *Secretary*, D. T. Reid, Dunblane. 1 Medal. Granted 1885. (In abeyance in 1887.)

Renfrewshire.

29. Mearns Society.—*Convener*, John Pollok, Blackhouse, Newton Mearns; *Secretary*, William Mather, Netherplace, Mearns. 2 Medals. Granted 1885.

30. Neilston Agricultural Society.—*Convener*, John Holm, Japston, Neilston; *Secretary*, A. R. Ferguson, Neilston. 2 Medals. Granted 1887.

Ross-shire.

31. Dingwall Ornithological Society.—*Convener*, A. R. Mackenzie, yr. of Kintail, Clunes, Kirkhill, Inverness; *Joint-Secretaries*, David Ross, Banker, Dingwall, and David Munro, 65 High Street, Dingwall. 2 Medals. Granted 1887.

32. Northern Pastoral Club.—*Convener*, Peter Robertson, Achilty, Dingwall; *Secretary*, Alex. Gunn, Balloan, Muir of Ord. 4 Medals. Granted 1885.

Applications from other Districts must be lodged with the Secretary of the Society *by 1st November next.*

RULES OF COMPETITION.

1. All Competitions must be at the instance of a local Society.
2. The classes for which Medals are granted must be in accordance with the list at pages 62 and 63. The Committee shall select the classes, and specify them in the return.
3. In each District the Convener (who must be a member of the Society appointed by the Directors) shall fix the time and place of Competition, appoint the Judges, and make all other necessary arrangements, in concurrence with the other members of the Society, and the local Association of the District.
4. The Money Premiums given in the District must be £2 for each Medal claimed.
5. The Medal for Sheep Shearing shall not be awarded unless there are three competitors, and it shall always accompany the highest Money Premium. There must not be fewer than two competitors in all the classes.
6. Blank reports will be furnished to all the Conveners and Secretaries of the different Districts. These must, in all details, be completed and lodged with the Secretary *on or before the 1st of November next*, with the exception of green crop reports, which must be forwarded on or before the 20th of December, for the approval of the Directors, against whose decisions there shall be no appeal.
7. When a grant has expired, the District cannot apply again for aid for two years.

Section 7.—PLOUGHING COMPETITIONS.

The Minor Silver Medal will be given to the winner of the first or highest Premium at Ploughing Competitions, provided a Report in the following terms is made to the Secretary, within one month of the Competition, by a Member of the Society:—

FORM OF REPORT.

I, of Member of the Highland and Agricultural Society, hereby certify that I attended the Ploughing Match of the Association at in the county of on the when ploughs competed; of land were assigned to each, and hours were allowed for the execution of the work. The sum of £ was awarded in the following proportions, viz.:—

[Here enumerate the names and designations of successful Competitors.]

RULES OF COMPETITION.

1. All Matches must be at the instance of a local Society or Ploughing Association, and no Match at the instance of an individual, or confined to the tenants of one estate, will be recognised.
2. The title of such Society or Association, together with the name and address of the Secretary, must be registered with the Secretary of the Highland and Agricultural Society, 3 George IV. Bridge, Edinburgh.
3. Not more than one Match in the same season can take place within the bounds of the same Society or Association.
4. All reports must be lodged within one month of the date of the Match, and certified by a Member of the Highland and Agricultural Society who was present at it.
5. A Member can only report one Match, and a Ploughman cannot carry more than three Medals in the same season.
6. To warrant the grant of the Medal there must have been twelve ploughs in Competition, and Three Pounds awarded in Premiums by the local Society. The Medal to be given to the winner of the first or highest prize.
7. Ploughmen shall not be allowed any assistance, and their work must not be set up nor touched by others; on land of average tenacity the ploughing should be at the rate of an imperial acre in ten hours, and attention should be given to the firmness and sufficiency of the work below more than to its neatness above the surface.

CLASS III.

COTTAGES AND GARDENS.

The following Premiums are offered for Competition in the Parishes after mentioned.

The Premiums granted previous to 1887 are for five years; those granted in 1887 and 1888 are for two years.

SECTION 1.—PREMIUMS FOR BEST KEPT COTTAGES AND GARDENS.

1.	Best kept Cottage, ...	£1 0 0
	Second best, ...	0 10 0
2.	Best kept Cottage Garden, . . .	1 0 0
	Second best, ...	0 10 0

Aberdeenshire.

1. HADDO HOUSE HORTICULTURAL POULTRY AND DAIRY ASSOCIATION.—*Convener*, William Leask, Skilmafilly, Ellon; *Secretary*, James Allan, Methlick. Granted 1888.

Argyllshire.

2. LORN HORTICULTURAL SOCIETY.—*Convener*, W. Hosack, Oban; *Secretary*, Arch. Campbell, Oban. Granted 1884. (In abeyance in 1887.)
3. MORVEN.—*Convener*, T. W. Murray Allan of Glenfeochan, Oban; *Secretary*, Arch. Campbell, Oban. Granted 1886. (In abeyance in 1886 and 1887.)

Fifeshire.

4. MARKINCH COTTAGE GARDENING SOCIETY.—*Convener*, Neil Ballingal, Sweetbank, Markinch; *Secretary*, Alex. Scott, Markinch. Granted 1887.

Inverness-shire.

5. INVERNESS HORTICULTURAL SOCIETY.—*Convener*, Duncan Forbes of Culloden, Inverness; *Secretary*, Thos. Findlay, Tomnahurich, Inverness. Granted 1887.

Stewartry of Kirkcudbright.

6. CORSOCK HORTICULTURAL SOCIETY.—*Convener*, H. Murray Dunlop of Corsock, Dalbeattie; *Secretary*, Miss Murray Dunlop, Corsock, Dalbeattie. Granted 1885.
7. CROSSMICHAEL HORTICULTURAL SOCIETY.—*Convener*, Robert Stewart of Culgruff, Castle-Douglas; *Secretary*, Mrs Stewart, The Manse, Crossmichael. Granted 1886. (In abeyance in 1887.)

Lanarkshire.

8. HAMILTON HORTICULTURAL SOCIETY.—*Convener*, William Forrest of Lawmuir, Hamilton; *Secretary*, David N. Cross, 31 Lamb Street, Hamilton. Granted 1886. (In abeyance in 1887.)
9. LARKHALL HORTICULTURAL SOCIETY.—*Convener*, William Forrest of Lawmuir, Hamilton; *Secretary*, William Bruce, 35 High Pleance, Larkhall. Granted 1883. (In abeyance in 1886.)

Linlithgowshire.

10. KIRKLISTON HORTICULTURAL SOCIETY.—*Convener*, Peter Glendinning, The Lenchold, Dalmeny Park, Edinburgh; *Secretary*, James Brown, Schoolhouse, Kirkliston. Granted 1882. (In abeyance in 1885, 1886, and 1887.)
11. TORPHICHEN HORTICULTURAL SOCIETY.—*Convener*, Colonel Gillon of Wallhouse, Bathgate; *Secretary*, James More, Torphichen, Bathgate. Granted 1882. (In abeyance in 1885, 1886, and 1887.)

Perthshire.

12. ALYTH HORTICULTURAL SOCIETY.—*Convener*, John D. Fell, Blairgowrie; *Secretary*, David S. Johnstone, Ashbank, Alyth. Granted 1887.

Renfrewshire.

13. ERSKINE HORTICULTURAL SOCIETY.—*Convener*, Henry B. M'Kie, Freeland, Erskine, Glasgow; *Secretary*, George Williamson, Gladstone Cottage, Bishopton. Granted 1887.

Ross-shire.

14. MID ROSS HORTICULTURAL SOCIETY.—*Convener*, George R. Hall, Belleport, Invergordon; *Secretary*, A. W. Brook, Invergordon. Granted 1888.

15. NOVAR HORTICULTURAL SOCIETY.—*Convener*, Donald M'Raw, Moultavie, Alness; *Secretary*, William Walker, Contullich, Alness. Granted 1886.

RULES OF COMPETITION.

1. Competitions may take place in the different parishes for Cottages and Gardens, or for either separately.
2. The occupiers of Lodges at Gentlemen's Approach Gates and Gardener's Houses are excluded, as well as others whom the Committee consider, from their position, not to be entitled to compete. The inspection must be completed by the 1st of October. In making the inspection, the Conveners may take the assistance of any competent judges.
3. It is left to the Committee of the District to regulate the maximum annual rent of the Cottages, which may, with the garden, be from £5 to £7.
4. To warrant the award of full Premiums, there must not be fewer than three competitors in each class. If there are less than three competitors in each class, only half Premium will be awarded.
5. A person who has gained the highest Premium cannot compete again.
6. If the Cottage is occupied by the proprietor, the roof must be in good repair; if the roof is thatch, it must be in good repair, though in the occupation of a tenant. The interior and external conveniences must be clean and orderly—the windows must be free of broken glass, clean, and affording the means of ventilation. Dunghills, and all other nuisances, must be removed from the front and gables. In awarding the Cottage Premiums, preference will be given to Competitors who, in addition to the above requisites, have displayed the greatest taste in ornamenting the exterior of their houses, and the ground in front and at the gables.
7. In estimating the claims for the Garden Premiums, the judges should have in view—The sufficiency and neatness of the fences and walks; the cleanness of the ground; the quality and choice of the crops; and the general productiveness of the garden.
8. Reports, stating the number of Competitors, the names of successful parties, and the nature of the exertions which have been made by them, must be transmitted by the Conveners to the Secretary *on or before the* 1*st November next.*
9. When a grant has expired, the District cannot apply again for aid for two years.

Parishes desirous of these Premiums must lodge applications with the Secretary *on or before the* 1*st November next.*

SECTION 2.—MEDALS FOR COTTAGES AND GARDENS OR GARDEN PRODUCE.

