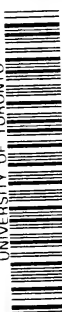


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THE BRITISH NATION :

ITS ARTS AND MANUFACTURES.

SECTION I.

ON THE PRESENT STATE OF BRITAIN, AND THE CAUSES
OF HER COMMERCIAL GREATNESS.

THE present state and condition of the British nation, rightly considered, must raise the joy and gratitude of every Christian heart; for what do we see around us but incessant proofs of God's mercy in our preservation from evils which heavily afflict other countries, and in our exaltation to a height of national wealth, prosperity, and importance, which has no previous parallel in our history, and which commits to our hands the largest means of doing good?

Placed remote from the quarrels of the continent, we have been happily preserved of late

years from intermeddling in them; and throughout the troubles which have affected the rest of Europe, our country has maintained the noble aspect of a land in which peace, commerce, and knowledge reign, and whence, as our means and influence extend, they are disseminated to the uttermost parts of the earth. On all sides of our land there are evident signs of progress: villages rising into populous towns, manufacturing towns growing into large and important cities, and the metropolis spreading out in all directions, as if anxious to embrace the whole community within her constantly extending limits. These signs, too, of a rapidly increasing population, are accompanied by tokens of a commerce so wide, of resources so immense and so well directed, and of a system of railway communication so complete and so costly, that when the subject of our present rate of national progress is brought fairly before our eyes, we are almost as much amazed at our own condition, as is the rustic who hears for the first time that this solid earth on which he stands is in constant and rapid revolution.

It is not contended, however, that the picture of our national prosperity can be regarded with unmixed satisfaction. With much to cheer, there is undoubtedly, in the survey of our

country's position, something also to sadden us. But it is surely the Christian's duty to weigh his mercies, individual or national, against his calamities. In so doing, he cannot but find the amount of the one immensely overbalanced by the preponderance of the other. We desire not, therefore, to dwell mournfully, as some have done, on the new social evils which are said to have arisen out of the peculiar circumstances of the present age; but would rather incline to the opinion expressed by an eminent historian, that the evils are, with scarcely an exception, old—while that which is new is the intelligence which discerns, and the humanity which seeks to remedy them.

The most conspicuous feature of our country's commercial greatness, at the present time, is undoubtedly her world-wide traffic with nations civilized and uncivilized. The marks of many English manufactures are now as well known in Samarcand or Bokhara as in Liverpool or London; and Manchester patterns guide taste alike under the burning sun of Africa, and amidst the snows of Siberia. A Manchester merchant, if he have but the opportunity, will undertake to supply the markets between Lima and Peking, and will condemn as a mercantile oversight the leaving unvisited an insignificant

village, where he might have sold a few yards of cloth, or hanks of yarn. Within his warehouses, the experienced eye may, in a great measure, detect, by the quality and pattern of his goods their ultimate destination, and the greater or less degree of civilization of the nations for whom they are prepared. At all times, a visit to the great emporium of the cotton trade is calculated to impress the mind with an overwhelming sense of the extent and importance of that one branch of our foreign commerce. In every other department of manufacture, however, England is making immense progress, possessing as she does the advantages of long practised skill and dexterity, combined with abundant supplies of raw material.

One most important circumstance, to which we can only briefly advert, must also be taken into account, in estimating the position of Great Britain and her sources of prosperity. This is, the extent and value of her colonial possessions, in which an open field is afforded for the enterprise of her people, and an outlet supplied to her superabundant population. Through various causes, into which it is not our province to enter, our colonies have frequently been sources of weakness rather than of strength. This, however, is not to be attributed to anything

inherent in the nature of such possessions ; they are in themselves the natural sources of wealth and power to a nation, and will we trust become increasingly so to our own, as the wondrous energy of steam brings the parent state into closer communication with them. And here we may appropriately pause in the outset of our subject, to consider the marvellous effect of the steam-engine, which has had so large a share in the promotion of our commercial greatness. Is it not for some higher purpose than the mere acquisition of wealth, that the Giver of all good has bestowed on our generation the knowledge of a power by which distance is almost annihilated, and the productiveness and consequent value of time are greatly enhanced ; by which seas can be traversed in spite of opposing wind and tide ; countries crossed with amazing celerity ; and by which the printing-press, that great engine for good or evil, has received a new impetus, multiplying and diffusing knowledge more extensively than at any previous period of the world's history ? In the withholding of this power from our forefathers, and the bestowal of it upon us, we are invited, as by the hand of God, to impart to the remotest nations of the earth, not only our commercial privileges, but the higher blessings of that evangelical truth—of which

England has been made so largely the depository. At this moment, happily, we are engaged in this blessed office. The vessels which convey from our shores the varied productions and manufactures of the country, convey also the oil and the lamp that are to give light to the remotest regions of the earth, so that in many cases "our modern merchants have a standing far above those who were called 'kings and princes,' while even the tempest-worn mariner may be recognised as a labourer in the great cause of human improvement."

England, by means of this extensive intercourse with distant countries, becomes, under the hand of Providence, an active agent in promoting their civilization. A gradual, though silent effect is produced on the most barbarous communities which her commerce visits, as their rude arts and inventions are brought into contact with her enterprise and skill. To use the words, slightly modified, of a spirited writer, "She is approaching, by the almost universal commerce she maintains, all the rude and barbarous nations of the world, carrying with her wherever she goes all those signs of progress by which these nations may be impressed with a sense of their backwardness, and set forward in the career of improvement. They

need only to be visited by the ships, especially by the steam vessels of European commerce, to see that they are in their childhood, and there must remain unless they adopt the science and the institutions of European nations. What, consequently, do we behold? Not the wilds of northern Russia alone—not the islands only of the sea, becoming members of European laws, arts, and manners—but the throne of Siam inquiring after the methods and truths of the west—all British India studying English, in a sense more real than the study of words—Muscat sending over to copy and examine our arts—both branches of the Mohammedan empire receiving freely, and protecting Christian travellers, and adopting as fast as they can the European modes of war [alas! that we should teach them these] and customs of society—China beginning to doubt whether she is indeed the celestial empire, and doomed, ere twenty years are gone by, to be as emulous of what is European as Egypt or Turkey now is. They feel our shadow cast on their weakness, and their hearts sink within them as if they had seen a people taller than they. At the same time, too, the false gods are trembling in their seats the world over, and all the strongholds of spiritual delusion are shaking to their fall. Wherever

commerce, conducted on Christian principle, goes, the power of science and all that belongs to cultivated man is felt. The universal air becomes filled with new ideas, and man looks out from the prison of darkness in which he has been lying, chained and blinded, sees a dawn arising on the hills, and feels the morning-breath of truth and liberty." It is to commerce, as the handmaid of Christianity, however, that this tribute alone is applicable. Wherever the gospel is diffused, there civilization follows in its train. "Towns and villages spring up in the desert; theft and piracy give way to lawful commerce; tribes that once lived in war are bound in the ties of peace and friendship; the dens of cannibalism are turned into human abodes; and the besotted slaves of sensuality are roused to a sense of their spiritual manhood." Its announcement is still as of old, "Glory to God in the highest, and on earth peace, good will toward men."

It is now our task to trace briefly the causes which have led to the commercial greatness of our country, and to the high position she maintains among the nations of the earth. These are many, and so linked together that it is difficult to arrange them in such a manner as

not to give undue prominence to one or the other. But it is certain, that although every other circumstance might have conspired to favour her, yet Great Britain could never have been eminent among the nations had it not pleased the Almighty to endow her with most abundant supplies of MINERAL WEALTH.

Our country does not, to any important extent, yield the precious metals, but it affords in abundance iron, the most useful of metals, and it possesses also valuable mines of tin, copper, lead, and manganese. It also supplies what is of far greater importance to us than gold or silver mines—an almost inexhaustible amount of coal. Without an abundant stock of this mineral, we could never have reached our present mercantile greatness; our manufactures must have languished, and the steam-engine would have been comparatively useless. Our vast population, too, would have been deprived of cheap fuel, one of the necessaries of life in a climate like that of Britain, and one which it would be difficult to supply the want of in any other way. The timber grown in these islands would be wholly inadequate for such a purpose, and no conceivable amount of care and attention could foster a sufficient quantity to meet the demand for fuel. In addition to the immense

domestic consumption of coals in this country, estimated at about twenty million tons, there are vast supplies required for iron works and other great branches of manufacture ; while our whole system of steam communication is dependent on this mineral as its moving power, and, as if these demands were not sufficient, we also export annually upwards of four million tons of coal. A striking idea of the wealth yielded to Great Britain by this most important article is obtained by comparing the value of the annual production of all the gold and silver mines of North and South America with that of our coal mines. The former was estimated by Humboldt at about 9,000,000*l.*, and subsequently fell to 5,000,000*l.* ; the annual value of the latter, on the other hand, is computed to be from 15,000,000*l.* to 20,000,000*l.* The iron brought into a manufactured state through the agency of this mineral may be reckoned as an additional 17,000,000*l.*

It is an interesting fact, that in those temperate regions of the earth, where industry and manufacturing skill are the most likely to take root and flourish, there, by the providence of God, are deposited in the greatest abundance the mineral products essential to their prosperity. All the principal and most important coal

formations are found between the Arctic circle and the tropic of Cancer, in those latitudes in which the energies of men can be the most fully exerted and sustained; similar climates south of the equator are principally occupied by the ocean. The coal formations of Australia and Van Diemen's land differ materially from those of Europe, and, in common with other carboniferous beds of that hemisphere, have not yet been sufficiently studied for their value or importance to be ascertained.

Of all European nations, Great Britain stands pre-eminent for the extent of her coal formations, the area of country occupied by this indispensable element of industry being nearly twelve thousand square miles, that is, one-tenth of the whole area of the United Kingdom. There is this additional and immense advantage also, that the best coal basins of England, Scotland, and Wales, are accessible by sea from numerous points around the island, so that coals of many varieties and admirable qualities can be shipped at the very sites where they are mined. This is the secret of those enormous and cheap supplies which our country furnishes, not only to home consumers, but to nearly every maritime country of Europe. The coal-fields of France, Belgium, Prussia, and Austria,

are far less numerous than those of England, and lie remote from the sea. Even within the limits of our own country, there is a marked difference in the prosperity and progress of our towns and cities, in proportion as they are near to or remote from the coal measures. "To what," asks M'Culloch, "is the astonishing increase of Glasgow, Manchester, Birmingham, Leeds, Sheffield, etc., and the comparatively stationary or declining state of Canterbury, Winchester, Salisbury, and other towns in the south of England, to be ascribed? The abundance of coal in the north, and its scarcity and consequent high price in the south, are the real causes of this striking discrepancy." But these causes of discrepancy are in a fair way to be in some degree lessened, as, by the extension of the railway system, the conveyance of coals to every part of the kingdom is likely to be accomplished with greater certainty and cheapness than heretofore. Thus, at no very distant period, the coasting trade will be diminished by the same power which has already put a check upon the canal system, and the supply of coals will be more nearly equalized throughout the kingdom.

The carboniferous series, as geologists inform us, predominate from the Grampian Hills to Sussex, and from the German Ocean to the

Irish Sea, with the most magnificent coal deposits accessible in every direction, and forming the great cause of the development of the mechanical arts, for which England is so famous. Had the granite of those hills extended into Sussex, or the chalk of Sussex stretched as far as the hills, the whole course of British history would have been changed, and it is more than probable that several of our great manufacturing cities, which now derive their prosperity from the coal, lime, and iron beneath the new red sandstone on which they are built, would never have come into existence.

It will thus be evident, that the whole course of manufacturing industry and mechanical invention in this country, with its accompanying commercial prosperity, is founded on our abundant supply of good fuel. But, on the other hand, it must be observed, that our power to obtain this fuel has been wonderfully increased by MECHANICAL INVENTIONS. Had it not been for the invention of the *steam-engine*, the old and imperfect methods of mining would still have been pursued, and a large proportion of coal would have been left underground; while numerous mines, now in full work, must have been long ago abandoned. By the con-

sumption of one bushel of coals in the furnace of a steam-boiler, a power is produced which in a few minutes will raise twenty thousand gallons of water from a depth of three hundred and fifty feet. To produce the same effect by hand labour, would require twenty men to work the whole day with the common pump. By thus expending a few pence, an amount of human labour is set free, to employ which would have cost fifty shillings. The effect of steam power in draining the mines is of the highest importance, and it is gratifying to learn that the demand for human labour has not in any way been diminished thereby, but that, on the contrary, a much larger number of persons are employed in coal-mining than without the agency just referred to could have been set to work.

The *safety lamp* of Davy is another invention, which has been of the greatest advantage to coal-miners. By its means many productive mines are wrought, and old collieries re-opened which had previously been useless. Not that the invention of that lamp has produced the saving of human life at first anticipated, for notwithstanding its use, fearful accidents still occur from the explosion of inflammable gas, or from the presence of carbonic acid or *choke-*

damp. But the reason of this is found in the fact, that under its protection very dangerous and "fiery" mines are now sometimes worked, which would not formerly have been attempted. In such situations, a small degree of remissness, a little neglect of the lamp, a momentary forgetfulness in the opening and shutting of certain doors, may cause the death of hundreds. Familiarity with danger, also, too often produces a reckless indifference, which is itself the first step towards the fatal result.

While Great Britain holds the foremost rank among European nations for the extent of her coal formations, she is at the same time greatly surpassed in this respect by the United States of America. That country possesses an extent of coal estimated at no less than 133,132 square miles, or one-seventeenth part of the whole surface, whereas in our own country, we have already stated the coal area to be under twelve thousand square miles. But the vast resources of the United States are yet almost untouched, and are covered by immense forests, which remain nearly in their primitive solitude. In a few of the older states, bordering the Atlantic, mining operations have commenced and are proceeding with unprecedented rapidity, producing an enormous increase in the

industrial occupations of the country ; but the remainder lies at present unproductive, a vast storehouse of materials for the future eminence and prosperity of that remarkable country. Thus, while the United States possess vast stores of coal, and produce comparatively little, Great Britain, with less extensive coal-fields, is producing an enormous amount every year, and freely dispensing it to other nations.

Considering the great importance of coal to the prosperity of our country, we are naturally led to ask, "Is this prodigal use of the treasure bestowed upon us, consistent with our character as a wise and understanding people? Is there no possibility that our sources of wealth in this particular may come to an end?" The first inquiry is too closely connected with the general principles of unrestricted commerce to be entered on here ; but, with respect to the second, we are relieved from immediate anxiety by the assurance, that the coal-fields of Durham and Northumberland alone are adequate to furnish the present annual supply for more than thirteen hundred years, and that the coal-fields of South Wales are equal to meet England's demand for two thousand years more. Thus, the evil day, when the failure of our coal mines shall destroy the commerce and manu-

factures of England, is apparently removed to a great distance, and perhaps, before it arrives, some new application of the treasures which have been poured out so liberally on our native land, may supply us with another kind of fuel. Yet it must not be concealed that doubts have been thrown on the accuracy of the above statement, and that some persons believe it to be founded on very insufficient data; in consequence of which belief, they loudly reprobate our present lavish expenditure of coal, and consider it as nothing less than a thoughtless waste of the nation's patrimony.