The Society will issue annually two Minor Silver Medals to a limited number of local Associations or individuals, who at their own expense establish Premiums for Cottages or Gardens under £15 of Rent. The Medals may be awarded for best kept Cottage, and best kept Garden or Flower Plot, or Garden Produce.

Local Associations or individuals desirous of these Medals, must lodge applications with the Secretary *on or before the 1st November next.*

The Premiums granted previous to 1887 are for five years; those granted in or after 1887 are for two years.

Argyllshire.

1. TIGHNABRUAICH HORTICULTURAL SOCIETY.—*Convener*, Robert Duncan, Royal Hotel, Tighnabruaich; *Secretary*, George Irvine Ardess, Tighnabruaich. Granted 1887.

Ayrshire.

2. CARRICK HORTICULTURAL SOCIETY.—*Convener*, Thomas Smith, The Castle, Maybole; *Secretary*, Robert Halliburton, Commercial Bank, Maybole. Granted 1885.

3. DAILLY HORTICULTURAL SOCIETY.—*Convener*, David Baxter, Ladyburn, Maybole; *Secretary*, Dr Shaw, Dailly, Maybole. Granted 1885.

Clackmannanshire.

4. CLACKMANNAN DISTRICT HORTICULTURAL SOCIETY.—*Convener*, Lord Balfour of Burleigh, Kennet House, Alloa; *Secretary*, J. T. M'Laren, Kennet, Alloa. Granted 1888.

Dumbartonshire.

5. VALE OF LEVEN AND DUMBARTON HORTICULTURAL SOCETY.—*Convener*, W. E. Gilmour, Woodbank, Alexandria; *Secretary*, Arch. M'Dougall, 13 Main Street, Alexandria, N.B. Granted 1888.

Dumfriesshire.

6. KIRKPATRICK-FLEMING HORTICULTURAL SOCIETY.—*Convener*, Col. J. G. Graham of Wyseby, Ecclefechan; *Secretaries*, John B. Leslie and C. F. Brown, Mossknow, Ecclefechan. Granted 1885.

Edinburghshire.

7. RATHO HORTICULTURAL SOCIETY.—*Convener*, John Usher of Norton, Ratho; *Secretary*, James Garden, 22 Scotland Street, Edinburgh, Granted 1886.

Haddingtonshire.

8. SALTON HORTICULTURAL SOCIETY.—*Convener*, John Fletcher of Salton, Pencaitland; *Secretary*, James Cameron, Salton Hall, Pencaitland. Granted 1887.

Inverness and Nairn shires.

9. CROY, PETTY, AND ARDERSIER HORTICULTURAL SOCIETY.—*Convener*, Duncan Forbes of Culloden, Inverness; *Secretary*, James Wedderspoon, Croy, Fort George Station. Granted 1886.

Stewartry of Kirkcudbright.

10. KIRKPATRICK-DURHAM HORTICULTURAL SOCIETY.—*Convener*, James M'Queen of Crofts, Dalbeattie; *Secretary*, James G. Clingan, Kirkpatrick-Durham, Dalbeattie. Granted 1886.

Lanarkshire.

11. BIGGAR HORTICULTURAL SOCIETY.—*Convener*, J. L. Murray of Heavyside, Biggar; *Secretary*, Andrew Smail, Biggar. Granted 1883. (In abeyance in 1887.)

12. BLANTYRE HORTICULTURAL SOCIETY.—*Convener*, John Craig of Bellsfield, Blantyre; *Secretary*, Arthur Gray, Stonefield, Blantyre. Granted 1884. (In abeyance in 1886 and 1887.)

13. EAST KILBRIDE HORTICULTURAL SOCIETY.—*Convener*, Arthur Gilmour, Crosshill, East Kilbride; *Secretary*, George S. Auchincloss, East Kilbride. Granted 1885.

14. LAW FLORAL AND HORTICULTURAL SOCIETY.—*Convener*, Sir W. C. Anstruther, Bart., Carmichael House, Thankerton; *Secretary*, James Gilchrist, Law Schoolhouse, Carluke. Granted 1884.

15. NEW VICTORIA GARDENS, POLLOKSHIELDS.—*Convener*, James Hunter, Braehead House, Cathcart; *Secretary*, Hugh Scott, 157 St Andrews Road, Pollokshields, Glasgow. Granted 1888.

16. RUTHERGLEN VICTORIA GARDENS ASSOCIATION.—*Convener*, Col. F. Robertson Reid of Gallowflat, Rutherglen; *Secretary*, J. Longmuir, 4 Gallowflat Place, Rutherglen. Granted 1884.

17. RUTHERGLEN HORTICULTURAL AND APIARIAN SOCIETY.—*Convener*, James Hunter, Coplawhill, Glasgow; *Secretary*, Eben. M'Nally, 13 Factory Lane, Rutherglen. Granted 1886.

18. STONEHOUSE HORTICULTURAL SOCIETY.—*Convener*, Thomas Tennant of Priestgill, Strathaven; *Secretary*, Archibald Brown, 6 Queen Street, Stonehouse. Granted 1886.

Linlithgowshire.

19. ABERCORN HORTICULTURAL SOCIETY.—*Convener*, Colonel Hare of Calder Hall; *Secretary*, William Wilson, Midhope, Hopetoun, South Queensferry. Granted 1884.

Nairnshire.

20. CAWDOR HORTICULTURAL AND INDUSTRIAL SOCIETY.—*Convener*, Robert Fraser, Brackla, Nairn; *Secretary*, John M'Arthur, Broomhill, Cawdor, Nairn. Granted 1884.

Perthshire.

21. ALMOND VALLEY HORTICULTURAL SOCIETY.—*Convener*, J. D. Lumsden, Pitcairnfield, Perth; *Secretary*, William Robertson, Huntingtowerfield, Perth. Granted 1884.

22. CAPUTH.—*Convener*, Sir Alex. M. Mackenzie of Delvine, Bart., Dunkeld; *Secretary*, R. Miller, Spittalfields, Caputh, Dunkeld. Granted 1883. (In abeyance in 1885, 1886, and 1887.)

23. COUPAR-ANGUS HORTICULTURAL SOCIETY.—*Convener*, Thomas Ferguson, Kinnochtry, Coupar-Angus; *Secretary*, John M. Muir, Coupar-Angus. Granted 1884.

24. LOGIEALMOND AND GLENALMOND HORTICULTURAL SOCIETY.—*Convener*, Viscount Stormont, Scone Palace, Perth; *Secretary*, Daniel Paton, Harrietfield, Perth. Granted 1888.

25. MENZIES FLOWER SHOW.—*Convener*, Sir Robert Menzies of Menzies, Bart.; *Secretary*, Peter Stevens, Weem, Aberfeldy. Granted 1887.

26. METHVEN HORTICULTURAL SOCIETY.—*Convener*, David M. Smythe, Methven Castle, Perth; *Secretary*, David Scrimgeour, Methven. Granted 1888.

Renfrewshire.

27. KILBARCHAN HORTICULTURAL SOCIETY.—*Convener*, Robert Wilson, Manswrae, Kilbarchan; *Secretary*, Archd. C. Buchanan, 4 Ewing Street, Kilbarchan. Granted 1886.

Stirlingshire.

28. CAMELON HORTICULTURAL SOCIETY.—*Convener*, Rev. John Scott, Camelon Manse, Falkirk; *Secretary*, Alex. Wardlaw, Lime Road, Falkirk. Granted 1885.

29. CAMPSIE HORTICULTURAL SOCIETY.—*Convener*, Lt.-Col. C. M. King, Antermony House, Milton of Campsie; *Secretary*, Matthew Gray, jun., Lennox Mill, Lennoxtown, Glasgow. Granted 1887.

30. TORRANCE AND BALDERNOCK HORTICULTURAL SOCIETY.—*Convener*, Sam. Macfarlane of Meadowbank, Torrance of Campsie; *Secretary*, John Scott, Torrance of Campsie. Granted 1888.

REGULATIONS.

1. Competitions may take place in the different districts for Cottages and Gardens, or for either separately.
2. The annual value of each Cottage, with the ground occupied in the parish by a Competitor, must not exceed £15.
3. If Competition takes place for Garden Produce in place of the best kept Garden, such produce must be *bona fide* grown in the Exhibitor's Garden, and he will not be allowed to make up a collection from any other Garden.
4. To warrant the award of the Medals, there must not be fewer than three Competitors.
5. Blank reports will be furnished to the Conveners and Secretaries of the different Districts. These must, in all details, be completed and lodged with the Secretary *on or before the 1st November next*, for the approval of the Directors, against whose decisions there shall be no appeal.
6. When a grant has expired, the District cannot apply again for aid for two years.

Section 3.—IMPROVING EXISTING COTTAGES.

To the Proprietor in Scotland who shall report the Improvement of the greatest number of Cottages during the years 1885, 1886, and 1887—The Gold Medal.

Section 4.—BUILDING NEW COTTAGES.

To the Proprietor in Scotland who shall report the Erection of the greatest number of approved Cottages during the years 1884, 1885, 1886, and 1887—The Gold Medal.

RULES OF COMPETITION.

1. Claims for the Premiums Nos. 3 and 4 must be lodged with the Secretary on or before the 1st of October next, to allow an inspection to be made of the different Cottages. The inspection will be conducted by a Committee of the Society's Members, and Reports must be transmitted to the Secretary *on or before the* 1*st November next.*

2. The annual value of the Cottage or Cottages separately, with the garden ground, must not exceed £5.

3. In estimating the claims of the Competitors, the following points will be kept in view:—The external appearance of the Cottages; their internal accommodation; the arrangements of the out-houses; the means of drainage and ventilation; and the expense of the building or of the alteration, compared with its durability and accommodation. When the Cottages of one Competitor are superior in style and comfort to those of another, though not so numerous, the Inspectors will give them preference, provided they amount at least to three, and have been erected at a moderate expense.