In certain localities, where the coal-fields, though rich, are of limited extent, the immense demands now made upon them must hasten the result so much dreaded. Take, for instance, the Dudley coal-field, and the neighbouring town of Birmingham, with its two hundred and twenty thousand busy inhabitants. A sagacious Scottish writer, viewing this district, has thus recorded his opinion: "There is a day coming, though a still distant one, when the miner shall have done with this wilderness of débris and chimneys, just as the charcoal-burner had done with it when the woodlands were exhausted ages ago, or as the farmer had done with it at a considerably later period;

and when it shall exist as an uninhabited desert, full of gloomy pitfalls, half-hidden by a stunted vegetation, and studded by unseemly ruins of brick. And the neighbouring city, like a beggared spendthrift, that, after having run through his patrimony, continues to reside in the house of his ancestors, shall have, in all probability, to shut up many an apartment, and leave many a forsaken range of offices and out-houses to sink into decay."

To allay such forebodings of evil, it is but fair to state, that a most important field of inquiry has been opened with respect to the uses of *peat*. This description of fuel, which consists of an accumulation of mosses and moist vegetable matter, has long been the great resource of the poorer classes in Ireland. One-seventh of their island is said to be covered with it, but this is probably an exaggerated statement. Owing to its accessibility and cheapness, it is, in its natural state of turf, the common fuel, in some districts, of all classes of the inhabitants, and it is also conveyed in barges to the capital, where it is consumed to a large extent along with coal, or instead of it. This turf has been latterly applied to many economical purposes, and it is capable of being charred, and rendered fit to be used

like charcoal in cookery, and for other domestic purposes. This is done in a very simple way by some Irish families. They take about a dozen cakes of peat, and put them edgewise on the top of the kitchen fire, where they allow them to remain, turning them at intervals, until they become red and cease to smoke, when they are removed to make room for a fresh supply. In this way the kitchen fire is kept up, and at the same time a store of charred peat is provided.

But the important fact respecting peat, in connexion with our present subject, is that by submitting it to the pressure of a very powerful machine, it can be condensed into a black and metallic-looking mass, which, in the form of bars, is used as a fuel far more valuable than any form of peat previously known. The properties of compressed peat are found to be very advantageous in certain manufactures, such as jewellers' work and the forging of steel; and as a proof of its superior economy, the cutlery wrought with it is offered at reduced prices, bearing the distinctive mark of "peat compressed."

Coke prepared from compressed peat is also a valuable fuel, and where bulk, stowage, and intensity of heat are great considerations, it is reckoned superior to wood charcoal.

That peat affords no mean substitute for coal is daily becoming more evident, for it is now employed on a large scale in France, Bohemia, and other places, in the manufacture of iron; it has also been found an excellent fuel in welding, and for softening steel plates, etc. The charcoal obtained from it is especially adapted for the finer iron works, so that Dr. Kane maintains that the precious Baltic iron, for which from 15*l.* to 35*l.* per ton is given, could be equalled by Irish iron, smelted by Irish turf, for 6*l.* 6*s.* per ton. Its properties for making gas have also been severely tested in Dublin, Paris, and Plymouth, and it has been proved to yield nearly as much gaseous matter as Newcastle coal, the light being also superior in brilliancy and power. By Williams's patent, the lightest and purest beds of peat moss or bog are now converted into the four following products:—1. A brown combustible substance, solid and denser than oak; 2. A charcoal, much more compact than that of hard wood; 3. A factitious coal; 4. A factitious coke. A most important result of these inventions is, that with ten hundredweight of the factitious coal, the same power is obtained in the ships of the Dublin Steam Navigation Company as with seventeen hundredweight of pit coal alone, thereby saving

largely in the stowage of fuel. Compressed peat is also said to be coming into use in mills and factories.

Attention having been thus drawn to a substance which, since the general introduction of coal, has been greatly neglected, our resources in this particular article begin to be valued. An almost inexhaustible amount of peat exists on the lands of the prince of Wales on Dartmoor, and various companies are now in operation for cutting and converting it to divers uses. A railroad of two miles in length to the bogs where the peat is cut, is projected, and the British Naphtha Company is obtaining two kinds of oil from this substance, one of which is used as a substitute for camphine. A good coke is also made, and a species of manure prepared from it. But Dartmoor is by no means our sole reservoir of peat in this country; many other extensive moors abound with it, and before the use of coal, these, supplying as they did the common fuel, were much valued. In ancient surveys, grants, and valuations of religious endowments, the *turbaries*, or beds of peat, formed an important part throughout the country from the eleventh to the sixteenth century.*

* See Taylor's "*Index Monasticus*."

Next in importance to coal, among the mineral riches of Great Britain, comes *iron*, a metal which may be regarded as the parent of agriculture and the useful arts. This most useful substance, when brought into a fluid state, can be made to assume an endless variety of forms; it can be drawn out into bars, it can be extended into wires of almost any degree of fineness, it can be spread into sheets, it can be bent, twisted, hardened, softened, sharpened, or made blunt, according to the purpose required. We owe to it the scythe and the pruning-hook, the needle, the chisel, the graver, the chain, the anchor, the compass, the delicate watch-spring, and the powerful springs by which carriages and machinery are put into easy motion. We owe machinery itself, with all its accompanying benefits, to the abundance of iron we possess. Had we been obliged to import this metal from other countries, our present wondrous system of railway and steam-boat travelling could not have come into operation. We should not then have heard of iron roads, iron bridges, iron boats, lighthouses, bedsteads, chairs, gates, rails, and ornaments of all descriptions; nor should we have witnessed the erection of elegant structures of this metal, designed to be taken apart and exported in pieces to the most

distant parts of the globe, there to be re-erected as dwellings for foreign princes, or as homes for English emigrants. Least of all should we have feasted our eyes on that "most magnificent and mighty freak," the Crystal Palace in Hyde Park; a vast transparent fabric, supported on the ground-floor by 1,060 pillars of iron, strengthened by nearly 2,300 iron transverse beams or girders. While we enumerate the useful and peaceful purposes to which iron is thus applied, we must also mourn, in the words of an ancient historian, that "contrariwise, the same iron serveth for wars, murders, and robberies; not only to offend and strike therewith in hand, but also to reach and kill afar off; with divers sorts of darts and shot, one while discharged and sent out of engines, another while launched and flung by the force of the arm; yea, and sometimes let fly with wings." This last mode of warfare seems more than any other to have excited the horror of the benevolent writer, for he adds, "This I take to be the wickedest invention that ever was devised by the head of man; for to the end that death may speed away the faster to a man, and surprise him more suddenly, we make it to fly as a bird in the air, and with the arrow, headed at one end with deadly iron, we set feathers at the other .

whereby it is evident that the mischief proceeding from iron is not to be imputed to the nature of it, but to the unhappy wit of man." Let us hope, however, that as by means of coal, and iron, and steam, the nations of the earth are brought into more frequent and friendly intercourse, and the doctrines of Christianity have wider and freer scope, so we may learn at last how good and blessed a thing it is to dwell together in unity. Then shall our emporiums of arms become useless, and our busy towns find other employment than that which in the time of war made the chief prosperity of Birmingham, namely, the fabrication of weapons at the rate of a musket a minute throughout the year.

There are traces of the iron manufacture in Britain prior to the Roman invasion ; but these traces become much more distinct subsequently to that event. Immense beds of iron cinders, left by the Romans have been discovered in the Forest of Dean, in Monmouthshire, in Yorkshire, and other counties. At that time, and for many centuries afterwards, wood-charcoal was the only fuel used in the smelting of iron, therefore those mines only were wrought which were in the immediate vicinity of forests or richly wooded districts. During the fourteenth and fifteenth centuries, the great and increasing

demand for iron led to such an increase in the manufacture, that some alarm began to be felt at the vast consumption of wood which it occasioned. This alarm continuing, various acts passed in the reign of Elizabeth for the limitation of the iron trade, and for preventing the erection of new iron-works. These mischievous restrictions would have continued to mar the prosperity of the trade, but for an invention of lord Edward Dudley, who, in 1623, took out a patent for the smelting of iron with pit coal. The opposition he met with was so great, that his invention does not appear to have prospered during his lifetime ; but at the beginning of the next century the attempts to substitute pit coal for charcoal were renewed in several quarters with success. Gradually, and by very slow degrees, the importance of the new fuel became recognised, and, as a matter of course, the locality of the manufacture also underwent a change. The coal counties now began to assume that rank, in connexion with iron, which the woodland districts had hitherto enjoyed. Shropshire, Staffordshire, and South Wales, rose into a degree of eminence as iron-producing districts, which they have ever since maintained.

The manufacture now steadily increased, at

first slowly, but afterwards, during the war, with extraordinary speed, accelerated by the difficulty of obtaining supplies from abroad. This progress is best estimated by the fact, that, in 1740, our whole produce of iron was seventeen thousand tons, whereas, in 1846, it reached one million seven hundred and fifty thousand tons. The railway system must be taken into account for very much of this increase, and also the new and varied purposes to which iron has been applied since it has become cheap and plentiful. At present, we export this metal in large quantities, and import little except Swedish iron, which is admirably adapted for making steel.

The principal iron-works of Great Britain are those of South Wales and Monmouthshire, occupying a range of country twenty-five miles in extent, the seat of the largest works being at Merthyr Tydvil ; those of Staffordshire and a part of Warwickshire, embracing Wolverhampton, Walsall, Dudley, and Birmingham ; those of Shropshire, the chief of which are at Colebrook Dale ; and the Scottish iron-works, situated for the most part round about Glasgow, where the supply of coal and ironstone seems to be inexhaustible, and where there are great facilities for land and water carriage. Iron was

formerly produced in Ireland, but given up, owing to the scarcity of timber. As we have already noticed, there is some reason to hope that, in employing the condensed peat, the Irish may be able at no distant period successfully to carry on this manufacture.

Another mineral treasure, to which Britain owes a very ancient fame and commerce, is *tin*. The Phœnicians traded to Cornwall for this metal at a very remote period ; and the circumstance of that part of our island, with the adjoining coast of Devon, being the only known depositories of it, long gave us the monopoly of the world in tin. But, since 1814, the tin of Banca and the Malay countries has been brought into the market in abundance, and is extensively imported here for warehousing ; it affords also full supplies to some countries which formerly depended upon us. Thus China is now supplied from that nearer source, instead of receiving from us the eight or nine hundred tons which we formerly sent. Nevertheless, our exports of tin are on the increase.

Tin, however, is produced on a small scale compared with *copper*, which abounds in the same county, Cornwall, and is a very considerable source of wealth and industry. Owing to there being no coal in the vicinity, the copper

ores of Cornwall are shipped from the nearest ports to Swansea, for the purpose of smelting. Several years ago, the estimate of our produce in copper amounted to fourteen thousand tons per annum. Six years since, the amount of tin averaged only five thousand tons.

Our *lead* mines yield much more than either our copper or tin mines, and are more widely diffused, existing in North Wales, Durham, Yorkshire, Derbyshire, etc. Their produce, some years since, was upwards of fifty-one thousand tons.

Our list of mineral treasures would not be complete without the mention of salt, of which we possess a most plenteous supply, as must appear from its immense consumption and extraordinary cheapness. Our principal resources in this particular are derived from mines of rock-salt near Droitwich and in Cheshire, which are of great extent, and in some cases of unknown depth; and also from brine springs, continually welling up out of the upper division of the new red sandstone-springs, whose waters were employed in making salt two thousand years ago, and still continue as vigorously as ever to throw up that mineral, at the rate of a thousand tons weekly from each spring. Such springs are also at Droitwich, at which place

there were salt-works in the time of the Romans, and have been ever since. Over this dark and sombre-looking town, there hangs an almost constant cloud of white vapour, arising from the numerous salt pans, whose steam is driven off by heat; while on the roads leading from it, and by the canal which traverses it, snowy heaps of salt, piled on wagons, carts, barges, etc., are constantly being borne away from this seat of industry to their near or remote places of destination. Some time since, the consumption of salt in Great Britain alone, exclusive of Ireland, amounted to nearly two hundred thousand tons annually, and we exported between three and four hundred thousand tons.

We have traced our country's commercial greatness, in the first place, to her abundant supplies of mineral wealth; and we may safely rank, in the second place, her *INSULAR POSITION*, which gives her such great advantages in the ready means of transit for her commodities to all parts of the earth, and admits of those friendly relations which she now holds, and of that beneficial commerce which she maintains over the wide world.

Great inland regions, by their very position, are wont to linger long in bigotry and superstition,

while their shores and islands are receiving the light of truth; nations remote from the sea and from the visits of commerce are likely to remain, age after age, without any idea of progress, and are the readiest victims of a despotism that enslaves not only the body, but the soul. The inhabitants of islands and coasts, on the other hand, are found much more disposed to respond to the influence of human society, and to yield themselves to its progress; generally they are less immovably fixed in their customs, and have a less amount of prejudice to lay aside ere they can receive new ideas and new truths.

Such new ideas cannot fail to accompany the intercourse which arises among nations as they interchange the gifts which God has bestowed upon them. While the overflowing abundance of the fields or vineyards invites to a participation with the nations whose opposite climates yield different, but not less useful products—while the vast results of manufactures are exchanged for supplies of raw material or of natural produce—there is also a commerce going on of a far higher kind, and calculated to affect for good or evil the everlasting destinies of man. The garners of one people are, as it were, supplied by the harvests of another's intellectual labours; the treasures of learning are dis-

seminated, and even the religious creeds and opinions of the different races of mankind are influenced by this constant intercourse. The true and beneficent order of things is, that the less enlightened should learn of the more highly favoured, and that thus Divine truth should at length overspread the earth. Where this is not the case, and where those having the name of Christians, being brought into close contact with superstition and false religion, gradually become indifferent, and forgetful of the high privileges of the gospel, this is a complete reversal of the true order of things, and involves them in the most awful danger and responsibility.

The rapid communication now maintained, by means of our steam navy, with all the principal neighbouring ports of Europe, forms but a small part of the wonders of our ocean traffic. The old world and the new are being brought into closer connexion. Large and powerful steam-ships are constantly passing between our island and the United States of America, giving a certainty and regularity to our commerce with that country, which is most important to the prosperity of this great branch of our foreign trade. Communications with India are also now maintained with a rapidity previously unknown; China is regularly

visited ; Australia is brought closer to us by improved means of transit ; our West Indian colonies are kept in regular communication, which is maintained also with Mexico and a great part of South America ; the Mediterranean and Egypt, too, coming in the line of our shortened eastern route, are the familiar resort of our vessels ; in fact, the whole inhabited world, so far as it can be reached by means of the great ocean paths diverging from our island home, is now become our neighbour, and is receiving our friendly visits.