4. Parties competing will forward to the Society Plans, Specifications, and Estimates, of which, and of all information sent therewith, copies may be taken for publication, if the Society shall see fit, and the originals returned to the parties within six months, if desired.

HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND.

GENERAL SHOW OF STOCK AND IMPLEMENTS

AT

GLASGOW,

ON 24TH, 25TH, 26TH, AND 27TH JULY 1888.

LAST DAYS OF ENTRY.

Implements and other Articles—Friday, 11th May.
Stock, Poultry, and Dairy Produce—Friday, 8th June.
No Entry received later than those posted on Friday night, 8th June.
Covered Booths for Offices—Friday, 8th June.

President of the Society.

HIS GRACE THE DUKE OF PORTLAND, Wellbeck Abbey, Notts.

Convener of the Local Committee.

COLONEL W. W. HOZIER of Mauldslie, Carluke.

The District connected with the Show comprises the Counties of Lanark, Ayr, Argyll, Renfrew, and Bute.

REGULATIONS.

GENERAL CONDITIONS.

1. The Competition is open to Exhibitors from all parts of the United Kingdom.

2. Every Lot must be intimated by a Certificate of Entry, lodged with the Secretary *not later than the 11th May for Implements and other Articles, and 8th June for Stock, Poultry, and Dairy Produce.* No Entry can be received later than those posted on Friday night, 8th June. Printed forms will be issued on application to the Secretary, No. 3 George IV. Bridge, Edinburgh. Admission Orders will be forwarded to Exhibitors, by post, previous to the Show.

3. Protests against the awards of the Judges, or against a violation of the judging regulations, must be lodged with the Secretary not later than 9 A.M. on Wednesday, 25th July, and parties must be in attendance at the Committee Room, in the Showyard, at 9.30 A.M. that day, when protests will be disposed of. All protests must be accompanied by the deposit of £2, 2s., and if not sustained the sum will be forfeited at the discretion of the Board.

4. Protests lodged for causes which the protestor produces no good evidence to substantiate, will render him liable to be reported to the Board of Directors, with the view, if they see reason, of his being prohibited from again entering Stock for a General Show.

5. The Society shall not be liable for any loss or damage which Stock, Poultry, Implements, or other articles may sustain at the Show, or in transit.

6. The decisions of the Board of Directors are final in all questions respecting Premiums and all other matters connected with the Show, and it shall not be competent for any Exhibitor to appeal against such decisions to, nor seek redress in respect of them from, any other tribunal.

7. Covered Booths for Offices (9 feet by 9 feet), purely for business, not for exhibition of goods, can be had for £3, 10s. to Members and £5 to Non-Members. Intimation to be made to the Secretary on or before the 8th of June.

8. No lights allowed in the Yard at night, and Smoking is strictly prohibited within the sheds. Those infringing this rule will be fined 10s.

9. As the command of water in the Yard is limited, it is particularly requested that waste be avoided.

10. When the ground requires to be broken, the turf must be carefully lifted and laid aside, and the surface must be restored to the satisfaction of the Society, and at the expense of the Exhibitor.

11. All persons admitted into the Showyard shall be subject to the Rules and Orders of the Directors.

12. The Stewards have power to enforce the Regulations of the Society in their different departments, and to bring to the notice of the Directors any infringement thereof.

13. All persons in charge of Stock or other Exhibits shall be subject to the orders of the Stewards.

14. The violation by an Exhibitor of any one of the Regulations will involve the forfeiture of all Premiums awarded to him, or of such a portion as the Directors may ordain.

15. Railway Passes for unsold Stock and Implements must be applied for at the Committee Room in the Yard between 9 and 11 o'clock on the forenoon of Thursday and Friday.

16. The Show terminates at 5 P.M. on Friday, 27th July, and no animal or article can be withdrawn before that hour. Steam Engines not till 6 o'clock. Stock and Implements may remain in the Yard till Saturday afternoon.

17. The Premiums awarded will be paid in November 1888, and, with the exception of the Tweeddale Gold Medals and the Silver Medals, may be taken either in money or in plate.

STOCK AND POULTRY.

18. Poultry and Stock will be admitted on Monday, 23rd July, and, with the exception of Horses, must be in the Yard before 12 o'clock that night. Horses must be in before 8 o'clock on the morning of Tuesday except those entered for Jumping only, which do not require to be in till Wednesday morning before 8 o'clock. Judging to commence at 10 A.M. on Tuesday, 24th July. Exhibited on Tuesday, Wednesday, Thursday, and Friday, 24th, 25th, 26th, and 27th July. Stock may be admitted on Saturday the 21st July, but only by sending information to the Secretary before the 14th July.

19. All former prize animals are eligible to compete.

20. All animals, except calves, foals, and lambs shown with their dams, must be entered in the sections applicable to their ages, and cannot be

withdrawn after entry. *Intention to compete for Family Group prizes must be notified at the time the other entries are made.*

21. No animal to be allowed to compete in more than one section, except for Jumping, the Turn-out, and Tandem Sections; and also for the Family Group prizes, animals for which must be drafted from the regular classes. The numbers of the animals constituting the family groups must be handed to the Steward before the animals are brought out for judging.

22. Shorthorn, Aberdeen-Angus, and Galloway animals must be entered in the herd books, or the Exhibitor must produce evidence that his animal is eligible to be entered therein.

23. Stock must be *bona fide the property and in the possession of* the Exhibitor on the last day of Entry, except where otherwise allowed in the Family Group prizes.

24. The Schedule of Entry must be filled up so far as within the knowledge of the Exhibitor.

25. The name of the Breeder, if known, must be given, and if the Breeder is not known, a declaration to that effect, signed by the Exhibitor, must be sent along with the Schedule, and no pedigree will be entered in the Catalogue when the Breeder is unknown.

26. Should it be proved to the satisfaction of the Directors that an animal has been entered under a false name, pedigree, or description, for the purpose of misleading the Directors or Judges as to its qualification or properties, the case shall be reported to the first General Meeting, in order that the Exhibitor shall be disqualified from again competing at the Society's Shows, and his name, if he be a member, struck from the roll, or his case otherwise disposed of as the Directors may determine.

27. When an animal has previously been disqualified by the decision of any Agricultural Association in Great Britain or Ireland, such disqualification shall attach, if the Exhibitor, being aware of the disqualification, fail to state it, and the grounds thereof, in his entry, to enable the Directors to judge of its validity.

28. Breeding Stock must not be shown in an improper state of fatness, and the Judges are requested not to award Premiums to overfed animals.

29. No animal when before the Judges shall bear on its rug, harness, or other fittings, any initial, crest, or mark of ownership, nor be distinguished otherwise than by the number indicating its place in the Catalogue.

30. Horses and Cattle must be paraded when required by the Stewards, and under their direction.

31. Exhibitors shall be answerable for all acts, whether committed by themselves, their servants, or others in charge of their Stock, and shall be responsible for the condition of their animals during the whole time they remain in the Showyard.

32. No animal to be taken out of its stall after 10 A.M. during the Show except by order of the Stewards, or with permission of the Secretary. Those infringing this Rule will be fined 10s.

33. Aged Bulls and Stallions must have had produce, and, along with Two-year-old Bulls, Three-year-old Colts, and aged Tups, have served within the year of the Show.

34. All Cows must have had calves previous to the Show, and when exhibited they must either be in milk or in calf; if in milk, birth must have been within 9 months of the Show; if in calf, birth must be certified within 9 months after the Show. This Rule does not apply to animals in Family Groups.

35. Cows in the Family Groups must have had calves previous to the Show, and when exhibited they must be either in milk or in calf. Two-year-old Heifers in the Family Group Prizes to be certified to have been

served before the Show, except Ayrshire and Highland Heifers, which need not be served till 3 years old.

36. All Milk Cows of the Ayrshire breed must be in the Yard on the evening of Monday, 23rd July, before 8 o'clock, after which they will be inspected by the Veterinary Surgeon, or other official of the Society, between 8 and 9 o'clock, to see if they have been milked dry; and if not, they must be milked under his direction, and, after the judging, all Milk Cows must be milked morning and evening.

37. Any artificial contrivance or device of any description found on or proved to have been used on an animal, either for preventing the flow of milk or for any other improper purpose, will disqualify that animal from being awarded a Premium, and the Owner of said animal will be prohibited from again entering stock for any of the Society's General Shows, or for such a period as the Directors may see fit.

38. Two-year-old Heifers—of the Shorthorn, Aberdeen-Angus, and Galloway Breeds—must be in calf when exhibited, and the premiums will be withheld till birth be certified, which must be within 9 months after the Show. This Rule does not apply to Animals in the Family Groups.

39. Animals of any age that have had a calf must be shown as Cows.

40. Mares in Section 5 must have produced foals after 1st January 1888, and foals must be at foot. Mares in Section 6 must be in foal, and awards will be suspended till birth is certified, which must be within 11 months from the date of the Show.

41. With reference to regulations 34 and 38, birth of at least a seven months' calf must be certified; and in regard to regulation 40, birth of at least a nine months' foal.

42. Horses entered as Hunters must be tried over the leaping bar if required by the Judges.

43. Judges are particularly requested to satisfy themselves, as far as possible, regarding the soundness of all Horses before awarding the Prizes, and to avoid giving a preference to animals showing symptoms of hereditary diseases. The Judges may consult the Society's Veterinary Surgeon if they deem it expedient. No protests on veterinary grounds will be received.

44. All Ewes must have reared Lambs in 1888; and Ewes of the Black-faced and Cheviot Breeds must be in milk, and have their Lambs at foot.

45. Sheep must have been clipped bare after 1st January 1888, and the Judges are instructed to examine the fleeces of the Sheep selected for prizes, and to cast those on which they find any of the former fleece.

46. Sows must have reared pigs in 1888 or be in pig; and Pigs must belong to the same litter, and be uncut.

47. In Poultry the Aged Birds must have been hatched previous to, and Cockerels and Pullets in 1888.

48. Bulls must be secured by nose rings, with chains or ropes attached, or with strong halters and double ropes. All cattle must be tied in their stalls.

49. Servants in charge of Stock must bring their own buckets or pails, and a piece of rope to carry their forage.

50. Loose boxes will be provided for Stallions, Three, Two, and One year-old entire Colts, and for Mares with foals at foot; closed-in stables for all the other horses, and covered accommodation for the whole of the other stock.

51. Straw, hay, grass, and tares will be provided free by the Society during the four days of the Show, and half allowance on Monday; other kinds of food will be supplied at fixed prices in the forage yard. Any servant removing bedding from an adjoining stall will be fined in double the amount taken. Exhibitors may fetch their own cake or corn to the Yard, but not grass, tares, hay, nor straw. Coops, food, and attendance for Poultry will be found by the Society.

52. Cattle, Sheep, Swine, or Poultry cannot be removed from the Yard till 5 P.M. on Friday, 27th July, except on certificate by the Veterinary Surgeon employed by the Directors, countersigned by the Steward of the department and the Secretary.

53. Horses may be withdrawn at six o'clock each evening on a deposit of £5 for each animal, which shall be forfeited, along with any prize money it may have gained, if the animal is not brought back. They must return between half-past seven and 8 o'clock the following morning, and those not in before eight will forfeit 10s. Horse passes to be applied for at the Committee Room between 5 and 6 P.M. on Tuesday, and the deposit will be returned between 12.30 and 2.30 on Friday.

54. When the Stock is leaving the Yard, no animal is to be moved till ordered by those in charge of clearing the Yard. Those transgressing this Rule will be detained till all the other Stock is removed, and fined 10s.

JUDGING STOCK AND POULTRY.

55. On Tuesday, 24th July, no person will be admitted, except Servants in charge of Stock, till 8 A.M., when the Gates are opened to the public.

56. The Judges will commence their inspection at 10 A.M. The space reserved for the Judges will be enclosed by ropes, and no encroachment will be permitted. In no case shall a Premium be awarded unless the Judges deem the animals to have sufficient merit; and where only one or two lots are presented in a section, and the Judges consider them unworthy of the premiums offered, it shall be in their power to award a lower prize, or to suggest the removal of any lot which appears to them unworthy of being placed in the Yard.

57. In addition to the Premiums, the Judges are authorised to award three Commendations in each section (except Poultry, where only two prizes are to be awarded), if the entries are numerous and the animals of sufficient merit. These Commendations to consist of:—Very Highly Commended, Highly Commended, and Commended.

58. The animals in Section 12 (Ayrshire Breed) which have not calved before the Show, will be judged along with the Cows in Calf, and those in Section 13 which have calved before the Show will be judged along with Cows in Milk.

59. Two Members of Committee and a Director will attend each section of the Judges. It will be their duty to see that no obstruction is offered to them, and that the space reserved for them is not encroached on; to ticket the prize animals; to assist the Judges in completing their reports; and should any difficulty arise to communicate with the Stewards.

60. It shall not be competent for any Exhibitor, nor for his Factor or Land-Steward, to act as a Judge or attending Member in any class in which he is competing.

DAIRY PRODUCE.

61. Dairy Produce will be received in the Showyard on Monday, 23rd July, and till 8 A.M. on Tuesday, 24th July. Judged at 10 A.M. on Tuesday. Exhibited Tuesday, Wednesday, Thursday, and Friday, 24th, 25th, 26th, and 27th July.

62. Dairy Produce must have been made on the Exhibitor's farm in 1888. Only one lot of each variety of Butter is allowed from each farm. At least 1 cwt. of the variety of Butter and 2 cwt. of that of the Cheese exhibited must have been made during the Season. The lots must be fair samples, and untasted. No lot can be removed from the Yard till 5 P.M. on Friday, 27th July.

STALL RENT.

63. The following rates shall be paid by Exhibitors when making their Entries:—

	Members. s.	Members. d.	Non-Members. s.	Non-Members. d.
Cattle, each,	15	0	25	0
Boxes for Stallions—3 and 2 year-old entire Colts, and Mares with Foals at foot,	30	0	40	0
Boxes for one year-old entire Colts,	20	0	30	0
Stallions, 12 hands and under,	15	0	20	0
Mares or Geldings, 12 hands and under,	10	0	15	0
All other Horses, each,	20	0	30	0
Sheep, per pen,	10	0	15	0
Swine, per pen,	15	0	20	0
Poultry, each entry,	3	0	5	0
Dairy Produce, each entry,	4	0	6	0
Covered Booths for offices, 9 feet by 9 feet,	70	0	100	0
Newspaper offices, . . £2, 10s.				

FINE FOR STOCK NOT FORWARD.

64. In order to lessen the number of vacant Stalls, the following fines will be imposed on all Exhibitors whose animals are not forward:—For Horses, 40s.; Cattle, 20s.; Sheep and Swine, 10s.; Poultry, 5s.;—this fine to be in addition to Entry Money. In the case of death or illness of an animal, a Veterinary Surgeon's Certificate is necessary for a remit of the fine.

IMPLEMENTS AND OTHER ARTICLES.

65. Implements will be received in the Yard on Tuesday, 17th July, and till 5 o'clock on the afternoon of Monday, 23rd July. Exhibited Tuesday, Wednesday, Thursday, and Friday, 24th, 25th, 26th, and 27th July. The Schedule of Entry must be filled up so far as within the knowledge of the Exhibitor, and prices must be stated.

66. No Money Prizes or Medals will be given for implements of any kind, and no inspection of them by Judges will take place, except those specified at page 17.

67. Agricultural Implements, and Implements and collections of articles not Agricultural, will be received for Exhibition, but the Secretary will be entitled to refuse Entries from dealers in articles not deemed worthy of Exhibition.

68. Implements will be placed in the following sections, viz.:—1st, Under Cover, for Agricultural Implements; 2nd, Open, for Agricultural Implements; 3rd, Exhibits not Implements of Husbandry, which will be placed apart from the Agricultural Implements, either under cover or open, as may be deemed necessary by the Secretary; 4th, Motion Yard; 5th, Open space for Agricultural Implements from local country operative Blacksmiths and Carpenters. See below.* Exhibitors must specify the space they require.

69. The articles of each Exhibitor must be all placed in one stand, except implements in motion, and must not on any account extend beyond the width allowed. No article to be moved out of its stand, or the stand dismantled, till the termination of the Show, at 5 P.M., on Friday, 27th July. Those infringing this rule will be fined 10s.

70. Exhibitors must arrange their own articles *within* the space

* In order to encourage exhibits of Agricultural Implements from local country operative Blacksmiths and Carpenters, open space will be provided for these in some less prominent part of the Yard at a charge of Entry Money of 1s. per running foot of frontage, 20 feet deep.

allotted to them before 9 o'clock on Tuesday the 24th July, and to the satisfaction of the Stewards in charge of the Implement Yard.

71. All Machines requiring steam or fire must be entered as such in the Certificate; and will be placed in the Motion Yard. *Coke or anthracite Coal must be used in all cases where fire is required.*

72. No Steam Engine shall be driven in the Yard at a greater speed than 4 miles an hour.

73. Locomotive and Traction Engines and other Machines must not be moved from their places without permission of the Stewards, and must not leave their stands till 6 P.M. on Friday.

74. There must be attached to each Implement, when forwarded to the Show, a label bearing the Exhibitor's name, and that of the implement.

75. The carriage of all Implements must be prepaid.

STALL RENT.

76. Ground to be taken in spaces of 10 feet frontage by 20 feet deep, except in Motion Yard, which is to be 10 feet or any larger amount of frontage by 50 feet deep. Except for exhibits not agricultural, no boarding shall exceed 4 feet in height.

77. The following rates shall be paid by Exhibitors when making their Entries :—

	Members.	Non-Members.
Implement Shedding, 20 feet deep, 8 feet high, per 10 feet, ...	£1 5 0	£1 15 0
Implements without Shedding, 20 feet deep, per 10 feet,	1 5 0	1 15 0
Implement space in Motion Yard, without Shedding, 50 feet deep, per foot, ...	0 2 6	0 3 6
And with Shedding, 20 feet deep, 12 feet high, per foot, ...	0 6 0	0 8 0
Covered Booths for offices, 9 feet by 9 feet each, .	3 10 0	5 0 0
Newspaper offices, each, ... £2, 10s.		

ADMISSION TO YARD.

The Public will be admitted on Tuesday, 24th July, at 8 A.M. The inspection by the Judges commences at 10 A.M. The charges will be—Tuesday, from 8 A.M. till 5 P.M., 5s.; Wednesday, from 8 A.M. till 5 P.M., 3s.; Thursday, from 8 A.M. till 5 P.M., 1s.; Friday, from 8 A.M. till 5 P.M., 1s.

Members of the Society are admitted to the Showyard without payment, on exhibiting a "*Member's Ticket*," which is strictly not transferable. Tickets will be sent to all members residing in the United Kingdom whose addresses are known, and on no account will duplicates be issued. All Members not producing their tickets must pay at the gate, and the admission money will not be returned.

Exhibitors of Stock (not Members) are admitted free on producing their tickets.

Exhibitors of Implements (not Members) and their attendants will be entitled to free entry during the Show, but must remain at their stalls during the judging of the Stock on Tuesday.

Tickets for attendants on Stock and Implements are not available to admit to the Yard between 11 A.M. and 5 P.M.; and any attendant requiring to leave the Yard during the day, cannot be again admitted except by a special pass (to be applied for at the Ticket Gate), which must be given up on his return.