The CLIMATE of England is another important element in her favour, as it respects the industrial arts, and the commerce depending upon them. Her people are apt to complain of its variableness, and to consider that it must be on that account very trying to the human constitution ; but this variableness is confined within moderate limits, and has been proved to be less injurious in its effects than the extreme mutability of temperature which is met with in other lands. For instance, it is credibly stated, that in several parts of the continent, to which English visitors resort for the renovation of their health, the average duration of human life is actually below that of the most unhealthy districts of our country ; and that in those

particular spots considered so beneficial to consumptive patients, there are as many of the natives afflicted with pulmonary complaints as in any part of England. Another important point in favour of our climate is the long life, vigour, and activity of its inhabitants, more especially of persons much exposed to the open air. It has been truly said, that the more the climate is allowed to exercise its full influence, without the restrictions imposed by injudicious refinement and luxury, and vicious systems of physical and mental education, the more robust, muscular, and symmetrically developed does the human frame become. In a few states of disease, the climate is undoubtedly hurtful, but even then it is perhaps blamed for more than it deserves; whereas, in the ordinary condition of things, it favours the expansion of the moral and intellectual, as well as the physical powers, and tends to produce the healthy, hardy, common-sense race with which our land is peopled.

And if the vicissitudes of our climate do not unfavourably affect the human constitution, neither do they exercise any prolonged or serious injury on the lower animals or on vegetable life. On the contrary, the average state of things in this country is favourable to the production of a most abundant supply of healthy

cattle and crops; and the nature of the soil is such, that while it calls for the diligent and incessant care of the husbandman, it also richly repays his toil. There is perhaps no country in the world where wholesome articles of diet are so plentiful, and where the health of the working classes is sustained by such substantial and invigorating food as in England.

Thus fortified for labour, our people have an additional stimulus to industry, beyond that of the dwellers in the south, in the absolute necessity for shelter and warm clothing which the climate requires. In some more genial lands, it must be a matter of very small concern to the inhabitants whether they sleep in the open air or under cover, and whether their clothing be little or none; the mere supply of food is all they have to think about, and this once provided, it is natural to expect that they should give way to the indolence engendered by a luxurious climate. But our case is very different, and our necessities have an important moral use. The supply of food, lodging, and comfortable clothing, for an English workman's family, is no trifling demand on his energies, and in the great majority of cases he meets it nobly. The steady patient labour of the thousands that cultivate our fields, and

work in our mines, mills, and factories, brings honour to the national character; and it is a perverted view of things, which would lead us to overlook the respectable conduct of a large proportion of the working classes, and to dwell mainly on the degraded condition of others, which is often the result of their own vices, and of the evil principles imbibed from bad companions and licentious publications.

In all the laborious occupations to which the commerce of our islands has given rise, the workman is not only fortified by constant habit against the variations of the climate, but taught by its requirements to labour for such an amount of wages as shall enable him to meet them. Everything which thus stimulates to honest industry is advantageous; but we refer to a future page the inquiry whether his labours are oppressively heavy, and whether, amidst his earnest struggles to obtain a livelihood, he has time and opportunity to care for his highest interests.

Another most important cause of our commercial greatness, is the MILD AND BENEFICENT FORM OF GOVERNMENT under which we live, and the feeling of security which is inspired by its firm administration of the laws, its gradual removal of abuses and evils, and its encouragement of

the most free and friendly intercourse with foreign powers. Without a well-grounded hope of peace and security, people are not disposed to exert their energies, either of body or mind, in the advancement of the useful arts, or the prosecution of commerce. In a public sense, the want of security has been rightly styled "the greatest of calamities, and the cause of the most abject misery and degradation." In Britain, the confidence of the people in the stability of their country has been fully shown by their peaceful industry and steady advance, at a time when the rest of Europe was convulsed with revolutionary wars. The practical character of our government and people, and their active business-like proceedings, seem particularly to arrest the attention of foreigners, especially of Germans, who (the more intelligent class) are prone to dwell on the ideal, to seek out the first principles of things, their general laws, their essence, etc., and, while thus engaged, to let slip the real business of life, or to go through it with abstracted minds. M. Merle D'Aubigné, the historian of the Reformation, appears to have been greatly struck by the contrast between the two nations: "Yet," he says, "this practical character which distinguishes England is not selfish,

as might have been expected. The large scale on which the people work gives a certain scope and grandeur to the imagination. The habit which the English have of forming into parties, and looking at themselves as a nation, is opposed to a narrow selfishness; and a more elevated sentiment struggles with this vice in a large portion of the people." "The constitution of Great Britain," he adds, "the balance of her powers, the slow but sure energy of the universal thought of the people—all this is so beautiful, that we cannot but recognise a master-hand."

Another point which struck this estimable traveller, in passing through our country, was that the people "never talk about liberty," which is the endless theme abroad. They do not talk about it because they really possess it; but the freedom with which they speak their mind on abuses and evils in the state, the petitions they pour in when they are earnestly set upon removing a grievance, and the patient and considerate manner in which their rulers listen to their appeals, and, in many cases, act upon them,—all these things proclaim, in no doubtful language, the extensive liberties of the British subject. Our little island may, indeed, be said to possess every element of sound

government and real prosperity, and we cannot contemplate the numerous tokens of God's favour bestowed upon us, without believing that we are raised up as a nation to be the instruments of good to the whole world, and the diffusers of Christianity throughout its length and breadth.

Nothing is more calculated to inspire confidence, and to bind the affections of a people to their sovereign and their rulers, than a disposition on the part of the latter to advance with an advancing age, to renew what is falling into decay, and to clear away every obstacle to the free exercise of the rights and privileges of their people—at the same time that they cherish, and support, and carefully guard from violence, all that is worthy of honour and veneration, or that is characteristic of the nation. In our own age, a broad and philanthropic view is taken on many subjects which were once hedged in by narrow prejudice. Thus, at one period there was the most impolitic jealousy of intercourse with foreigners, and the reception they met with in this country was anything but cordial ; whereas we have recently invited all the nations of the earth to visit our shores, and many of their people have long since found a safe asylum here. Our policy in this respect

resembles that which has marked the Dutch government from a remote period. A paper, published by authority so long ago as 1756, thus decisively states their views on the subject as it respects Holland: the same liberal feeling is not, however, extended to their colonies. "It has always been our constant policy to make Holland a perpetual, safe, and secure asylum for all persecuted and oppressed strangers; no alliance, no treaty, no regard for, nor any solicitation from any potentate whatever, has at any time been able to weaken or destroy, or make the state recede from protecting those who have fled to it for their own security and preservation. Throughout the whole course of all the persecutions and oppressions that have occurred in other countries, the steady adherence of the republic to this fundamental law has been the cause that many people have not only fled hither for refuge, with their whole stock in ready cash and their most valuable effects, but have also settled and established many trades, fabrics, manufactures, arts, and sciences in this country, notwithstanding the first materials for the said fabrics and manufactures were almost wholly wanting in it, and not to be procured but at a great expense from foreign parts."

In the same manner, England has now been for many years the asylum of the unfortunate of all lands. As Venice, in the days of her glory, was celebrated as the sanctuary of the oppressed—so England, which has often been compared to Venice, on account of her important commerce, and her maritime power, also displays the same universal hospitality. With wise and generous policy, she collects together within her sheltering arm the conquered and the wrecked, whoever they may be. There is scarcely a nation in Europe which is not indebted to her for the protection of some of its people in circumstances of danger and distress. On the persecution of wealthy merchants in Italy, and the consequent decay of their commerce, England gave them an abode, and still bears marks of the event in the name of the street where they principally settled, called Lombard Street. So, also, on the dispersion of the French Huguenots, consequent on the revocation of the edict of Nantes, thousands took refuge in England, and brought with them a degree of knowledge and skill, especially in the manufacture of silken goods, which materially forwarded our commerce at that time. Among the weavers of Spitalfields there still exist many French names, and a street called

after the *fleur de lys*. At a later period, England gave shelter to nearly all the French nobility and princes ; and afterwards, when the scene had changed, she was equally generous in receiving the constitutionalists, republicans, and adherents of Napoleon. Again, a shifting of the scene takes place, and she welcomes other royal French fugitives, and sees a de-throned prince end his days on her peaceful territory ; but she does not so espouse his quarrel as to refuse shelter to his most violent opponents, when their turn comes to be driven to the same harbour of refuge. The benefit of this asylum is not, therefore, granted by favour or caprice, but by a wise and impartial law which includes the whole earth in its beneficent action.

Another great contributing cause of our commercial greatness, may be found in our wondrous FACILITIES OF INTERNAL COMMUNICATION, which, together with the smallness of our island, and the density of our population, bring the mind and intelligence of the masses to act on each other to a degree not known in any other kingdom of the earth. Good roads have been aptly called national veins and arteries, being quite as indispensable to a healthy state of the community, as veins and arteries are to the existence of individuals. A century ago,

such means of circulation were either wholly wanting in Great Britain, or they were of so wretched a description, so clogged and obstructed, that no healthy flow of internal communication could take place. So late as 1763, for instance, there was but one coach between London and Edinburgh, and this set out but once a month, and, owing to the badness of the roads, took from twelve to fourteen days to perform the journey. So opposite is our condition at the present time, that even in the remote Highlands of Scotland, which, until a recent period, were in many parts quite inaccessible, there are now some of the finest roads in Europe. Government came forward in aid of the undertaking, and six hundred miles of excellent roads brought improvement and civilization into what had been a wild and unfrequented region. And so it is all over our country, the vast improvement and extension of roads have worked a corresponding advancement in the condition of the people. The combined length of the streets and turnpike roads in England and Wales only, amounts to about twenty thousand miles ; while that of the cross-roads and highways, where turnpikes do not exist, is estimated at ninety-five thousand miles. Thus, even before the great railway

system came into operation, and while stage-coaches were in their glory, we had a greatly improved and most important means of internal communication. Valuable as this was at the time, however, it shrinks into utter insignificance when compared with the facilities now offered by canals and railways.

The *canal* system of Britain must always be connected with the name of the duke of Bridgewater, who expended a princely fortune in constructing a line of water communication between Worsall and Manchester, and afterwards between Manchester and Liverpool. This great undertaking was successfully carried out by his engineer, the celebrated Brindley. That individual had early formed the grand scheme of uniting the great ports of London, Liverpool, Bristol, and Hull, by a system of internal navigation, and before his death the project was brought into a fair train towards accomplishment. The public spirit of the duke of Bridgewater became infectious; individuals came forward, and companies were formed for the purpose of carrying on the useful undertaking. Canals designed to open communications between important places were to be heard of on all sides; some of these were highly beneficial; others were injudiciously

planned, and, therefore, subjected their promoters to loss. But, on the whole, the canal system, by its great facilities for the transmission of heavy goods, gave fresh life to agriculture and to manufactures. New villages were seen to start up along the banks; new lands were brought into cultivation, owing to the cheap conveyance of the necessary manure, marl, lime, etc.; buildings were erected in quarters where they would not have arisen but for this easy mode of conveying stone and building materials; manufactures flourished anew, on account of the convenient carriage of coal; in fact, a change came over the face of the country. New sources of wealth were opened, and internal traffic gave an impulse to external commerce; for now from the ports foreign merchandise was safely and cheaply transmitted into the interior of the country, while the produce of the interior found a new market at the ports. Though, subsequently, the establishment of railways gave a sudden check to the progress of canals, yet for many descriptions of goods the latter will always be preferable, and will, therefore, maintain their place. In some instances, the traffic has even increased on canals since the establishment of a railway in their vicinity. Before the opening

of the London and North Western Railway the amount of goods annually moved on the Grand Junction Canal averaged 756,894 tons, whereas the average amount since that period has been upwards of 1,000,000 tons annually. In 1847, it was 1,163,466 tons.

It now remained that the wholesale method of transportation from place to place, hitherto applied mainly to goods, should be made equally available to human beings. This was done to an extent never dreamed of by the most sanguine mind, on the establishment of the *railway* system. Henceforth, the well-loaded stage-coach, whose arrival was one of the main events in the day's history of many a country town, and whose modicum of news and dozen of passengers gave rise to no small temporary bustle and excitement in the quiet place; henceforth, this important vehicle, ushered in with shouts and sounding horn, was to sink into comparative obscurity, taking perhaps the humble task of conveying passengers to the nearest railway station, where, on that wondrous iron road, were linked together a long line of carriages, each more capacious than the poor old stage, and each more densely filled, yet all put in motion by the same power, and gliding smoothly along with snake-like move-

ment, at a speed that was never thought of in the palmiest days of "four in hand."

As this wondrous system gained ground, the fears at first excited by what appeared an awful risk of human life gradually subsided. The accidents, though terrific, were found not to exceed in amount of damage those sustained by the upsetting of coaches in former days ; their wholesale character, when they did occur, being set off by their comparative infrequency. And then, who could resist, however prejudiced, the increased comforts of the new mode of travelling? Who could be insensible to its vast advantages, with respect to economy of time and rapidity of communication, whether between friends or traders? The railway system was destined, in the providence of God, to prosper, and to unite all parts of our island in one common bond of brotherhood. Its tendency was to break down unjust and hurtful jealousies, to bring the agricultural and manufacturing districts into a closer dependence on each other, to equalize the privileges of the whole nation, and to create the kindly feeling between towns and districts, which springs up between individuals in proportion to their opportunities of holding friendly converse.

Meanwhile, the transmission of goods is also

accomplished with a speed which is of vast advantage in the case of perishable articles, and leaves far behind all previous modes of conveyance. Take the lively account of an eye-witness of the arrival of a luggage-train on one of our principal lines of railway, and of the wonderful rapidity with which its contents are set in motion, for all parts of the metropolis or of England :—“ The picture altogether is really astounding. For, from one side of the platform, a set of active porters are centripetally wheeling, from different spring-wagons, innumerable packages to the recording clerks, (whose duty it is to record the weight of every article, and to affix to it the company’s printed charge for conveyance to its address,) other porters, equally active, are centrifugally wheeling other packages to various railway vans, which, as fast as they can be filled, are drawn away from the dispatching side of the platform, and immediately replaced by empty ones. One set of porters are wheeling to a recording clerk a wagon load of raw silk, valued at £9,000, from China, which, *viâ* the South Western Railway, has just arrived at Southampton, to go to Macclesfield to be manufactured ; another set, Russia tallow, in casks ; others, draperies ; another set, yarns for Gloucester ; one porter

has on his truck a very small but heavy load of iron or lead ; another, with comparative ease, is wheeling through the crowd a huge wool-bag, large enough to contain, if properly packed, a special jury. Here comes a truck of mustard, in small casks ; there goes a barrow load of drugs—preceding a cask of spirits, which, to prevent fraud, has just been weighed, tapped, gauged, and sampled ; also several trucks full of household furniture—the family warming-pan being tacked round the eight-day clock, etc. This extraordinary whirl of business, set to music by the various noises proceeding from the working of the steam cranes, steam-dollar, steam capstan, common cranes, and other machinery above the platform ; from the arrival, turning, backing, and departure, of spring-wagons beneath it ; from the rumbling of porters' trucks crossing the platform, as also of the railway vans, as, laden with goods, they are successively rolled away, forms altogether a scene which we repeat, though rarely visited, is astounding to witness."