Placards, except those of the Society, are prohibited both inside the Showyard and on the outside of the Boundary Fence, with the exception of those belonging to Exhibitors, whose right is confined to their own stalls. No newspapers or any other article allowed to be carried about the Yard for sale or display. No strolling bands or musicians admitted.

No Carriages or Equestrians admitted without special leave from the Directors, and then only for Invalids. Bath chairs may be brought in.

Premium Lists, Regulations, and Certificates of Entry may be obtained by applying at the Secretary's Office, No. 3 George IV. Bridge, Edinburgh.

All Communications should be addressed to FLETCHER NORTON MENZIES, Esq., *Secretary of the Highland and Agricultural Society of Scotland, No. 3 George IV. Bridge, Edinburgh.*

LAST DAYS OF ENTRY.

IMPLEMENTS AND OTHER ARTICLES—Friday, 11th May.

STOCK, POULTRY, AND DAIRY PRODUCE—Friday, 8th June.

No Entry received later than those posted on Friday night, 8th June.

COVERED BOOTHS FOR OFFICES—Friday, 8th June.

RAILWAY ARRANGEMENTS.

The Railway Companies will be furnished with a list of the Exhibitors of Stock, after the 1st of July, and all applications for horse-boxes and trucks, and for information as to arrangements of Special Trains, must be made by the Exhibitors themselves with the Station-master where their stock is to be trucked.

The Scotch Railway Companies have adopted the following Regulations:—

BY PASSENGER TRAIN.

1. Live Stock *to* the Show to be charged ordinary rates.
2. Live Stock *from* the Show, *if sold*, to be charged ordinary rates.
3. Live Stock *from* the Show, *if unsold*, to be conveyed at half rates back to the station whence they were sent at owners' risk, on production of a certificate from the Secretary of the Agricultural Show to the effect that they are really unsold; failing production of such certificate, ordinary rates must be charged. The reduction to half rate is to be allowed only when the animals are returned by the same route as that by which they were conveyed to the Show.

If the unsold Live Stock which was conveyed on the outward journey by Goods Train in cattle trucks be required to be returned by Passenger Train in horse-boxes, half the Passenger Train rates must be charged.

4. HORSES.—By Passenger or Special Train.
   (*a*) A Stallion to be charged the rate for one Horse, plus 50 per cent.
   (*b*) Any other Horse, for which the exclusive use of a horse-box is *ordered*, to be charged the rate for one horse, plus 50 per cent.
   (*c*) Other Horses to be charged at ordinary rates.
5. BULLS, COWS, AND OTHER ANIMALS—
   (*a*) A Bull, Cow, or other Animal sent in a horse-box, and for which the exclusive use of the box *has been ordered*, to be charged the rate for two Horses. (Great North of Scotland Railway, plus 25 per cent.)
   (*b*) Bulls, Cows, or other animals sent in horse-boxes, but for which the exclusive use of the box *has not been ordered*, to be charged each the rate for one Horse, plus 50 per cent. (Great North of Scotland Railway, plus 25 per cent.)
6. Unsold Live Stock transferred from one Agricultural Show to another, in another part of the country, must be charged ordinary rates.
7. POULTRY.—The Companies give notice that they are not common carriers of poultry; they will, however, to accommodate the public,

carry such by special agreement only, and at special rates, to be obtained at the Companies' stations.

8. Provender conveyed to Agricultural Shows with Live Stock is to be charged ordinary rates, except so much of the same as may be required on the journey.

9. Dogs to be charged full rates both ways.

10. All the above to be carried at owners' risk.

11. Collection and delivery to be performed in all cases by the owners.

12. Men, certified by the owners to be *bona fide* in charge of Live Stock to be conveyed free in the same train as the animals, as follows:—

One man for each consignment, except when the consignment requires more than one vehicle, when one man for each vehicle may be sent free.

NOTE.—*Upon both the outward and homeward journey a separate certificate must be given, which must be retained by the station-master at the outward or homeward starting-point, as the case may be.*

13. For men in charge of Horses or other Live Stock forwarded by Passenger Train, no separate pass must be issued; the only form of pass must be the endorsement of the station clerk written across the horse ticket, which must be delivered up on the arrival of the animals at their destination.

BY GOODS TRAIN.

Live Stock.

1. Live Stock *to* the Show to be charged ordinary rates.

2. Live Stock *from* the Show, *if sold*, to be charged ordinary rates.

3. Live Stock *from* the Show, *if unsold*, to be conveyed at half rates back to the station whence they were sent at owners' risk, on production of a certificate from the Secretary of the Agricultural Show to the effect that they are really unsold; failing production of such certificate, ordinary rates must be charged. The reduction to half rate is to be allowed only when the animals are returned by the same route as that by which they were conveyed *to* the Show.

If the unsold Live Stock which was conveyed on the outward journey by Passenger Train in horse-boxes be required to be returned by Goods Train in cattle trucks, half the Goods Train rates must be charged.

4. Live Stock rates are "station to station" only.

5. Unsold Live Stock transferred from one Agricultural Show to another, in another part of the country, must be charged ordinary rates.

6. POULTRY.—The Companies give notice that they are not common carriers of Poultry. They will, however, to accommodate the public, carry such by special agreement only, and at special rates, to be obtained at the Companies' stations.

7. Horse-boxes must not be provided for the carriage of Live Stock sent by Goods Train and invoiced at Goods Train rates.

8. Provender conveyed to Agricultural Shows with Live Stock is to be charged ordinary rates, except so much of the same as may be required on the journey.

9. Men, certified by the owners to be *bona fide* in charge of Live Stock, to be conveyed free in the same train as the animals; the number not to exceed one man to each vehicle.

NOTE.—*Upon both the outward and homeward journey a separate certificate must be given, which must be retained by the station-master at the outward or homeward starting-point as the case may be.*

10. For men in charge of Live Stock forwarded by Goods Train, no separate pass must be issued, but the form of pass must be printed on the Live Stock Ticket, which must be delivered up on the arrival of the Live Stock at their destination.

Agricultural Machines and Implements.

The application of the following Regulations for the conveyance of Agricultural Implements should not be extended to articles other than Implements of husbandry.

11. Agricultural Machines and Implements *to* the Show to be charged ordinary rates.

12. Agricultural Machines and Implements *from* the Show, *if sold*, to be charged ordinary rates.

13. Agricultural Machines and Implements *from* the Show, *if unsold*, to be conveyed at half rates back to the station whence they were sent, on production of a certificate from the Secretary of the Agricultural Show to the effect that they are really unsold; failing production of such certificate, ordinary rates must be charged. The reduction to half rate is to be allowed only when the articles are returned by the same route as that by which they were conveyed to the Show.

14. Unsold goods transferred from one Agricultural Show to another, in another part of the country, must be charged ordinary rates.

15. Agricultural Societies' Show Plant must be charged at Special Class rates, station to station.

16. All the above to be carried at owners' risk.

17. Collection and delivery to be performed in all cases by the owners.

PREMIUMS.

In addition to the Premiums, the Judges are authorised to award three Commendations in each Section (except Poultry, where only two Prizes are to be awarded), if the Entries are numerous, and the animals of sufficient merit. These Commendatious to consist of—Very Highly Commended, Highly Commended, and Commended.

All former Prize animals are eligible to compete.

Family Groups must be notified at the time the other Entries are made.

The Directors are willing to accept suitable Champion Cups or Prizes, of not less than £10 in value, for the recognised Breeds of Cattle, Horses, and Sheep, &c. Intimation to be made to the Secretary on or before 1st May.

CLASS I.—CATTLE.

SHORTHORN.

Section		Premiums. 1st. £	2d. £	3d. £	
	Tweeddale Gold Medal for Best Bull, .	20	—	—	
1.	Bull calved before 1st Jan. 1886, . .	20	10	5	
	Breeder of best Bull,—The Silver Medal.				
2.	Bull calved on or after 1st Jan. 1886, .	20	10	5	
3.	Bull calved on or after 1st Jan. 1887, .	15	8	4	
4.	Cow of any age, ...	15	8	4	
5.	Heifer calved on or after 1st Jan. 1886, .	10	5	3	
6.	Heifer calved on or after 1st Jan. 1887 .	10	5	3	
					£180

Carry forward £180

Brought forward, ... £180

AYRSHIRE.

Section		Premiums. 1st. £	2d. £	3d. £	
7.	Bull calved before 1st Jan. 1886, . .	20	10	5	
	Breeder of best Bull,—The Silver Medal.				
8.	Bull calved on or after 1st Jan. 1886, .	15	8	5	
9.	Bull calved on or after 1st Jan. 1887, .	10	5	3	
10.	Cow in Milk, calved before 1st Jan. 1885, .	15	8	4	
11.	Cow in Milk, calved on or after 1st Jan. 1885,	15	8	4	
12.	Cow in Milk or in Calf, of any age, bred by Exhibitor, ...	15	8	4	
13.	Cow in Calf, calved before 1st Jan. 1885, .	10	5	3	
14.	Heifer calved on or after 1st Jan. 1886, .	10	5	3	
15.	Heifer calved on or after 1st Jan. 1887, .	8	5	3	
					214

ABERDEEN-ANGUS.

16.	Bull calved before 1st Dec. 1885, . .	20	10	5	
	Breeder of best Bull,—The Silver Medal.				
17.	Bull calved on or after 1st Dec. 1885, .	20	10	5	
18.	Bull calved on or after 1st Dec. 1886, .	15	8	4	
19.	Cow of any age, ...	15	8	4	
20.	Heifer calved on or after 1st Dec. 1885, .	10	5	3	
21.	Heifer calved on or after 1st Dec. 1886, .	10	5	3	
					160

GALLOWAY.

22.	Bull calved before 1st Jan. 1886, . .	20	10	5	
	Breeder of best Bull,—The Silver Medal.				
23.	Bull calved on or after 1st Jan. 1886, .	20	10	5	
24.	Bull calved on or after 1st Jan. 1887, .	15	8	4	
25.	Cow of any age, ...	15	8	4	
26.	Heifer calved on or after 1st Jan. 1886, .	10	5	3	
27.	Heifer calved on or after 1st Jan. 1887, .	10	5	3	
					160

HIGHLAND.

28.	Bull calved before 1st Jan. 1885, . .	20	10	5	
	Breeder of best Bull,—The Silver Medal.				
29.	Bull calved on or after 1st Jan. 1885, .	20	10	5	
30.	Bull calved on or after 1st Jan. 1886, .	15	8	4	
31.	Cow of any age, ...	15	8	4	
32.	Heifer calved on or after 1st Jan. 1885, .	10	5	3	
33.	Heifer calved on or after 1st Jan. 1886, .	10	5	3	
					160
					£874

CLASS II.—HORSES.

FOR AGRICULTURAL PURPOSES.

A Silver Medal (value £3) will be given by the Clydesdale Horse Society to the breeder of the best registered Clydesdale in each of the sections 1 to 9 inclusive.

The Clydesdale Horse Society have also intimated that they will offer premiums for—(1) family group of five yearling colts or fillies got by one sire; (2) family group of five two-year-old colts or fillies got by one sire; (3) family group composed of mare and two of her progeny. A first, second, and third prize will be offered in each class, the amounts of which will not be less than the premiums usually offered by the Glasgow Agricultural Society. All the competing sires and all the animals composing the various groups must be registered in the Clydesdale Stud-Book.

Animals competing for the Family Group prizes must be drafted from the regular classes. *See* Regulation No. 21.

Section		Premiums. 1st. £	2d. £	3d. £	4th. £	
1.	Stallion foaled before 1st Jan. 1885, Breeder of best Stallion,—The Silver Medal.	25	15	10	5	
2.	Entire Colt foaled on or after 1st Jan. 1885, . . .	20	15	10	5	
3.	Entire Colt foaled on or after 1st Jan. 1886, . . .	20	10	6	3	
4.	Entire Colt foaled on or after 1st Jan. 1887, . . .	12	7	4	2	
5.	Mare (with Foal at foot) foaled before 1st Jan. 1885, . .	20	10	5	3	
6.	Mare (in Foal) foaled before 1st Jan. 1885, ...	20	10	5	3	
7.	Filly foaled on or after 1st Jan. 1885,	10	6	3	2	
8.	Filly foaled on or after 1st Jan. 1886,	10	6	3	2	
9.	Filly foaled on or after 1st Jan. 1887,	10	6	3	2	
10.	Draught Gelding of any age, .	8	4	2	—	
						322
	HUNTERS AND ROADSTERS.					
11.	Mare or Gelding, suitable for field, foaled before 1st Jan. 1885, .	15	8	4		
12.	Mare or Gelding, suitable for field, foaled on or after 1st Jan. 1885, .	15	8	4		
13.	Mare or Gelding, suitable for field, foaled on or after 1st Jan. 1886, .	10	5	3		
14.	Mare or Gelding, suitable as Hackney,	8	4	2		
	Carry forward,	48	25	13		£322

HUNTERS AND ROADSTERS—*continued.*

Section		Premiums. 1st. £	2d. £	3d. £	
	Brought forward,	48	25	13	£322
15.	Mare or Gelding, suitable for driving, 3 years old and upwards, to be shown in harness and driven,	10	5	3	
16*	Best One Horse Turn-out, . .	10	5	3	
17*	Best Tandem Turn-out, . .	10	5	3	
18*	Mare or Gelding, for jumping, .	20	10	5	
					175
	PONIES.				
19.	Stallion, 15 hands and under, .	6	3	1	
20.	Mare or Gelding, between 13 and $14\frac{1}{2}$ hands, . . .	6	3	1	
21.	Mare or Gelding, between 12 and 13 hands, . . .	6	3	1	
22.	Mare or Gelding, under 12 hands, .	6	3	1	
23.	Shetland Stallion, not exceeding $10\frac{1}{4}$ hands, ...	4	2	1	
24.	Shetland Mare or Gelding, not exceeding $10\frac{1}{4}$ hands, . .	4	2	1	
25*	Ponies, 14 hands and under, for jumping, ...	5	3	1	
					63
					£560

* Animals entered in the other Sections may compete for Jumping, Best Turn-out, and Tandem Sections. Animals entered for Jumping only do not require to come to the Showyard till Wednesday morning before 8 o'clock.

CLASS III.—SHEEP.

Section		Premiums. 1st. £	2d. £	3d. £	
	BLACKFACED.				
1.	Tup, three shear and upwards, . .	12	8	4	
2.	Tup, two shear, ...	12	8	4	
3.	Shearling Tup, ...	12	8	4	
4.	Three Ewes above one shear, with their Lambs at foot, ...	10	5	2	
5.	Three Shearling Ewes or Gimmers, .	10	5	2	
					106
	CHEVIOT.				
6.	Tup above one shear, ...	12	8	4	
7.	Shearling Tup, ...	12	8	4	
8.	Three Ewes above one shear, with their Lambs at foot, ...	10	5	2	
9.	Three Shearling Ewes or Gimmers, .	10	5	2	
					82

Carry forward, ... £188

		1st.	2d.	3d.	
	Brought forward,	...		...	£188
		Premiums.			
	BORDER LEICESTER.	1st.	2d.	3d.	
Section		£	£	£	
	Tweeddale Gold Medal for best Tup, .	20	0	0	
10.	Tup above one shear, . . .	12	8	4	
11.	Shearling Tup, ...	12	8	4	
12.	Three Ewes above one shear, . .	10	5	2	
13.	Three Shearling Ewes or Gimmers, .	10	5	2	
					102
	LONG-WOOLLED OTHER THAN BORDER LEICESTER.				
14.	Tup above one shear, . . .	3	2	—	
15.	Shearling Tup, ...	3	2	—	
16.	Three Ewes above one shear, . .	3	2	—	
17.	Three Shearling Ewes or Gimmers, .	3	2	—	
					20
	SHROPSHIRE.				
18.	Tup above one shear, . . .	10	5	3	
19.	Shearling Tup, ...	10	5	3	
20.	Three Ewes above one shear, . .	8	4	2	
21.	Three Shearling Ewes or Gimmers, .	8	4	2	
					64
	SHORT-WOOLLED OTHER THAN SHROPSHIRE.				
22.	Tup above one shear, . . .	10	5	3	
23.	Shearling Tup, ...	10	5	3	
24.	Three Ewes above one shear, . .	8	4	2	
25.	Three Shearling Ewes or Gimmers, .	8	4	2	
					64
	EXTRA SECTIONS.				
26.	Three Blackfaced Wethers, two or three shear,	4	2	1	
	Cup for heaviest one shear Blackfaced Wether (value £10).*				
27.	Three Blackfaced Wethers, one shear, .	4	2	1	
28.	Three Cheviot Wethers, not above three shear, ...	4	2	1	
29.†	Three Cross Bred Wethers, one shear, .	4	2	1	
					28

SHEPHERDS.

	1st.	2d.	3d.	4th.	
To the Shepherd for feeding Prize Shearling Blackfaced Wethers, .	(30/	25/	15/	10/‡)	
					£466

* Given by Mr Howatson of Glenbuck.

† Cross Bred Wethers must be the offspring of any Whitefaced or Short-Woolled Tup with Blackfaced Ewes, or the progeny of Blackfaced Tups with Whitefaced or Short-Woolled Ewes.

‡ Given by Breeders of Blackfaced Sheep.

CLASS IV.—SWINE.

Section		Premiums. 1st. £	2d. £	3d. £	
	LARGE BREED.				
1.	Boar,	5	3	1	
2.	Sow,	4	2	1	
3.	Three Pigs, not above 8 months old,	4	2	1	£23
	BLACK OR SHIRE.				
4.	Boar,	5	3	1	
5.	Sow,	4	2	1	
6.	Three Pigs, not above 8 months old,	4	2	1	23
	MIDDLE WHITE BREED.				
7.	Boar,	5	3	1	
8.	Sow,	4	2	1	
9.	Three Pigs, not above 8 months old,	4	2	1	23
					£69

EXTRA STOCK.

Animals not included in the Sections for Competition may be exhibited as Extra Stock, and will receive Honorary Premiums when specially commended, as follows:—

CATTLE AND HORSES.

Very highly commended,	Medium Gold Medal.
Highly commended,	Minor Gold Medal.
Commended,	The Silver Medal.

SHEEP AND SWINE.

Very highly commended,	Minor Gold Medal.
Highly commended,	The Silver Medal.
Commended,	Medium Silver Medal.

CLASS V.—POULTRY.

FIRST PREMIUM—ONE SOVEREIGN; SECOND PREMIUM—TEN SHILLINGS—in all the Sections of Poultry.

Aged Birds must have been hatched previous to, and Cockerels and Pullets in, 1888.