It is needless here to describe the principal railways of Great Britain. The manner in which they traverse and intersect the country is visible on any map of our island. The capital expended on their formation is reckoned at

upwards of one hundred and forty-eight millions sterling ; and some of the principal lines, especially the London and North Western, are works that do honour to our country, and strikingly display the wealth, science, and power of the nation.

Another cause of prosperity in this kingdom is the MUTUAL RELATION AND DEPENDENCE OF THE VARIOUS INTERESTS THROUGHOUT THE LAND.

Like the human body, our country is so intimately united in all its parts, that if one member or class suffer, all the other members or classes suffer with it. The manufacturing interest cannot be injuriously affected without the consequent depression of the agriculturist, nor can the agriculturist long suffer without a depreciating effect on trade and manufacture. The farmer, the merchant, the retail trader, the manufacturer, are all involved in the same chain of interests, however much a spirit of rivalry may sometimes lead them to imagine that their interests clash. If the merchant class, for instance, were wanting, the farmer would have to dispose of his produce in various quarters as best he could, and would be distracted by the cares of trading and bartering when his time and attention were needed for his crops. The ready market for his goods

which is now supplied by the intervention of the wholesale dealer, would be exchanged for a perplexing traffic with numerous customers, and a corresponding risk and loss of time. If the retail dealers did not form a distinct class, and if the merchant himself sold out in small quantities the goods which he purchased wholesale, his cares would become so multiplied, and the capital required so large, that success would be next to impossible. Were the manufacturer missing in this chain of interests, or rather were his labours confined within narrow limits, all the other classes would suffer accordingly. The agricultural districts would have to bear the weight of supporting a vast number of labourers, who now find active employment in factories and iron-works. They would miss an almost infinite variety of useful and necessary articles, which are now supplied to them at a cheap rate, and they would also lose an immense market for their own produce. The closing of a mill deprives the neighbouring dairy farmer of all his best customers; and in periods of manufacturing distress, the sale of agricultural produce, especially milk, butter, and cheese, is very much depressed. And this influence is not confined to the close vicinity of manufacturing districts. Throughout the length and breadth

of the land the same effects are produced, so that it has been declared without any exaggeration, that the herrings of Sunderland, the wools of Sussex, the butter of Cork, and the malt of Hants and Essex, all afford a standard whereby to judge of the state of industry in the great manufacturing districts of Yorkshire and Lancashire. Even in the apparently trifling matter of giving a "dressing," as it is called, to cotton goods, whereby a more smooth and substantial appearance is imparted to the fabric, the consumption of flour is estimated at twenty thousand loads per annum; for there are at least one hundred thousand dressing-frames in operation, and each of these consumes five pounds' weight of flour weekly, thus making in the year twenty-five million pounds' weight, equal to twenty thousand loads.

This mutual dependence of classes extends to commerce generally. "The commerce of one country with another," says Mill, "is in fact merely an extension of that division of labour by which so many benefits are conferred upon the human race. As the same country is rendered the richer by the trade of one province with another, as its labour becomes thus infinitely more divided, and more productive than it could otherwise have been, and as the mutual supply to

each other of all the accommodations which one province has, and another wants, multiplies the accommodations of the whole, and the country becomes thus in a wonderful degree more opulent and happy : the same beautiful train of consequences is observable in the world at large—that great empire of which the different kingdoms and tribes of men may be regarded as the provinces. In this magnificent empire, too, one province is favourable to one species of accommodation, and another province to another. By their mutual intercourse, they are enabled to sort and distribute their labour as most peculiarly suits the genius of each particular spot. The labour of the human race thus becomes much more productive, and every species of accommodation is afforded in greater abundance. The same number of labourers, whose efforts might have been expended in producing a very insignificant quantity of home-made luxuries, may thus, in Great Britain, produce a quantity of articles for exportation, accommodated to the wants of other places, and peculiarly suited to the genius of Britain to furnish, which will purchase for her an accumulation of the luxuries of every quarter of the globe. There is not a greater proportion of her population employed in adminis-

tering to her luxuries, in consequence of her commerce, there is probably a good deal less ; but their labour is infinitely more productive ; the portion of commodities which the people of Great Britain acquire by means of the same labour is vastly greater."

31 In the last place, as the most important cause of our country's greatness and prosperity, we would rank the great blessing of AN OPEN BIBLE, AND FREEDOM TO FOLLOW ITS SACRED TEACHINGS IN the way which conscience dictates, that freedom being universal, and its peaceful consequence—religious toleration. Happy the nation in which the rule of faith is the word of God only ! Happy the people who are at liberty to drink at that pure and sacred fountain, instead of vainly seeking refreshment and health at the troubled streams polluted by man's inventions ! That which is necessary for the spiritual life and progress of every individual Christian, is also necessary for the life and progress of the nation at large. Without the word of God and prayer, the Christian cannot exist. The one is his spiritual food and sustenance, the other the very breath of his soul. The Bible makes known to him sin and its remedy ; it teaches him to seek salvation in Christ only, excluding every work or merit of his own as a means of

justification ; it leads him to depend on the Spirit of God only for the sanctification of his heart and life ; it directs him in all his difficulties and trials, being a lamp unto his feet and a light unto his path ; it gives him spiritual discernment to detect error, for by bringing the sayings and opinions of men “ to the law and to the testimony,” he knows full well that “ if they speak not according to this word, it is because there is no light in them,” Isa. viii. 20, 21. It regulates his religious worship, and teaches him to place dependence, not in external rites and multiplied observances, but in the presence of his Lord and Saviour ; it is to him, indeed, the perfect law of liberty ; and continuing therein, he, being “ not a forgetful hearer, but a doer of the work,” is “ blessed in his deed.”

And as “ the entrance of God’s word giveth light” to individuals, so does the unrestricted use of that word give light to nations. However much that light may be obscured by the glare of worldly ambition, the glitter of wealth and fashion, and all those dazzling objects which interpose for the moment to hide it from mortal eyes, yet it burns steadily, affording, by its clear pure ray, a standard whereby to judge of all false lights, as well as of all worldly objects and aims. Thus, in that nation where

the Bible is the acknowledged standard of right and wrong, and where the gospel of our Lord and Saviour has free course, although vast numbers of the people, unhappily, may not be under its immediate influence, yet the whole community shares in the light which it diffuses, for it is the light of *Truth*. A high moral standard is before the nation; and even those who miss the grand purpose for which the word of God was given, and are unable, through the ignorance that is in them, to comprehend the way of salvation therein so plainly revealed—even these are able, in some degree, to appreciate the moral dignity of the Christian character, and to see the value, in a worldly sense, of the integrity and uprightness which distinguish it. They copy the fruits of the gospel, while the gospel itself remains unknown. The laws, also, and public ordinances of such a nation are just, and wise, and good, so far as human ordinances can be so called, for they are ostensibly based on the eternal law of God. Thus, in our own Protestant land, the character of the whole nation is elevated by the free use of the Scriptures; our laws and institutions are admired throughout the civilized earth; and such is the world's faith in our honour and integrity, that England has unbounded credit. There are no sophistries in

England's creed ; she is not taught that it is allowable to break faith with heretics and infidels ; she is not permitted to use unlawful means to accomplish good ends ; but every Protestant within her isles may read for himself those striking words, "Lying lips are abomination to the Lord : but they that deal truly are his delight." The Bible has made us what we are as a nation ; let us hold it fast as our common birthright, our most glorious possession. "The moment England abandons the faith of the Bible," says D'Aubigné, "the crown will fall from her head. If the gospel dies in these illustrious isles, from the blows which Romanism and Tractarianism now unite to give, then must be written upon their so long triumphant banner, ICHABOD—' *The glory is departed.*'"

But we hope better things of our beloved country ; we believe that the spirit of the Bible and of the Reformation is yet strong within her, and that she will rise up in her strength and integrity to cast off the trammels of superstition, to break every yoke, and to let the oppressed go free. Then shall her motto be, not *Ichabod*, but EBENEZER—" *Hitherto hath the Lord helped us.*"

The spirit of the Bible is not a persecuting spirit ; it opposes error by holding up the light to it, so that all may see its deformity, but it

does not wage war against the victims of error. With the Bible in their hands, Christians know that the fruit of the Spirit is love, joy, peace, long-suffering, goodness, gentleness, truth. How can they claim to be guided by that Spirit if they have bitterness and wrath towards those who oppose themselves? In like manner, a nation professing to be guided by the maxims of the sacred word will exercise all forbearance towards differing creeds, while holding up before all the one Divine standard of truth. Hence comes what in political language is called *religious toleration*—a great blessing to the people at large, permitting each to worship according to the dictates of his own conscience, and not denying to any one freedom of expression and of action.

The spirit of the Bible is favourable to the highest cultivation of the intellectual and moral nature of man, and to his rapid progress in whatever may best promote his individual advantage, or that of his fellow-creatures. The man of science, if a true Christian, will exclaim with a worthy physician now deceased, “Why are not God’s works studied more? Why are not all who have the means acquainted with *his* birds, *his* fishes, *his* herbs, trees, and flowers; the habitudes of *his* creatures existing around

them, the structure of *his* world, and of *his* universe? Many have access to this volume, and live and die ignorant of its instructive pages, as if it had never been unfolded to them. Alas! it is so with the Scriptures also!" Far from condemning with narrow bigotry the general pursuit of knowledge, the Christian sees how valuable every new acquirement may become, and how greatly it may subserve the cause of truth. He remembers, that as there is only one source of truth, so we need not be under any alarm lest human research should discover facts at variance with the word of God. It cannot be that truth should oppose truth; but it can be, and is the case, that so many links are wanting in our chain of knowledge, that we have to wait in all humility till these are supplied, before we can take in the grand ideas which are dawning upon us. There is no need to denounce the discoveries of science, or to prohibit the reading of books in which those discoveries are made known. A corrupt church, which fears and abhors the progress of enlightenment, lest it should shake her own superstitions, may resort to these devices; but the Bible Christian is not afraid of the progress of human knowledge: on the contrary, he gladly goes along with it, taking with him the Divine light,

which invests it with new beauty, by teaching him to see God in everything.

The practice of Protestant and Roman Catholic countries is, in this respect, exactly opposed, and, as might be expected, the fruits of the two systems are most apparent. In the one there is constant progress and advancement in all the useful arts and sciences, in education, literature, and all that belongs to enlightened and civilized life—in the other, there is a condition of things as nearly stationary as it is in the power of the church to keep them; a jealousy and depreciation of literature and science; a watchful eye to train up the people in old superstitions, and to prevent or crush a spirit of inquiry. To carry on such a system as this, it is absolutely necessary to withhold the word of God. The entrance of that word would give light, and light, except as it emanates from the church, is the very thing they dread. It is seldom that either Protestantism or Popery has absolute and undivided sway in a nation, therefore these effects are variously modified according to circumstances. In our own country, there is enough of the spirit of Popery to influence a large body of persons, and hinder the perfect and complete diffusion of intellectual and moral truth. In the neighbouring kingdom of France, especially in

her capital city, there is enough of the spirit of Protestantism, and, alas! also of infidelity, to emancipate the people from superstitious bonds, and to leave an open field for scientific research. But it sometimes happens, that a fairer and closer opportunity of comparing the two systems is afforded by particular towns, where the doctrines of each church hold, respectively, unlimited sway over the consciences and habits of the people. This is remarkably the case with the two neighbouring Swiss towns of Zurich and Lucerne, and in a great measure also with the numerous villages scattered along the valley where those towns are situated. Of these villages, some are Roman Catholic and others Protestant, scarcely any two together being of the same faith throughout the valley. The Protestant villages are most obviously superior in cleanliness, wealth, and general prosperity; while in the Catholic, the numerous festivals of the Romish faith tell severely on the well-being of its followers, in a country where labour is scarce, and there is more to be done than there are hands to accomplish. The opposite pictures presented by Zurich and Lucerne shall be given in the words of an observer, who is wholly unprejudiced in the matter, or whose leanings, if any, seem rather in favour of "picturesque, unchanged, quaint

old Lucerne," which he describes as sitting at the extremity of her exquisitely lovely lake, girdled in by a circlet of battlemented walls, as feudal in appearance, as mediæval in her physiognomy, as if her mailed warriors were still fighting for the faith on the field of Cappel with the burgher heretics of Zurich.

Let us proceed first to the picture which our traveller gives of the Protestant town:—
"Active, clean, industrious, smiling, and comfortable, ultra-Protestant Zurich sits on the fertile bank of her gentle lake, and enjoys the prosperity of which the foundations were laid for her by the sufferings and struggles of Zuinglius, and many another citizen patriot and martyr, in the cause of temporal and spiritual liberty. The French have a proverb, '*grossier comme un Zurichois*;' but there are few or no provincial towns in France which possess such ample preparations for education and intellectual pursuits, as these good, fat burghers have provided for themselves and their children. It is true that society at Zurich is not brilliant. Balls are rare, and parties are chiefly confined to small meetings amongst intimate friends. But numerous booksellers' shops, well supplied with German and French literature, chiefly the former—extensive educational insti-

tutions for all classes, on the most large and liberal scheme—a reading-room, supplied with two hundred and fifty of the best periodicals of Europe—various public libraries, containing above eighty thousand volumes—and philanthropic institutions of all sorts, are sufficient to prove that the burghers of Zurich are not so ‘*grossier*’ as to think of nothing but their woollens and calicoes.”

The picture of the Catholic town of Lucerne is next drawn. A great variety of superstitions, dead or dying elsewhere, are still in full vigour and authority among its unenlightened people. Among the rest, they fully believe that “the accursed Pilate,” after wandering about the world in wretchedness for some years, at last came thither, and drowned himself in a small lake on the top of a grim mountain overlooking their town, and hence called Mont Pilate. The inhabitants have not the smallest doubt that the violent thunder-storms, for which the Lake of Lucerne is remarkable, all proceed from the restlessness and malice of the spirit of Pilate.

Our traveller was a witness of one of these storms, and of a superstitious observance connected with it. He describes the fiery redness of the lightning, and the loud explosion of the

thunder, as of the most startling description, the latter shaking every timber of the bridge on which he was standing, waking the mountain echoes, and then retreating with low muttered growling into the dark recesses of the Bay of Uri. "Then suddenly, from every tower and steeple of Lucerne, boomed out such a clangour of bells as might indeed have scared the spirit of the storm, if aught earthly could be supposed to do so. This ancient practice is still in full vigour here, and is never omitted whenever the restless ex-governor of Judæa sends a storm down from his mountain to trouble the town and lake. I am aware that the movement of the air caused by a peal of bells is said to be of some real service in dissipating the electric fluid; but assuredly it is by no such scientific afterthought that the good citizens of Lucerne are influenced."

This circumstance, taken in connexion with the fact, that until very recently the town council forbade the ascent of the ill-omened mountain, lest the ghost of Pilate should be disturbed, and storms multiplied, will make it almost unnecessary to say, that the means of acquiring knowledge at Lucerne are miserably defective. One small reading-room there is, but it is badly supplied and ill-supported; and

the Lucernois do not read any English publication.

The following passage, from a well-known modern historian, is an appropriate comment on these fruits of the faith of Rome. "During the last three centuries, to stunt the growth of the human mind has been her chief object. Throughout Christendom, whatever advance has been made in knowledge, in freedom, in wealth, and in the arts of life, has been made in spite of her, and everywhere in inverse proportion to her power. The loveliest and most fertile provinces of Europe have, under her rule, been sunk in poverty, in political servitude, and in intellectual torpor; while Protestant countries, once proverbial for sterility and barbarism, have been turned, by skill and industry, into gardens, and can boast of a long list of heroes and statesmen, philosophers and poets. Whoever, knowing what Italy and Scotland naturally are, and what, four hundred years ago, they actually were, shall now compare the country round Rome with the country round Edinburgh, will be able to form some judgment as to the tendency of papal domination. The descent of Spain, the first among monarchies, to the lowest depths of degradation; the elevation of Holland, in spite of many

natural disadvantages, to a position such as no commonwealth so small has ever reached, teach the same lesson. Whoever passes in Germany from a Roman Catholic to a Protestant principality—in Switzerland, from a Roman Catholic to a Protestant canton—in Ireland, from a Roman Catholic to a Protestant county—finds that he has passed from a lower to a higher grade of civilization. On the other side of the Atlantic the same law prevails. The Protestants of the United States have left far behind them the Roman Catholics of Mexico, Peru, and Brazil. The Roman Catholics of Lower Canada remain inert, while the whole continent around them is in a ferment with Protestant activity and enterprise. The French have, doubtless, shown an energy and an intelligence which, even when misdirected, have justly entitled them to be called a great people ; but this apparent exception, when examined, will be found to confirm the rule, for in no country that is called Roman Catholic has the Roman Catholic church, during several generations, possessed so little authority as in France.”

Such is the verdict of history upon the respective operations of Protestant or Romish principles. Long, then, may England be

honourably distinguished for attachment to the former, and uncompromising antagonism to the latter ! Various causes have been enumerated by us as having tended, in a greater or less degree, to the formation of her national greatness. An open Bible, a deep attachment to the truths of the Reformation, may be numbered, however, among those which have been mainly instrumental.

Instead, however, of indulging in vain-glorious elation at national advantages, may the reader remember that exalted privileges imply enlarged responsibilities ! Each mercy we enjoy is a call to repent and turn to Him whose bounty gives us all ; to be reconciled to him through faith in the Son of his love ; and in the strength of the Holy Spirit to present ourselves "a living sacrifice, holy, acceptable unto God," which is our "reasonable service."

SECTION II.

ON THE VAST AMOUNT OF LABOUR EMPLOYED IN OUR MANUFACTURING AND MINING OPERATIONS; AND THE EFFECT OF MACHINERY, CONJOINED WITH SKILLED LABOUR, IN ENHANCING THE COMFORTS AND CONVENIENCES OF LIFE.

IN taking a general view of the present state of our country, as regards her extensive commercial relations and her consequent wealth, power, and influence, we were naturally led to trace the *causes* which, under the providence of God, have placed us in our present position. Not less naturally are we now led to inquire into the effects likely to flow from our commercial greatness, as it respects our own internal prosperity and the welfare and happiness of our people.

It is not to be denied that we have amassed a capital far greater than that of any other nation—that we have raised the value of British industry above that of any other people—and that our land has thus become more valuable than any other territory of equal extent. We

have grown wealthy beyond all expectation, and apparently with little effort. A thoughtful writer remarks truly, that "whatever may be said of some portions of our countrymen, the English (and they form the bulk of the population of Britain) are not a saving people. In every occupation and in every rank, among labourers, mechanics, shopkeepers, capitalists, and proprietors, there is a tendency to the display and consumption of wealth, little known on the continent. We have exhibited the strange spectacle of a nation rising rapidly to enormous wealth, in the midst of profuse public and private expenditure." This state of things is closely connected with our manufactures and commerce; let us, therefore, trace their effects on the welfare of our people.

The first effect to be noticed, as resulting from the increase of arts and manufactures in this country, is the *vast amount of labour* thereby brought into requisition. This is a result of the utmost importance to our prosperity under existing circumstances; for, at the present time, notwithstanding all that emigration has done to diminish our numbers, we have an overflowing population, of which a larger proportion, perhaps, than at any previous period, consists of adult males, capable of useful

labour. The progress of a nation as to its population is reckoned, not according to the number of births, but to the number of active members in proportion to those who are feeble and helpless. In this respect, the condition of England, Wales, and Scotland, is highly satisfactory, and exhibits a marked improvement since the war. There is some advance also in Ireland, but it is very small compared with that of the rest of the kingdom. The number of persons between the ages of fifteen and fifty was much greater in proportion to the number of infants and old persons in 1841 than in 1821, and we doubt not will be still greater in the census of 1851. For not only have we enjoyed many years of peace, but, in consequence of various improvements going on in our country itself, as well as in the habits of our people, there has been of late years a continually diminishing mortality. Laudable efforts to improve the soil and productiveness of marshy and cold districts have been made by owners and occupiers of land, and these have proved, not only immediately beneficial for the purposes designed, but also extensively useful to the respective neighbourhoods. As stagnant waters are drained off, and as healthy cultivation appears, so do low fevers and agues take flight,

and healthy faces predominate. This generally improving condition of the country is also happily accompanied by improved habits of the people. Their dwellings are less crowded; their clothing is better and cheaper; they are more temperate, and frequently more cleanly than of old; and they are saved, by the general adoption of vaccination, from the fatal effects of a great scourge, which once swept off numbers in their bloom. Thus, there are many beneficial causes in operation to produce in our population a large and increasing number of healthy and active individuals, for whom work must be found. The grand difficulty in all communities appears to be the employment of the people; and in our own small islands, where it is impossible to find in the tillage of the land sufficient occupation for our abundant population, this difficulty has often presented itself in a most formidable light. Scarcely, then, can we overestimate the value of manufactures, as providing employment for our people. The immense stimulus given to manufacturing art by steam-impelled machinery, when viewed in connexion with the increase of our population, appears to offer a happy and wisely ordered means of saving from misery and want a people for whom we can trace no other path of peaceful labour.

Cordially does the writer concur in a remark of the rev. Mr. Parkinson, made on this subject at a meeting of the British Association: "I believe that a feeling is becoming very prevalent elsewhere, that there is something in the character of manufactures unnatural, and opposed to the will of God. Now, I maintain that the state to which we are tending in manufactures is as much the will of God as agricultural pursuits." And surely so it must be. If, in the immediate family of our first parents, there were not only tillers of the soil and keepers of cattle, but also "artificers in brass and iron," and those who "handled the harp and organ;" then, doubtless, the useful arts and the fine arts, as well as the toils of agriculture, received their sanction from the Divine appointment, while their progress, from that hour to this, has been regulated by the Divine will. The more we accustom ourselves to refer *all* events to God, the less shall we be disposed to cavil at those vast changes which are taking place in the world, accompanied by circumstances which might well arouse our fears, were they viewed independently of the unseen arm which directs them all.

Comparing the returns obtained by the census of 1841 with those of former periods, it

is evident that the number of persons engaged in agriculture is constantly diminishing, while that of the manufacturing population is as constantly on the increase. In the textile manufactures alone, that is, in the preparation of woven fabrics used for clothing, etc., employment was then given to 1,465,485 persons, namely, fifty-four out of each thousand of the entire population. The number employed in the working of metals in Great Britain was 36,222 ; and the total number engaged in the working of her mines, 193,825. These numbers appear small compared with those of the workers in textile fabrics, but the latter would become feeble and inoperative were it not for the miners and workers in metal. It must also be remarked, that in reckoning workers in metal as above, we have only numbered those engaged in bringing the raw material into a form in which it shall be fit for the operations of the blacksmith, the nail-maker, the brazier, tinman, cutler, etc., of whom there are many thousands in the kingdom. Were these included and added to the miners, the total number would more nearly approach 350,000 persons, engaged in the raising from the mines, smelting, working, fashioning, and preparing for useful purposes the metals of Great Britain. The

total number of persons engaged in agriculture throughout Great Britain, in 1841, was 1,490,785.

These being the facts of the case, it becomes an interesting inquiry, whether these persons, who, in continually increasing numbers, swell the amount of our manufacturing population, are to be pitied as the over-tasked slaves of a system, dangerous alike to health and morals, or whether they are to be considered as possessing no greater claims to compassion than agricultural and other labourers, whose condition is necessarily subject to vicissitude and hardships. To answer this question fairly, we must have a general understanding of the nature of the respective systems, and of the mining and manufacturing operations now going on so extensively in the kingdom. The proceedings of the agriculturist are generally witnessed and understood, but to a great part of our people the manufacturing employments of hundreds of thousands of their fellow-countrymen are quite unknown. Let us, then, in the first place, briefly glance at some of the proceedings of the 1,465,485 persons engaged in textile manufactures.

The cotton trade is the most important and prosperous, and at the same time the most recently established of all our great depart-

ments of manufacture. Until the close of the last century, the value of our home-made cotton fabrics was trifling, and the sources on which we now chiefly depend for the supply of raw material were not opened to us; the unexampled increase of the trade is, therefore, the work of our own times.

In the manufacture of *cotton yarn*, the work-people assemble in huge buildings, sometimes seven or eight stories high, with rooms two or three hundred feet in length, and lighted by numerous windows. These buildings are congregated together in districts where the great essentials of water-power, fuel, and iron, can be readily obtained, and where an easy communication exists with places of import and export. The districts thus favoured are situated in Lancashire; the tract of land lying between the rivers Ribble and the Mersey being, perhaps, the most advantageously situated for manufactures of any known locality. The neighbouring hills pour down a number of rapid streams, supplying water-power to many hundred mills, feeding navigable canals, and furnishing supplies to the bleaching, printing, dyeing, and other works connected with the manufacture. In and around Manchester—the great cotton metropolis of England—all

these processes are carried on with the utmost activity, steam here taking the place of water-power. In the various departments of the factories where cotton yarn is spun, the operations are very far from being laborious; many of them are even performed by women and children. It is by the great power of machinery that the work is done, human labour being merely required to transfer and adjust the materials in their several places. Mr. Baines has given a lively picture of these operations when he says, "It is by iron fingers, teeth, and wheels, moving with exhaustless energy and devouring speed, that the cotton is opened, cleaned, spread, carded, drawn, roved, spun, wound, warped, dressed, and woven. The various machines are proportioned to each other, in regard to their capability of work, and they are so placed in the mill as to allow the material to be carried from stage to stage with the least possible loss of time. All are moving at once, the operations chasing each other; and all derive their motion from the mighty engine, which, firmly seated in the lower part of the building, and constantly fed with water and fuel, toils through the day with, perhaps, the strength of a hundred horses. Men, in the meanwhile, have merely to attend

on this wondrous series of mechanism, to supply it with work, to oil its joints, and to check its slight and unfrequent irregularities; each workman performing, or rather superintending, as much work as could have been done by two or three hundred men sixty years ago." Taking into consideration this mighty power, and vast amount of machinery, with the subordinate part played by the operatives, one is at first disposed to wonder how the numbers employed in the manufacture of woven goods, whether of cotton, silk, or woollen fabric, find occupation. But the wonder ceases when we reflect that the amazing *quantity* of goods produced by machinery must of itself create employment in various ways for a numerous array of work-people. The very conveyance and arrangement, first of the raw material, and then of the finished product, is no light matter; and when we take into account the almost endless processes through which this raw material passes—processes, indeed, mainly performed by machinery, but requiring the constant assistance of human hands—we are then considerably enlightened as to the reasons for the flocking of thousands to Manchester and other great seats of manufacture, and the ready employment found for them there.

The manufacture of *linen yarn* is an ancient branch of industry; it was known to the Egyptians at the time when Joseph and his brethren were sojourners in their land. Linen was a costly article in Great Britain until the invention of the admirable machinery which has now raised the British trade to so important a position, both as it respects our home consumption and our exports. Within the last fifty years, the trade in linen has become doubled in England, and trebled in Scotland. The situation of the principal flax mills in England is in the West Riding of Yorkshire and its immediate vicinity; and in Lancashire, Dorsetshire, Durham, and Salop. Dundee, in Scotland, and Belfast, in Ireland, are the chief seats of the trade in those countries.

Persons wishing to gain a just idea of the extent to which the flax manufacture is carried on in England, should visit such mills as those of the Messrs. Marshall, near Leeds. These buildings cover a large extent of ground, and for the most part consist of the usual lofty, many-storied mills. But there is one which is distinctively known as the "New Mill," or "One-story Mill," where the machinery is arranged in one enormous room on the ground-floor, a room five times larger than West-

minster Hall, and seven times larger than Exeter Hall, London—its dimensions being 396 feet long by 216 feet wide, equal to nearly two acres. Along the whole length of this extraordinary mill, the machines are arranged in parallel lines, and are mostly attended by young women. Each machine bears a tablet, stating the number of spindles at work, the quality of yarn being spun, or some other special information respecting its own action. Here may be seen the processes of drawing, roving, spinning, doubling, and reeling; and there is ample space left between and among the machinery for the operations of the attendants. This mill is lighted abundantly from the roof, which is formed of brick groined arches, sixty-six in number, each thirty-six feet span, and supported by iron pillars to the height of twenty-one feet. In the centre of each arch is a conical skylight, rising ten feet above the roof, and having at its point an outlet for the used air of the room beneath. The ventilation of the mill is excellent, and its warmth is maintained by means of a small steam-engine, which works in the vaulted cellar beneath, and sends up hot air through a series of pipes. The temperature can be regulated, and that degree of moisture

obtained, which is essential to the successful spinning of flax. In the cellar are also two steam-engines of one hundred horse power, impelling the shafts which set in motion the immense assemblage of machines in the mill. Other contents of this cellar are pipes for gas and for water, a carpenter's shop and warehouses, and a set of hot and cold baths for the use of the operatives, each bath being contained in a separate room, lighted with gas. This most healthful and valuable privilege is extended to all the operatives who can exhibit a ticket of good conduct, the cold bath being gratis, the warm bath charged one penny.

Every part of this one-story mill is turned to good account, for even the roof, to which we ascend by a flight of steps from within the mill, is not an ordinary roof, but a wide lawn, on which sheep are sometimes seen grazing; this lawn being agreeably chequered by what seem like numerous conservatories rising from its surface, but which, on coming nearer to them, prove to be the skylights just described, through which the busy scene below is visible. The existence of a grass-plat in this unusual situation is thus explained. The roof of the mill was first covered on the outside with a coating of rough plaster, then with an

impervious coating of coal-tar and lime, and, to prevent this from cracking, a layer of earth, eight inches thick, was added, and finally sown with grass, which flourishes well in that situation. The method of draining this two-acre field is by the iron pillars which support the roof; these are hollow, the upper extremity of each being merely protected by a grating, to keep back solid substances, while the rain-water passes into the sewer beneath. The number of operatives employed in these mills is upwards of two thousand; and this fact, in itself, is sufficient to prove the flourishing state of a trade in which one establishment can find work for so many hands.