	Section	Section
DORKING—*Silver Grey*,	1. Cock	2. Hen
	3. Cockerel	4. Pullet
DORKING—*Coloured*,	5. Cock	6. Hen
	7. Cockerel	8. Pullet
COCHIN-CHINA,	9. Cock	10. Hen
	11. Cockerel	12. Pullet
BRAMAHPOOTRA,	13. Cock	14. Hen
	15. Cockerel	16. Pullet

SPANISH, . . .	17. Cock	18. Hen
	19. Cockerel	20. Pullet
SCOTCH GREY, . .	21. Cock	22. Hen
	23. Cockerel	24. Pullet
HAMBURG, . . .	25. Cock	26. Hen
	27. Cockerel	28. Pullet
ANY OTHER PURE BREED,	29. Cock	30. Hen
	31. Cockerel	32. Pullet
GAME—*Black or Brown Reds*, . . .	33. Cock	34. Hen
	35. Cockerel	36. Pullet
GAME—*Any other Pure Breed*, . . .	37. Cock	38. Hen
	39. Cockerel	40. Pullet
BANTAMS — *Any Pure Breed*, . . .	41. Cock	42. Hen
	43. Cockerel	44. Pullet
DUCKS—*White Aylesbury*,	45. Drake	46. Duck
	47. Drake (Young)	48. Duckling
DUCKS—*Rouen*, . .	49. Drake	50. Duck
	51. Drake (Young)	52. Duckling
DUCKS—*Any other Pure Breed*, . . .	53. Drake	54. Duck
	55. Drake (Young)	56. Duckling
TURKEYS—*Any Pure Breed*,	57. Cock	58. Hen
	59. Cock (Poult)	60. Hen (Poult)
GEESE—*Any Pure Breed*,	61. Gander	62. Goose
	63. Gander (Young)	64. Gosling

Amount of Poultry Premiums, £96.

CLASS VI.—DAIRY PRODUCE.

	Premiums.								
	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	
Section	£	£	£	£	£	£	£	£	
1. Cured Butter, not less than 28 lbs., .	5	4	3	2	1	—	—	—	
2. Powdered Butter, not less than 7 lbs., .	5	4	3	2	1	—	—	—	
3. Fresh Butter, three 1-lb. rolls, . .	5	4	3	2	1	—	—	—	
4 Two Cheddar Cheeses, 56 lbs. and upwards,	15	12	10	8	5	4	3	2	
5. Two Cheddar Cheeses, 14 lbs. and under,	5	3	2	—	—	—	—	—	
6. Two Dunlop Cheeses, 30 lbs. and upwards,	5	3	2	—	—	—	—	—	
									£124

WORKING DAIRY.

Arrangements will be made to have a Working Dairy open for the inspection of the Implements used in the separation of Butter and Cream, and in the manufacture of Cheese.

CLASS VII.—IMPLEMENTS.

Section

1. Best fixed Single Cylinder Steam-Engine with Boiler, combined or separate, for erection in Steadings, to drive all ordinary Farm Machinery. Nominal power, 6 horse. In awarding the Prize, special regard will be paid to price, simplicity of construction, economy in consumption of fuel, rapidity in raising steam, facility of erection, and cheapness of foundations, &c. Total cost at Glasgow not to exceed £150. Premium, £75.

   Exhibitors of Steam-Engines to send for the Catalogue a Specification of their Engines and Boilers, stating diameter of cylinder, ; stroke of piston ; revolution per minute, ; diameter of flywheel and width ; diameter of crank shaft, ; boiler to be type; length, ; diameter, ; thickness of plates, ; number of tubes, thickness and diameter, ; quality of plates, ; total heating surface, ; boiler suitable for a working pressure of lbs. per square inch, and tested by water to lbs. per square inch, and by steam to lbs. per square inch, being perfectly tight under these pressures. The working pressure not to exceed 80 lbs. per square inch. Approximate nett weight of Engine and Boiler.

2. Best combination of Machinery for cutting chaff as the straw is delivered from ordinary thrashing machine, and transporting by blower or otherwise the cut chaff for storage in bulk or in bags. Premium, £25.

Amount of Implement Premiums, £100.

GENERAL REGULATIONS FOR COMPETITIVE TRIALS.

1. Implements to be entered with the Secretary on or before 11th May. Received in the Yard on Tuesday, 17th July, and till 5 o'clock on the afternoon of Monday, 23rd. Exhibited Tuesday, Wednesday, Thursday, and Friday, 24th, 25th, 26th, and 27th July.

2. The Society will provide suitable ground as near to the place of the Show as possible, at suitable seasons, and make arrangements for the proper trial of the Implements.

3. The price as entered in the Catalogue must be held the same till after the trials are over.

4. Implements must be *bona fide* the manufacture of the exhibitor, and fitted together by him, but portions of the machine or other article exhibited for competition may be purchased from other works. Foreign makers may exhibit through their accredited agents.

5. The premiums will not be awarded without thorough and exhaustive open and competitive trials.

6. Implements selected for trial will be stamped, or otherwise marked for identification by the Society's Engineer, before being removed from the Showyard, but alterations will be allowed on such implements between the time of the Show and the date fixed for the trial.

7. Implements may be entered for trial, up to within a fortnight of the trial, on payment of £2 for each Implement.

8. The Directors shall have power to withhold the Prizes where there is not sufficient merit, or to apportion them as they think best.

Reference is made to the General Regulations for the terms on which other implements and Machines may be exhibited at the Show.

CLASS VIII.—HIGHLAND INDUSTRIES AND FISHERIES.

Section	Premiums. 1st. £	2d. £	3d. £	
1. Best Collection of Inland Fishing Tackle, .	10	5	3	
2. Best Collection of Kippered and Preserved Salmon, ...	10	5	3	
3. Best method of sending Salmon and Trout fresh to Southern Markets, . .	5	2	—	
4 Best method of transporting Live Fry or Young Fish, ...	5	2	—	
				£50

CLASS IX.—BEE HUSBANDRY.

£20 and 2 Silver Medals have been granted to the Caledonian Apiarian and Entomological Society. Information to be obtained from, and Entries made with, Mr R. J. Bennett, 50 Gordon Street, Glasgow.

ABSTRACT OF PREMIUMS.

1.	Cattle,	£874	0	0
2.	Horses,	560	0	0
3.	Sheep,	466	0	0
4.	Swine,	69	0	0
5.	Poultry,	96	0	0
6.	Dairy Produce,	124	0	0
7.	Implements,	100	0	0
8.	Highland Industries and Fisheries,	50	0	0
9.	Bee Husbandry,	21	8	0
10.	Six Silver Medals to Breeders,	4	4	0
11.	Extra Stock, say	100	0	0
		£2464	12	0

F. N. MENZIES, *Secretary.*

3 George IV. Bridge,
Edinburgh, 1*st February* 1888.

The General Show of Stock and Implements will be held in the Kelso Show District in 1889.

MEMBERS ADMITTED SINCE THE LIST WAS PUBLISHED IN APRIL 1887.

15*th June* 1887.

Alexander, William, Loanside, Clackmannan
Allan, William, Kinnon Park, Methven, Perth

Baxter, Andrew, Manager, Aberdeen Lime Co., Aberdeen
Blackie, Alfred, Horticultural and Agricultural Chemical Co., 103 Holm Street, Glasgow
Bowman, George Millar, of Logie, Cupar Fife

Campbell, Lieut.-Col. John, governor, General Prison, Perth
Cairns, William, Dairyman, Fountainbridge, Edinburgh
Callander, Henry, of Preston Hall, Dalkeith
Campbell, William Gray, 7 Montpelier, Edinburgh
Campbell, Wm. R. Hamilton, of Netherplace, Mauchline
Chalmers, P., Aldbar Castle, Brechin
Chiene, Prof., 26 Charlotte Square, Edinburgh
Cowie, George, jun., Pitglassie, Dufftown

Don, H. G., Ryehills, Marske by the Sea, Yorkshire
Dudgeon, John G., Dolphington, Cramond Bridge
Duncan, James, Fern Villa, Inverness

Geddes, G. H., Mining Engineer, 142 Princes Street, Edinburgh
Gellatly, William, Land Steward, Balgowan, Perth
Goodall, Thomas, Cardenbarns, Lochgelly
Gow, George, Dunalastair Hotel, Kinloch-Rannoch
Graham, William, 9 Hill Street, Edinburgh
Grant, George, Tullyneddie, Blairgowrie

Hamilton, John Wallace, of Cairnhill, Hurlford
Handley, William, Green Head, Milnthorpe, Westmoreland
Hope, Captain Thomas, of Bridge Castle, Bathgate

Inglis, John, Colluthie, Cupar Fife
Inglis, Robert T., Blinkbonny Lodge, Newburgh, Fife

Kellas, James, Nether Comisty, Huntly

Macdonald, Duncan, Comrie Farm, Aberfeldy
M'Laren, D., Cornton, Bridge of Allan
M'Lean, Neil, Battleby, Redgorton, Perthshire
Maxwell, Henry, How, Sanday, Orkney
Menzies, William M'Jannet, Cults, Castle Kennedy
Millar, Robert Hoyer, of Blair Castle, Culross
Milne, Robert, Corse of Kinnoir, Huntly
Mitchell, Peter B., Factor, Kinniel Estate, Bo'ness
Morton, John, Muirton, Perth
Myles, Robert, Coilamy, Cortachy, Kirriemuir

Orde, Colin Campbell, Kilmory, Lochgilphead

Paterson, John, of Torfoot, Strathaven
Pullar, Edmond, Coneyhill House, Bridge of Allan

Readman, J. B., 9 Moray Place, Edinburgh
Ross, W. C., of Cromarty
Rutherford, Richard, V.S., Bread Street, Edinburgh

Sandeman, Col. F. S., Stanley House, Stanley
Shanks, James, Headswood Farm, Denny
Simpson, James, Ingliston, Ratho
Smart, James, Architect, Perth
Stuart, A. R., of Inverfiddich, Craigellachie

Thomson, William D. S., Newark, Sanday, Orkney

Wallace, Hugh Robert, of Busby and Cloncaird, Cloncaird Castle, Maybole
Wilson, Thomas, Mains of Auchindochy, Keith

Young, James B., Pitlandie, Perth

18*th January* 1888.