The manufacture of *woollen and worsted goods* is peculiarly suited to a country and climate like ours, where pasturage for sheep abounds, and where there is a constant necessity for warm clothing. Accordingly, we find that the growth of this article was early encouraged; it was the custom, however, for several centuries to carry large quantities of our English wool to Flanders, where it was manufactured and returned to us in the form of the finer descriptions of woollen cloths. At length, in the reign of Edward III., Flemish workmen were invited hither, and protected in their trade, with

a view to the improvement of the various processes of the manufacture. From this period, the trade advanced, and British wool began to find its way into foreign markets, and to secure a good price. Yet the machinery employed in the carding and spinning of wool, and in the weaving and finishing of cloth, remained of the same simple character in the reign of George III. as in the reign of Edward III.; the woollen manufacture, therefore, could not have made any remarkable progress, had not the inventions of Hargreaves and Arkwright brought machinery to bear on the manufacture of cotton, which was soon found to be capable of adaptation to the carding and spinning of wool. Accordingly, between 1785 and 1800, hand-cards and spinning-wheels were laid aside, and carding-engines, spinning-frames, gigs, or raising-frames, shearing-machines, brushing-machines, etc., took their place. At the same time, there was such a vast increase in the manufacture, that the number of workpeople required became greater instead of less after the introduction of machinery. And not only was it the case at that period, but in the opinion of some eminent manufacturers, there are as many hands employed at the present day to produce *the same amount of cloth* as formerly, because a

great deal more work is now bestowed on it, and its appearance and state of finish are wonderfully improved and heightened.

The manufacture of fine cloth was for a long period confined to Gloucestershire, Wiltshire, and Somersetshire, where the wool was grown, and from whence the port of Bristol could be conveniently reached. The coarse woollen manufacture prevailed in Yorkshire. The state of the roads throughout the kingdom prevented the ready interchange of commodities which we now enjoy, and limited to a great degree the seat of manufactures. Pack-horses derived their name from the packs of wool with which they were laden, before roads could be safely traversed by wheeled conveyances. But with improved means of communication great changes took place in the trade. The merchants of Bristol no longer monopolized the foreign trade in wool, which had hitherto been brought chiefly through their hands from Spain and Portugal. The introduction of merino sheep into the north of Europe, and the importations of Saxony wool by way of Hull and Liverpool, soon enabled the Yorkshire manufacturers successfully to compete with their brethren of the west of England, and at length to surpass them in the extent and importance of their manufac-

tures. In the mills of Yorkshire, we have witnessed similar mighty operations going on in the production of woollen goods, and similar extensive employment of operatives to that for which the cotton and linen manufactures are remarkable. In Ackroyd's power-loom shed at Halifax, there are eight hundred and sixteen looms arranged in seventeen rows, all engaged in the constant production of worsted fabrics, often of very beautiful colours and patterns. The attendants here, as elsewhere, have merely to see that the work goes on properly, and to supply the material for this gigantic process of weaving. Here are woven brilliant coloured stuffs for South America, for China, or for any other nation to which English commerce is extended. The manufacture of the finest descriptions of cloth is also carried on most extensively in the neighbourhood of Huddersfield and elsewhere—so that Yorkshire has now a just claim to be considered the great seat of the woollen manufacture, though the same continues to be prosecuted with success in the west of England also. The principality of Wales maintains its reputation for the manufacture of flannels, and Scotland has her own celebrity for tweeds, tartans, shawls, plaids, etc.

Although the *factory system* (or that which

assembles large numbers of persons in buildings belonging to the master, and employs them on fabrics which are entirely his property) is common in the woollen as well as in the cotton and linen trades, yet in the first there are two other systems pursued, that of the *master clothier*, who keeps distinct classes of persons to their peculiar branches of the trade, employing them either at his factory, or at their homes ; and that known as the *domestic system*, which is now principally confined to the vicinity of Leeds and Huddersfield, and to some parts of North Wales. This last allows of a number of small proprietors possessing each two or three looms, and working them at home on their own account, assisted by their families and sometimes a few journeymen. They are not able to carry their work through all the necessary processes in this way ; for certain of them, therefore, they resort to a mill, established on the joint stock principle. The advantages of this system are, that it affords steady and industrious men an opportunity of establishing themselves by small beginnings as master manufacturers, and so, frequently, of rising to comfort and independence. The system is also accompanied with less risk to the merchant in adverse states of the market, and enables him to carry on his

trade with far less capital than if he were the sole manufacturer of his own cloth. Instead of keeping a large stock on hand, he can repair to the market, and there purchase the full amount which he may require to meet a sudden demand.

The total value of woollen fabrics annually produced in Great Britain has been estimated at twenty-four millions sterling; and the total number of persons employed in the manufacture at three hundred thousand.

The manufacture of *silk* in Great Britain was very trifling until the reign of James I. It was previously confined to light articles, such as ribands, girdles, etc.; but in consequence of the encouragement given by that monarch, silk dyers, throwsters, and weavers, came hither from the continent, and introduced the manufacture of broad fabrics. In 1661, the company of silk throwsters in London employed forty thousand persons; but in 1685 the number was greatly increased by the arrival of the refugees from France, on the revocation of the Edict of Nantes. That edict had been granted nearly a hundred years before, for the purpose of securing to the French Huguenots, or Protestants, the free exercise of their religion, and the enjoyment of civil rights; but

this liberty, always repugnant to Roman Catholic intolerance, was now withdrawn, and the consequence was, the dispersion all over Europe of a skilful and intelligent population, who carried with them a knowledge of arts and manufactures, which greatly stimulated the industry of their protectors, and gave new life to the manufactures of the respective countries in which they were located. About seventy thousand of these persecuted Protestants settled in England and Ireland, many of whom had previously been engaged in the weaving of silk. These congregated in Spitalfields, and carried on the manufacture of brocades, satins, velvets, and many other articles previously obtained from abroad. The machinery employed was, however, exceedingly defective, and it was not till 1717 that a knowledge of the Italian machinery and methods was obtained and acted upon. These, after a series of years, gave place to modern improvements. The winding, spinning, doubling, reeling, and weaving of silk, are processes somewhat analogous to those carried on in a cotton or flax mill, but exhibiting, of course, far greater beauty and richness. The splendid damasks and figured silks fabricated in the silk-mills of Manchester are objects of high admiration to the visitor, for whom also

the ingenious processes of the embroidery frames possess peculiar interest. The operations in a throwing or silk-spinning mill are almost entirely performed by young women and boys, under the superintendence of male and female adults. In the best-conducted establishments the sexes are kept, as much as possible, apart. The winding is performed by little girls. The spinning-frames are managed by boys, and the various finishing operations by girls. In Derby, where about five thousand of the inhabitants find employment in the various operations of the silk trade, and also in Leeds, there is a peculiar department for the manufacture of sewing silk, which is quite on the principle of the rope-walk. The sewing-silk room or shed is twenty-four yards long, and at each extremity are wheel machines with hooks, their number being regulated by the breadth of the room. The machines are under the care of men, but two or three boys are employed at each, to run backwards and forwards with groups of ends of silk to be fastened to the hooks. In the course of the spinning, these boys run at the rate of five or six miles an hour, with intervals of rest, performing about twenty miles a day; yet they are in high health, and are so little tired, that when

work is over they are generally foremost in any sport that is going on. The manufacture of broad silks is now conducted in Spitalfields, Manchester, Macclesfield, Glasgow, Paisley, Dublin, and some other places. Ribands are chiefly made at Coventry; crapes in Norfolk, Suffolk, Essex, and Somerset; silk hose and gloves at Derby, Leicester, and Nottingham; and mixed goods, of silk and cotton, are made in various parts of the kingdom.

The number of persons employed in the manufacture of silk, cotton, and woollen *hosiery*, and other articles knitted upon frames, is estimated at no less than one hundred thousand, including the numbers engaged in seaming and stitching the goods after they are removed from the frames. This mass of population is scattered over the three counties above named, and is decidedly the worst paid, the most crowded in their dwellings, and the most wretched of the textile manufacturers. Were all the manufacturing labourers similarly situated, little could be said in favour of the system. There is an unfortunate facility in acquiring a knowledge of the hosiery trade, which constantly tempts women and unemployed workpeople belonging to other trades to enter this; the consequence is, a great overplus of hands, and depreciation of

wages. A fruitful source of poverty is the exorbitant rents paid by the operatives for their frames, for very few of the regular knitters possess frames of their own. More than two-thirds of the frames belong to hosiers or manufacturers, who give them out to undertakers and middlemen, these last letting them out to workpeople, but retaining a certain number to be worked in their own houses. The middleman receives yarn from the hosier with directions for the work, and then sets his knitters about it. He has, perhaps, half-a-dozen knitting-frames in his house; he has neither authority nor inclination to enforce the wholesome regulations of a factory; the men, therefore, come and go as they like; working, perhaps, with unnatural energy for two or three days, and then spending the rest of the week in intemperance. They are subject to several exactions, having not only to pay the rent of the frames, but also a commission, called "taking in," for the middleman's trouble in receiving the yarn and orders, and taking back the goods. They have also to pay for "standing room," or the rent of the space taken up by the frame in the house. If their frames remain idle all the week, no rent, etc., is demanded. But if more than one day's work is performed,

the full rent and charges are exacted. This letting of frames is found so profitable, that numbers are constructed beyond the requirements of the trade, as a matter of speculation. The following unjust regulation is sometimes enforced : if a poor operative has his frame at home, he does not escape the usual charges, for in addition to the rent of the frame he frequently pays standing-room, just as if he were occupying a place in the middleman's house. This is extorted in consideration of the convenience granted to him by having the frame at his own home. The evils connected with frame-work knitting are therefore greatly aggravated by the absence of the factory system, and by the necessity for the class of middlemen, and the exactions which the custom of the trade enables them to impose.

The peculiar condition of these operatives shuts them out from many opportunities of improvement which are presented to the workers in factories, and, owing to the depressing influence of extreme poverty, they appear unable to appreciate such advantages when they come in their way. For instance, in a mill for spinning yarn for stocking-frames, a small library was provided for the use of the work-people, but the superintendent complained that

they had no taste for instructive reading, and that the young girls in particular neglected the books in the library, while they would eagerly read the cheap trash of the book-shops in the form of penny romances. The wages paid in the *lace trade* are better, so far as regards the superior class of operatives, who are able to dwell in comfortably furnished rooms, and are exempt from the miseries which beset a lower class. The latter comprises menders, runners, etc., who repair faults in the lace, and receive very scanty pay. There is at times such a heavy pressure of night-work in the lace-making districts, that all the persons engaged in it become dreadfully exhausted. The consequence is, that on the sabbath, the only privilege they are sensible of, is that of lying in bed the greater part of the day. Many of the operations can be performed by young children; hence, the temptation to make them work when they ought to be at school. The law which enforces education is not applicable except in factories, and it is no uncommon thing to find mere infants employed in drawing the threads which release the strips of lace edging, originally manufactured all in one piece. One of the characteristic features of the lace trade is the relay system, by which workmen succeed each other

every four or six hours. The value of the machinery is so great, that in order to get a return for his outlay, the owner is obliged to keep it in action a greater number of hours than is known in any other branch of manufacture. Bobbin-net and warp machines are sometimes wrought twenty hours out of the twenty-four, two men belonging to each machine, and relieving one another at intervals. The total number of lace-making machines at work in 1836 was 3,547, of which the county of Nottingham possessed 2,162, or more than one-half. At that time there was a new source of employment in the making of fancy nets, which demanded about two thousand additional hands, beyond the regular numbers employed on plain nets, and the usual branches of the trade. The subordinate operations connected with textile manufactures, such as calendering, bleaching, dyeing, calico-printing, etc., also make large demands on the labour of the country.

Let us turn from this busy scene to another field of labour, which, taken in its widest sense, affords employment, as we have already stated, to about three hundred and fifty thousand of our population. The *mining system*, so actively and scientifically pursued at the present day, is accompanied by many fearful evils ;

but these are not so inevitably associated with it as to be incapable of amelioration. Much has been done by wise and humane legislation, and much more might be done, by careful superintendence, to lessen the dangers and difficulties of the miner's life. The course of proceeding in the *collieries* (and these must always stand foremost in mining operations) is first to ascertain by *boring* the probable existence of the desired beds of coal, and then to sink a perpendicular shaft from the surface, so as to pass through the various strata containing coal. This shaft, which is from ten to fifteen feet in diameter, has its upper portion bricked or walled to prevent the falling in of loose materials; in some cases, this walling is continued down to the solid rock. Before any great depth has been reached, the workmen are almost sure to come upon springs of water, which have to be pumped out by a powerful steam-engine. In the northern coal-field, the shafts are continued in some instances to the depth of three hundred fathoms, (one thousand eight hundred feet;) an expense of forty or fifty thousand pounds has often been thus incurred before any actual working for coal has been commenced. When a desirable seam presents itself, the sinking of the shaft is discontinued,

and a broad straight passage is driven into the seam in opposite directions. This passage is twelve or fourteen feet wide, and is made of the whole height of the seam, so as to expose the rock above and also the stratum below. There is also a passage made for draining off the water which collects, as in a gutter, along one side of the floor. From the principal gallery various others are driven in the most profitable directions, as respects the inclination of the strata and the cleavage of the coal. These secondary galleries again meet other principal galleries, which are driven in a direction parallel with the first, and thus a coal mine comes to resemble a regularly built town, with its intersecting streets and masses, not of buildings but of coal. Where these passages or streets are of tolerable height, the miner's task is not more arduous than that of many other labourers ; but where seams of only two or three feet in height are considered worth working, unless the roof and floor are excavated beyond the coal, the position of the miner is most painful, and his task becomes exceedingly laborious. In some collieries, the habit of employing boys, and even women, to work in these low galleries, has been carried to a barbarous extent. The *hewers*, or excavators of

the coal, disengage immense masses by means of gunpowder, or they drive wedges into fissures, which they have previously made, or they work laboriously with the pickaxe. The coal is drawn from the place of excavation in baskets along tram-roads. This work is performed by lads, and was formerly shared in by women, who crawled along the low passages with chains round their waists, to which these baskets were attached. The females were dressed like the boys, and, covered as they were with coal dust, could scarcely be distinguished from them. This shameful state of things is, we trust, entirely at an end; it was fraught with evil, and most justly called for that interference of the state by which it is now forbidden. The coal conveyed in this way to the principal galleries is received into wagons, several of which are fastened together, and drawn by a horse to the bottom of the shaft, whence their contents are raised by a steam-engine to the surface. The coal is then screened, or roughly sifted, through a sloping framework of iron bars, half an inch asunder, to separate the small coal from the large masses; each sort is then ready for the market. The small coal was formerly burned to waste at the pit's mouth; but it is now profitably employed in making coke

for locomotives, iron-works, etc., and some of the large coal is even crushed for the same purpose.

The dangers which surround the collier, and the means taken to avert them, have been adverted to at an earlier page ; they are, however, strongly displayed in the following extract from the report of the South Shields Committee :—“ Pit coal is produced by a severity of labour, and risk of personal safety to the miner, which the workman of no other occupation is exposed to. The pitman descends two hundred, three hundred, and sometimes five hundred yards into the bowels of the earth, and there traverses subterranean passages, frequently for two or three miles in extent, to his work ; where, by the glimmering of a small candle, or more imperfect lamp, in a space seldom six feet high, and oftener three or four, he labours in a stooping position, sometimes lying on his side for eight or ten hours together, in an impure atmosphere, to extract the mineral that above ground is diffusing light, heat, riches, and enjoyment. In such a situation, often without a moment's warning, he is overtaken by destruction. The gases generated in such abundance in the mine, from some accident suddenly explode, and fill the pit

with death. In an instant, and in the most fearful manner, he is scorched and shrivelled to a blackened mass, or literally shattered to pieces against the rugged sides of the mine; or if out of the range of this terrible piece of ordnance, in a few seconds the *after-damp* spreads itself in every direction, and poisons beyond recovery all that it may reach."

Such fearful accidents, still unhappily frequent in coal mines, call loudly for all the aid which science can give, and improved plans of ventilation can supply, to diminish the risk to the large number of human beings thus laboriously engaged in adding to our comforts, and in advancing the commercial greatness of our country, by extracting the fuel which feeds our engines and propels our vessels.

In *iron mines*, the course of operations is different. The iron-stone frequently occurs near the surface, and can at first be procured by merely removing the soil, and then raising it, like a pavement, by means of wedges, bars, etc. But as the strata descend, the stone is gradually more difficult to get at, and horizontal galleries are perforated under the soil, so as to fall in with the declivity of the strata. When a gallery of this description has been carried to the extent of from one hundred to two hun-

dred and forty yards, the miner turns round, and excavates, right and left, to the width of twenty or thirty yards, throwing the shale and rubbish into the space behind him, or getting it wheeled out to the mouth of the gallery along with the iron-stone. Thus he clears out the whole band of iron-stone, which perhaps is not more than four or five inches thick, and yet repays the expense of working. Much of this work is performed in a lying posture, and the wheelers crawl on all-fours, but there is scarcely any danger from noxious gases, and no great risk of accident, except from occasional fallings in of soil. When the galleries have become extensive, the labour and cost of wheeling out the iron-stone are very great, and it is then necessary to sink a pit from the surface. This is usually done at a distance of from one hundred and sixty to two hundred yards along the same line of level, and when the iron-stone is found, a gallery is set off to meet the former working. Sometimes the galleries are high enough to allow a horse to work in drawing the laden trucks to the pit's mouth. When the ore is thus extracted, it is raised to the surface, where it goes through all those processes which make the iron districts so remarkable. It is roasted in heaps in the open air with small

coals, to keep up the combustion. Over these mounds the fire slowly creeps along, and the whole district, glimmering with these burning heaps as far as the eye can reach, presents a strange scene, especially during the night. The same process is likewise performed in kilns and furnaces. The effect is also heightened by the long rows of flame proceeding from the coking fires of an iron district, as well as by the body of smoke and flame poured out by the blast furnaces. The spectator cannot fail to be reminded of volcanic regions, not only by these eruptions of roaring flames, but by the ruinous appearance of many of the houses, caused by the excavations beneath, and the sinking of the land on which they rest.

When the iron-stone is roasted, it is next *smelted* (which is only another word for melted) in a blast furnace. In South Wales, some of these furnaces, at their widest part, are fifteen or eighteen feet in diameter, and will contain, when at work, one hundred and fifty tons of ignited materials. In England, they seldom exceed thirteen or fourteen feet in diameter. By means of inclined planes, the materials (iron-stone, coke, and limestone,) which are to be smelted together in these furnaces, are conveyed in barrows to the top of

the chimney, and thus the furnace is regularly charged. As the fire is never allowed to go out, some idea may be formed of the industry brought into action by the supply of such enormous fires as these, which are rendered more fierce by continued blasts of hot or cold air, sent into them by means of powerful machinery. The iron-stone, coke, and limestone, act upon each other, so as ultimately to form at the bottom of the furnace two liquid products ; one, a sort of glass, consisting of the limestone in combination with the earthy impurities of the ore—the other, the melted iron. The former runs off, and forms, when cool, a solid slag, or cinder. The latter is drawn off at intervals of eight or twelve hours, the process being continued, with double sets of attendants, day and night, for two or three years. Were the furnace allowed to cool, the contents might become solid, and the furnace would then be ruined ; but in some works arrangements are made for lessening labour on the sabbath, by merely keeping up the fire on that day, and omitting the drawing off or *casting*. This releases all the workpeople except one. According to the breadth of the channels in which the bright and molten metal flows as it is drawn off, the bars of iron are called

sow or *pig* iron, and of these there are many qualities.

The *refining* of iron by further melting in small low blast furnaces; the *puddling*, or remelting and kneading with long tools in a reverberatory furnace; the *shingling*, or bringing the glowing mass from the puddling furnace, and placing it under the shingling hammer, where it is beaten into a firm tenacious oblong mass; the *rolling*, by which this oblong mass, still at a bright red heat, is passed repeatedly between the grooves of rapidly moving rollers, until it is drawn out like a flame-coloured riband—all these processes, and many more, by which these iron ribands are cut up in lengths, and then again subjected to further refinements and rollings, bring into operation a large amount of labour, and prove a constant demand on the energies of the people. In 1844, there were 1,400,000 tons of iron made in Great Britain, and when we remember the almost endless purposes to which that metal is now applied, and the many branches of manufacture employed in bringing it into the useful and ornamental shapes we see around us, in all the elegant forms of steel goods as well as of massive iron, we then acquire some idea of its importance as a source of industry to the British nation.

As a field for the employment of labour, the *copper* trade is far less important than the iron trade, yet the wages obtained are, on the whole, higher and better sustained. The chief source of our copper ore is Cornwall, but we also import it from South America, the West Indies, and Australia; and it may be mentioned as a very remarkable circumstance, that this bulky and valuable freight should be brought from the ends of the earth to this country to be smelted, and also that one particular locality (Swansea) should be the great scene of operations. In consequence of the absence of coal in Cornwall, and its abundance in South Wales, all our copper ore is taken to Swansea to be smelted, where it is first crushed by large iron hammers, wielded by men and women, or by passing it through rollers worked by steam power. It is then wheeled in barrows to an incline, up which it is drawn to a stage over the calcining furnaces. Into these it is delivered by means of hoppers, each of which will receive forty-five hundredweight of ore. It is allowed to remain in the furnace twelve hours, its surface being disturbed or renewed every two hours by an operation called "rabbling." Some of the sulphur, arsenic, and other volatile impurities, are thus disengaged, and when the

ore is cooled and the calcination complete, it has the appearance of small black gravel. It is then wheeled away to other furnaces, called "ore furnaces," where it is mixed with a flux, melted afresh, and after the removal of impurities in the form of a slag, the metal is allowed to run off into pits of water, where it becomes granulated in sinking. Several more meltings have to be carried on before the metal is sufficiently pure, and during all these processes the workpeople are exposed to the injurious action of fumes, which are very irritating to the lungs of visitors. Yet they do not complain, nor do they appear to suffer so much as might be expected. The answer, "There is not much sickness among us; we live like other people, as well as we can," was that given to an inquiry concerning their health. If the number of people actually employed in the works is not very great, yet the copper trade between Cornwall and Wales alone gives employment to about one thousand two hundred seamen, and to shipping amounting to twenty thousand tons. A great many barques, of five hundred tons, also trade in copper ores with Cuba and South America; and in 1849, eighteen vessels, of six hundred tons' burden each, entered with a similar freight from Australia.

The mining for *tin*, as well as for copper, is performed by sinking shafts and driving horizontal galleries. When large masses of ore are to be extracted, pillars are left to support the roof, and these, to avoid loss, are frequently of timber. The timber used in the mines of Devonshire and Cornwall is Norwegian pine, and it has been calculated that the supply required is such as it would take one hundred and forty square miles of Norwegian forest to furnish. There are no noxious or inflammable gases generated in the Cornish mines, so that ventilation is simply carried on from shaft to shaft, by communication through the different galleries. The ore is extracted by means of gunpowder, (three hundred tons' weight of which are annually used in the mines of Cornwall alone,) and when extracted is conveyed to the bottom of the shaft in wagons, moving upon tram-roads, which sometimes extend over miles in these subterraneous regions. It is then raised to the surface by steam-power. The comfort of the miners has latterly been much increased by special arrangements for their accommodation; convenient places are now provided for the changing and drying of their underground garments; protection from the weather is also afforded to the women and girls who pound,

and pick the ores on the surface. In deep mines, the men suffer much from fatigue in climbing the ladders after work is over, and it sometimes takes them a full hour to get from the place where they are at work to the surface. In the deepest mine of all, the Tresavean, three hundred fathoms, a machine has been erected for raising and lowering the miners as much as two hundred and forty fathoms, and it is much to be desired that this sort of aid could be universally rendered. Tin ore is smelted in reverberatory furnaces, being mixed with small coal and a little slaked lime as a flux. The melted mass is worked up with an iron rake to separate the scoria. The liquid tin is allowed to run off into cast iron moulds, but is still alloyed with iron, copper, arsenic, sulphur, and other matters, which have to be got rid of by subsequent processes of refining. The purest results of these processes are *block tin*, *refined tin*, and *grained tin*. The familiar uses to which these are put, again remind us of the great amount of labour which each of the metals worked in our island is continually bringing into operation. The manufacture of *tin-plate*, or the covering of sheets of thin iron with that preservative wash of tin which fits them for the endless purposes of domestic use, is a trade

which is much on the increase at the present time, and in which good hands can always find employment. The wages, too, are good, those of the men averaging from 25s. to 30s. or £2 per week, and those of the women from 7s. to 10s. and 12s. The japanning, ornamenting, and polishing of tin goods, is also a fruitful source of employment, as in the *Britannia metal* trade, or making of articles from a compound of block-tin, antimony, copper, and brass. About three hundred persons in Birmingham work at this trade, but its chief seat is at Sheffield. The manufacture and tinning of *pins* is another instance of abundant employment furnished by this metal.

The *lead* mines of England are of ancient repute. They exist in Derbyshire, in Northumberland, Cumberland, Durham, some parts of Yorkshire, and in Salop and Cornwall. There are also mines in Wales, Ireland, and the Isle of Man. Altogether, the United Kingdom furnished, in 1847, 83,747 tons of lead ore, yielding 55,703 tons of lead. The dressing of lead ore is simple, and does not greatly differ from that of tin. The ore always contains a portion of silver, and when this is considerable enough to be worth extracting, it is separated by one process, called *cupellation*, or by another,

called *crystallization*. In all the processes, a very considerable amount of labour is called into action, as well as in the other manufactures dependent upon lead, such as shot-making, the manufacture of leaden pipes, leaden sheeting, etc. *Zinc* is another metal furnished by our mines, and applicable to a variety of useful purposes. The zinc manufacturers in the neighbourhood of London display a great variety of articles to which this metal has been recently applied, thus giving proof of its increasing importance as a source of industry to our people. The various compounds of metals might also be named, such as brass, bronze, gun-metal, pinchbeck, and the multifarious employments they lead to; but enough has been said to remind the reader, that to the abundance and variety of our mineral riches we owe a constant and valuable demand for labour. It may also be added as a remarkable fact, and in illustration of a peculiarity of our country, that there is scarcely a mineral to be named which does not occur in some part of the United Kingdom; and that all those most essential in the useful arts and manufactures are sufficiently abundant, not only to furnish the demands of the nation, but to allow of extensive exportation.

We must not leave the subject of our mineral wealth, without a passing remark on those various clays and earths found in Somersetshire, Devonshire, and Cornwall, which furnish material for the extensive labour of the *potteries*. These are mixed with calcined flint and Cornwall-stone, ground to a very fine powder under water, and reduced to a pulp of the consistence of cream. The clay having been brought to a similar consistence, both are strained through silken sieves, and mingled in a common tank. The tank is paved with fire-tiles, and has shallow furnaces running underneath; the liquid paste is by this means kept at a slow simmer until the moisture has evaporated, and left a consistent white dough. This is pressed in cone-shaped machines to extract bubbles of air, and issues from the base of the cone in continuous flow and of the appearance of putty. It is next carried in masses, of about one hundredweight each, to an adjoining warehouse, where it is to be moulded into the required shapes. How multiform these shapes are, and what large employment they give to numbers in their formation, casting, baking, ornamenting, glazing, and general preparation, we need not say. A glance at the shops and warehouses where china, crockery,

and earthenware are displayed, or still better, a visit to that remarkable region in Staffordshire known as "The Potteries," will give enlarged ideas on this subject, while it will also afford the means of judging of the comfortable condition of most of the operatives. It is difficult to stop in the catalogue of England's mineral riches, and of the manufactures dependent upon them; the very shores of our sea-girt isle supply material for the *glass-maker*. Glass is formed of sea-sand in conjunction with an alkali, and some of our sands are of so fine a description as to produce the best varieties of ware. The alkalies employed are the carbonates of soda and potash. For the coarser kinds of glass, barilla, kelp, or wood ashes are used, which contain many impurities. Other materials are, a small portion of nitre, and in the case of flint-glass, oxide of lead, in the form either of litharge or minium. Black oxide of manganese and arsenic are also used, and in the case of plate-glass, borax is added. Birmingham is now as famous for its manufactures in glass as in metal. The number of flint-glass makers in the United Kingdom is about a thousand, of whom one-fifth reside at Birmingham. The materials of which glass is made differ, as we have seen, according to the kind of

article to be produced. The ingredients are mixed in large troughs, and there undergo calcination, previous to their more perfect fusion in the glass-house. This is called fritting; and when the materials have been gradually raised to a heat sufficient to form them into a pasty mass, they are so maintained for two or three days, and then removed and cut up in squares and stored for use. In this state they are called *frit*, a brittle crumbling substance not unlike alum. This frit is afterwards placed in crucibles or *glass-pots*, which are set permanently in the furnace, and remain there for months, being constantly employed, however, in melting successive charges of glass. The men work night and day to supply these crucibles, to keep up the fire, and to manufacture articles from the molten glass. It is to be noticed here, also, that on the sabbath the furnace is merely watched that it may not go out, and no more attendance is required than is absolutely necessary to accomplish that object. Glass vessels of every variety are for the most part produced by blowing the melted glass into form, and moulding it by hand with the assistance of a few simple tools. Our country has long been forward and successful in the manufacture of glass, and now that

the duty is removed our progress can scarcely be calculated. The value of the glass annually produced in the United Kingdom has been roughly estimated at two millions sterling, and the number of the workpeople at fifty thousand. The intense heat to which the glass-blowers are subjected, might naturally lead us to think the occupation an unhealthy one, but neither here nor in the iron-works, where also intense heat is endured, do the men themselves consider their trade injurious. In both cases, it leads to excessive thirst, and in quenching this the men often pass the bounds of safety and of moderation; in fact, they drink more than it would be possible for them to do, but for their exhausting labour and profuse perspiration. The glass-blowers earn good wages, and live well. It is not uncommon for them to have meat at breakfast, dinner, and supper. The men relieve each other every six hours, and those who leave off work at the end of the first turn, or one o'clock, frequently go to bed after dinner, and then get up refreshed to take their turn at six o'clock. In a large glass-making establishment at Birmingham, constant employment is given on an average to one thousand workpeople, and this number was greatly increased in consequence of the demand for glass

for the Great Exhibition building. Other flourishing trades, such as the manufacture of paper, leather, gas, sulphuric acid, soda, etc., employ large numbers of workpeople, and contribute to the well-being of the community.