Dalkeith, The Right Hon. the Earl of

Baird, George Alexander, of Strichen and Stitchell
Brewster, James, Tarrylaw, Balbeggie, Perth
Brown, Colonel, Longformacus, Duns
Brown, Charles, Factor, Tullyallan, Kincardine-on-Forth
Campbell, J. Adair, Tullichewan Castle, Alexandria, N.B.
Chapman, Alexander, Bonnytownhill, Fraserburgh
Coats, Thomas Glen, of Ferguslie Park, Paisley
Cunningham, George Miller, C.E., of Leithen Hope, 135 George Street, Edinburgh

Duncan, Miss C. H. A. Morison, of Naughton, Newport, Fife

Edgar, James, Nether Bogside, Elgin

Findlay, John, Warrenhill, Thankerton
Fowler, John, 4 Kelvinbank Terrace, Sandyford, Glasgow

Galashan, Alfred, Saddler, Alloa
Galloway, John, Milton, Leuchars
Graham, William, of North Erines, Tarbert
Grahame, John, Advocate, Sheriff-Substitute, Woodend, Perth

Hutcheson, James, W.S., Elgin

Kerr, George, Great Stuart Street, Edinburgh
Kyd, Robert, Implement Maker, Coupar-Angus.

M'Lean, Donald, Dunrobin, Golspie
M'Lennan, Bailie James, 40 St Andrew Street, Glasgow
MacRae, Ewen, Kinbeachie, Conon Bridge, Ross-shire
Mitchell, Robert, M.R.C.V.S., 18 Shaftesbury Street, Glasgow
Moncrieff, Robert Hope, of Potterhill, W.S., Perth
Murdoch, James, jun., Gartcraig, Shettleston
Mutter, Captain James Mitchell, of Bunanuisg, Bowmore, Islay

Naismith, Robert Thomson, Accountant, 18 St Andrew Square, Edinburgh
Nimmo, Thomas, Kirklands, Winchburgh

Purdon, Matthew, Drumby Farm, Busby

Rae, James, of Kirkpatrick-Fleming and Newton, Ecclefechan

Scott, Adam, Seiberscross, Golspie
Sharp, Andrew, of North Mains of Liff, Dundee
Sprot, Edward William (of Drygrange), Findynate, Tullypowrie, Perthshire
Stenhouse, John, jun., 13 Blackett Place, Edinburgh
Stewart, H. D., Strathgarry, Blair-Athole

Thomson, Henry, M.R.C.V.S., Aspatria

Walker, Alex., Gunhill, Inveramsay
Willsher, George, Pitpointie, Auchterhouse, Dundee
Wilson, James, Westburn, Cambuslang

Young, David, 377 High Street, Edinburgh

DIPLOMA HOLDERS—ELECTED FREE LIFE MEMBERS, JUNE 1887.

N. N. Bannerjee, Calcutta
George Carrington, M.R.A.C., Missenden Abbey, Great Missenden, Bucks
Edward Smith Davies, Claverley, Bridgenorth, Shropshire
Andrew T. L. Dunlop, Morriston, Maybole
Robert Haig, Dollarfield, Dollar
Harry Reid Maitland, Muiryfold, Grange, Keith
William Somerville, 46 Findhorn Place Edinburgh
Daniel Steele, Merkland, New Cumnock

Number of Members in List published in April 1887,	5020
Number of Members admitted in June 1887,	53
Number of Members admitted in January 1888,	41
Number of Diploma Holders admitted in June 1887,	8
	5122
Deduct estimated deaths, &c.,	122
Total,	5000

MEMBERS ADMITTED SINCE THE LIST WAS PUBLISHED IN APRIL 1887,

ARRANGED ACCORDING TO COUNTIES.

ABERDEEN.

Baird, George Alex., of Strichen and Stitchell
Baxter, Andrew, Manager, Aberdeen Lime Company, Aberdeen
Chapman, Alex., Bonnytownhill, Fraserburgh
Kellas, James, Nether Comisty, Huntly
Milne, Robert, Corse of Kinnoir, Huntly
Walker, Alex., Gunhill, Inveramsay

ARGYLL.

Mutter, Capt. James Mitchell, of Bunanuisg, Bowmore, Islay
Orde, Colin Campbell, Kilmory, Lochgilphead
Graham, Wm., of North Erines, Tarbert

AYR.

Campbell, William R. Hamilton, of Netherplace, Mauchline
Dunlop, And. T. L., Morriston, Maybole
Hamilton, John Wallace, of Cairnhill, Hurlford
Steele, Daniel, Merkland, New Cumnock
Wallace, Hugh Robert, of Busby and Cloncaird, Cloncaird Castle, Maybole

BANFF.

Cowie, George, jun., Pitglassie, Dufftown
Maitland, Harry Reid, Muiryfold, Grange, Keith
Stuart, A. R., of Inverfiddich, Craigellachie
Wilson, Thomas, Mains of Auchindochy, Keith

BERWICK.

Brown, Colonel, Longformacus, Duns

CLACKMANNAN.

Alexander, William, Loanside, Clackmannan
Galashan, Alfred, Saddler, Alloa

DUMBARTON.

Campbell, J. Adair, Tulliechewan Castle, Alexandria

DUMFRIES.

Rae, James, of Kirkpatrick-Fleming and Newton, Ecclefechan

EDINBURGH.

Cairns, William, Dairyman, Fountainbridge
Callander, Henry, of Preston Hall, Dalkeith
Campbell, William Gray, 7 Montpelier
Chiene, Professor, 26 Charlotte Square
Cunningham, George Miller, of Leithen Hope, C.E., 135 George Street
Dalkeith, The Earl of
Dudgeon, John G., Dolphington, Cramond Bridge
Geddes, G. H., Mining Engineer, 142 Princes Street
Graham, William, 9 Hill Street
Kerr, George, Great Stuart Street
Naismith, Robert Thomson, 18 St Andrew Square
Readman, J. B., 9 Moray Place
Rutherford, Richard, V.S., Bread Street
Simpson, James, Ingliston, Ratho
Stenhouse, John, jun., 13 Blackett Place
Young, David, 377 High Street

ELGIN.

Edgar, James, Nether Bogside, Elgin
Hutcheson, James, W.S., Elgin

FIFE.

Bowman, George Millar, of Logie, Cupar Fife
Duncan, Miss C. H. A. Morison, of Naughton, Newport
Galloway, John, Milton, Leuchars
Goodall, Thomas, Cardenbarns, Lochgelly
Inglis, John, Colluthie, Cupar Fife
Inglis, Robert T., Blinkbonny Lodge, Newburgh

FORFAR—Eastern Division.

Chalmers, P., Aldbar Castle, Brechin

FORFAR—Western Division.

Kyd, Robert, Implement Maker, Coupar-Angus
Myles, Robert, Coilamy, Cortachy, Kirriemuir
Sharp, Andrew, of North Mains of Liff, Dundee
Willsher, George, Pitpointie, Auchterhouse, Dundee

INVERNESS.

Duncan James, Fern Villa, Inverness

LANARK.

Blackie, Alfred, Chemical Co., 103 Holm Street, Glasgow
Findlay, John, Warrenhill, Thankerton
Fowler, John, 4 Kelvinbank Terrace, Sandyford, Glasgow
M'Lennan, Bailie James, 40 St Andrew Street, Glasgow
Mitchell, Robert, M.R.C.V.S., 18 Shaftesbury Street, Glasgow
Murdoch, James, jun., Gartcraig, Shettleston
Paterson, John, of Torfoot, Strathaven
Wilson, James, Westburn, Cambuslang

LINLITHGOW.

Hope, Captain Thomas, of Bridge Castle, Bathgate
Mitchell, Peter B., Factor, Kinneil Estate, Bo'ness
Nimmo, Thomas, Kirklands, Winchburgh

ORKNEY.

Maxwell, Henry, How, Sanday
Thomson, Wm. D. S., Newark, Sanday

PERTH—Eastern Division.

Allan, William, Kinnon Park, Methven, Perth
Brewster, James, Tarrylaw, Balbeggie, Perth
Brown, Charles, Factor, Tullyallan, Kincardine-on-Forth
Campbell, Lieut.-Col., Governor, General Prison, Perth
Gellatly, William, Land Steward, Balgowan, Perth
Gow, George, Dunalastair Hotel, Kinloch-Rannoch
Grahame, John, Sheriff-Substitute, Woodend, Perth
Grant, George, Tullyneddie, Blairgowrie
Macdonald, Duncan, Comrie Farm, Aberfeldy
M'Lean, Neil, Battleby, Redgorton
Millar, Robert Hoyer, of Blair Castle, Culross
Moncrieff, Robert Hope, of Potterhill, W.S., Perth
Morton, John, Muirton, Perth
Sandeman, Col. F. S., Stanley House, Stanley
Smart, James, Architect, Perth
Stewart, H. D., Strathgarry, Blair Athole
Young, James B., Pitlandie, Perth

RENFREW.

Coats, Thomas Glen, of Ferguslie Park, Paisley
Purdon, Matthew, Drumby Farm, Busby

ROSS and CROMARTY.

M'Rae, Ewen, Kinbeachie, Conon Bridge
Ross, W. C., of Cromarty

ROXBURGH.

Sprot, Edward William, of Drygrange

STIRLING.

M'Laren, D., Cornton, Bridge of Allan
Pullar, Edmond, Coneyhill House, Bridge of Allan
Shanks, James, Headswood Farm, Denny

SUTHERLAND.

M'Lean, Donald, Dunrobin, Golspie
Scott, Adam, Sciberscross, Golspie

WIGTOWN.

Menzies, Wm. M'Jannet, Cults, Castle Kennedy

ENGLAND.

Carrington, George, M.R.A.C., Missenden Abbey, Great Missenden, Bucks
Davies, Edward Smith, Claverley, Bridgenorth, Salop
Don., H. G., Ryehills, Marske by the Sea, Yorkshire
Handley, William, Green Head, Milnthorpe, Westmoreland
Thompson, Henry, M.R.C.V.S., Aspatria

FOREIGN.

Bannerjee, N. N., Calcutta

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