No better opportunity of studying the arts and manufactures of our country has ever been presented than in the building we have just named, nor would our notice be complete without a glance at our country's contributions to its contents. Our brief descriptions may recall to such of our readers as have visited this marvel of modern times many objects which they personally inspected with deep interest. The sketches which we give will also, we trust, not be devoid of instruction to those who have not had an opportunity of examining the contents of this grand treasure-house of art and skill. Let us suppose, then, our reader to accompany us in a walk through those parts of the structure which more immediately illustrate the subject of our work.

The building before us is itself a marvellous specimen of rapid and skilful workmanship ; while the materials of which it has been formed bring to mind the abundant natural resources of the country, the mechanical knowledge of the people, and the excellence of the machinery em-

ployed. A space of upwards of eighteen hundred feet in length by four hundred in breadth, was covered by a beautiful and elegant structure in little more than six months, the first column having been laid on the 26th of September, 1850; the Exhibition opened on the 1st of May, 1851. The industrial energy of Great Britain has never, perhaps, been more strikingly exemplified than in the construction of this palace; the precision and punctuality of the nation have never received a better illustration.

The vertical supports of the building consist of one thousand and sixty hollow columns of cast-iron on the ground-floor, continued in sections of about sixteen feet long to the roof, and serving as the means of drainage thereto. At the junction of the columns are connecting pieces of peculiar construction. The horizontal connexions are of both wrought and cast-iron; of the latter, about three thousand five hundred tons have been used in the building; of the former, five hundred and fifty tons. The columns rest upon cast-iron plates based upon concrete, and above these plates are the sleepers which carry the floor. The security of the columns is further insured by the arrangement of the iron girders, which brace

and unite them above in a framework of tried strength. These girders, two thousand three hundred in number, are attached to the connecting pieces ; they are of a form admirably adapted to sustain the load they have to bear, and at the same time to please the eye, and enhance the general effect of the building. The strength of both columns and girders has been severely tested. It has been found that six tons is the bearing weight, and twelve tons the breaking weight of each column in the middle ; and that no less than thirty tons are required to form the breaking weight of the girder. The cylindrical form gives extraordinary strength to a column, as was exemplified in an interesting manner by professor Cowper, in a lecture delivered in the building on the 31st of December, 1850. Placing two short sections of a common quill about a foot asunder, on a table in a vertical position, and resting on these apparently fragile cylinders a flat piece of board, he proceeded to load the latter with heavy weights, a quarter of a hundredweight at a time. He continued this until, to the amazement of his audience, two hundredweight had been sustained. At that point, a sudden snap of the quills, and the descent of the weights, announced that the breaking

weight had been reached. The great force required to crush such slight objects, afforded the means of roughly estimating the strength of the iron cylinders around.

The effect of the whole framework of the building is extremely light, and it needed the demonstrations given to assure the public mind that sufficient strength had been imparted to the supporting columns and girders. Above the highest tier of iron framework, the roof consists entirely of wood and glass, which form the materials also of nearly the whole face of the building. No less than 896,000 superficial feet of glass, weighing 400 tons, have been employed in this edifice; while the quantity of wood, including that used in the flooring, amounts to 600,000 cubic feet.

The arrangement of the building is that of a vast nave, with two aisles on each side, crossed by a magnificent transept, whose noble vault embraces two venerable elms. The preservation of these trees has been the motive for raising the transept to so great a height; so that we are indebted to these ancient denizens of Hyde Park for the most striking feature of the new building. At the height of 68 feet from the ground springs a semi-cylindrical vault, 72 feet in diameter, which extends for a

length of 408 feet from north to south. The principal approach to the Crystal Palace is at the south side of this transept, and the visitor on entering has at once a grand and astonishing *coup d'œil*. On walking halfway along this transept, he has reached the centre of the whole building, and looking to the right and left, he sees the nave extending to the length of 900 feet on either side. The nave is a grand avenue, 64 feet high, and 72 feet wide. The side aisles, parallel with it, are each 24 feet wide, and are covered by galleries throughout their whole extent. The two lines of gallery are connected at frequent intervals by bridges, while access is gained to the galleries in general by ten double staircases, eight feet wide.

The total area of the ground-floor of this immense building is 772,784 square feet; that of the galleries, 217,100 square feet. The length of the latter is nearly a mile. There are 358 wrought-iron trusses for supporting the galleries and roof, 30 miles of gutters for conveying water to the columns, and 202 miles of sash-bars throughout the edifice. The roof of the nave, throughout its whole extent, is covered externally with canvass; the south side is also covered, but not the north, where the light does not require to be subdued. The

transept is uncovered ; the sunbeams, therefore, fall unchecked on the trees, flowers, and fountains, which adorn the centre of the building. The flooring of the whole edifice is laid with spaces of half an inch between the boards, so that dust may easily pass away, and that after being watered the boards may dry quickly.

The arrangements for supplying air to the Crystal Palace are on a most extensive scale. The ventilating surface comprises an extent of 50,000 superficial feet, and is nevertheless so easily manageable, that one individual can open or close 600 feet of this surface at a time. One man's strength, therefore, applied at about ninety different points, suffices to regulate the whole simultaneously. The ventilators are galvanized iron blades, moving on pivots, and fixed in a wooden frame. There are eight of these blades in each of a series of frames, inserted between the columns and the sill on the ground-floor, and six in other series, surmounting the sash-frames in the two upper stories.

The arrangement of the contents of the Exhibition is in a geographical form ; the position of the products of each country being determined to a great extent by the latitude of the country itself. The productions of the United

Kingdom are placed westward of the central transept, in the nave, and numerous courts adjoining, as well as in a large portion of the galleries. On the north side of the nave there are the several courts for the exhibition of machinery, and also distinct courts for the exhibition of carriages, minerals, paper, miscellaneous articles, and East Indian productions; while on the south side there are courts for printed fabrics, for flax and woollen, and for mixed fabrics, for furniture, for Birmingham and Sheffield manufactures, for agricultural implements, for mediæval furniture, for sculpture, etc. The department appropriated to machines in motion is the most striking and impressive of the whole of this wondrous display. Thousands of persons have beheld in it, for the first time in active operation, that interesting series of machines by which raw cotton is spun into *yarn*, a material which either by itself, or woven into various fabrics, produced to this nation, in the year 1850, nearly twenty-nine millions of pounds sterling in exports alone—a sum exceeding in amount the value of all our other exports taken together.* First, there is the *cotton-cleaning machine*, by which the tangled and matted tufts of cotton, as obtained from the cotton plants of the eastern and western hemispheres,

are beaten and whirled about until solid impurities are removed, and dust is drawn out by means of a shoot, in which the air is rarefied by the rapid motion of a fan. Then, there is the *lap-machine*, in which the cleaned cotton is spread out in certain weighed quantities on an endless apron, which by its constant motion feeds some rollers, whose action is to convert the loose cotton into a *lap* or continuous substance. In this lap, however, the filaments of cotton remain in a confused and tangled mass; as it passes out of the machine it is wound upon a roller, and thus conveyed to the *carding engine*, a beautiful invention for bringing the fibres into a parallel position. The lap is here slowly unwound, and is combed out or *carded* by an immense number of wire teeth, arranged on drums; from the last of these drums the cotton is stripped off by the action of a crank and comb, in the form of a filmy web, which is gathered up by passing through a trumpet-mouthed tube, and then between three pairs of rollers, which, moving with differing velocities, drag out or draw the fibres into a parallel position. To make this action intelligible, suppose the second pair of rollers to move more quickly than the first pair; it is clear that in passing from the first to the second pair, the second will

pull the cotton while the first is holding it fast. It is this pulling or drawing action of rollers moving at different speeds, that formed the grand feature in Arkwright's improvements.

In the carding engine, the process of drawing is only begun ; but here are likewise specimens of other machines, called *drawing* and *doubling frames*, by means of which the loose porous cords of cotton, termed *slubbings*, are drawn out to a much greater length. Six, eight, ten, or twelve of these slubbings are doubled or drawn into one, of the length of the sum of the whole number brought together. This will explain the use of some large upright cylindrical cans, each feeding with its separate slubbing the same machine.

Next in the order of the manufacture is the *bobbin-and-fly frame*, the most complicated of all the machines of the cotton mill. Here the slubbings are drawn out into longer finer threads, called *rovings* ; the twisting or spinning is begun, and the roving as it is formed is wound upon a bobbin. For this purpose the bobbin moves up and down upon a rapidly revolving spindle, the flyer or arms of which surround the bobbin, while a spring-finger presses the roving upon the bobbin. This pressure, together with the up and down motion

of the bobbin, causes the roving to be laid in equal coils.

The spinning of the roving is completed at one of two machines, according to the purpose for which the twisted roving or *yarn*, as it is now called, is intended. One of these machines is named the *throstle*, on account of the low musical hum produced by the rapid motion of the arms of the spindle; the other is the *spinning mule*. The spinning mules shown in the Great Exhibition are self-acting, and are as wonderful specimens of human ingenuity as are to be found in the whole range of the useful arts.

The yarn thus produced is of various degrees of fineness, according to the purpose for which it is intended. There is a specimen of lace net in the Great Exhibition, manufactured at Nottingham from cotton spun at Manchester. The yarn is called No. 600, that is, six hundred hanks to the pound, each hank containing 840 yards.—Now, $600 \times 840 = 504,000$ yards = $286\frac{4}{11}$ miles. One pound of cotton, therefore, has been made to yield two hundred and eighty six miles of yarn. The cost of the best raw cotton (picked sea-island) is 3s. 6d. per pound, and the price of this yarn was £27. 10s. per pound, so that the value of the cotton has been increased by labour 157 times. This yarn,

before being made into lace, was doubled into thread, namely, two lengths of yarn were twisted together into one thread. This cost an additional ten shillings, making £28 per pound, as the price of the yarn for the fabric, before it was used for the purpose for which it was ordered. There are also specimens of muslin in the Exhibition, manufactured from yarns of extreme fineness.

In following out the history of the yarn produced by the cotton-spinning machinery, we may either notice the machinery by which it is doubled and twisted into sewing-thread, or that more important process by which it is woven into calico. The *power-loom*, whose restless shuttle performs this office, is here seen in forms differing according to the various inventions and refinements which have been introduced of late years. In contrast with these, a power-loom, constructed fifty years ago, is also exhibited. The calico thus made is subjected to the bleaching process, which changes its dingy yellow colour to a brilliant white, by the action of a compound of chlorine and lime, with abundant washings. As a preparatory process to bleaching, the calico is *singed*, that is, the loose downy fibres of the woven material are burned off by passing rapidly over a cylinder

of copper, kept at a bright red heat—a process which seems to threaten the destruction of the fabric, as that of *gassing* does in the case of the yarn.

The bleached calico is now fit to be used in its white state, or it may be dyed or printed, thus bringing into operation a vast number of ingenious and refined chemical and mechanical contrivances. We turn, then, to a *calico-printing machine*, in which a pattern made out in eight colours can be printed off at one operation, and in which there is also a drying apparatus included. The different parts of the pattern fall into their places in consequence of previously nicely adjusted arrangements; that part appropriated to one colour is engraved on a copper roller, and is supplied with colour from its own colour trough. The roller is at first completely covered with colour, but a steel edge removes the latter from all except the sunken or engraved parts, before it is applied to the calico.

A general idea may also be gained, from various machines exhibited to the public, of plain and figure weaving, in one colour and in various colours; also of the manufacture of lace and of stockings, which is accomplished by machines in which a new principle is intro-

duced, for while, in plain and figure-weaving, the threads simply cross each other alternately or at certain intervals, the *weft* threads passing over and under the long or *warp* threads, in the *lace machine* and the *stocking loom* the weft threads pass *round* the warp threads, and form a mesh with them.

Machines for sewing at the rate of five hundred stitches per minute, for the manufacture of pins and of needles, for making lint, for cutting soap, etc., form some of the objects of interest in this department of the Exhibition; but the next extensive series of operations at which we arrive in the order of arrangement, is that of the dressing and spinning of flax. Here are machines engaged in crushing the straw of the flax, and separating the woody particles, for dividing it into lengths, for *heckling* or combing it with iron or steel teeth, and thus separating the short fibres, forming *tow*, from the long ones, forming *line*. This line consists of long, fine, soft, and glistening fibres, of a bright silver grey or yellowish colour. Here, also, is the machinery for dressing, preparing, spinning, and twisting both these substances; for both are alike converted into yarn, the line making a superior article for thread or for weaving into the fine linen fabrics, which

in their bleached state are so much admired. We may remark, that this art of bleaching, like all the other processes in the textile manufactures, has received improvements which are truly astonishing, compared with the old method. Formerly the brown linen, manufactured in Scotland, was sent to Holland to be bleached, (hence these linens are called *hollands*.) After some preparatory processes, the linen was spread out upon the grass of extensive bleaching grounds, and sprinkled with water many times a day. In the course of several months' exposure to air, light, and moisture, the goods became bleached. Goods sent to Holland in March were usually returned in the following October; but if not sent till the summer, they were not returned till the following year. The discovery of the bleaching power of chlorine, and the application of chloride of lime, or bleaching powder, to the art, has led to the accomplishment of such wonders as the following, which have come under the writer's notice. A bleacher in Lancashire received fourteen hundred pieces of grey muslin on a Tuesday, to be bleached on the Thursday following; they were not only completed, but were delivered to the manufacturer, at a distance of sixteen miles, and were packed up and

sent off on the same day to a foreign market. The flax machinery in the Exhibition has many novel modifications, and is well worthy of study. The spinning is by cold water instead of steam, which is generally employed.

Many of the machines employed in the cotton manufacture are used, in a modified form, for the manufacture of woollen fabrics; but there are also special machines exhibited for the production of worsted yarns, for the stretching of cloth after it has shrunk in the processes of bleaching, scouring, dyeing, etc., for dressing and finishing it with teazles without removing the cloth from the machine, and for other processes connected with a manufacture which must always hold a high rank in England, as having been for so long a period the great ~~sample~~ staple of the country. There are also, in another part of the building, admirable specimens of woollen fabrics from the clothing districts of the north and west of England, which serve to sustain our high reputation in this respect.

The beautiful silk machinery in motion, attended by its proper factory operatives, has attracted just notice. The bright glossy hanks of silk, as formed by the unwinding of the cocoons of the silk-worm, are stretched out,

each hank upon a light, nicely-balanced, six-sided reel, called a *swift*. Above each swift is a bobbin, on which the slender filament is wound. From these bobbins it is taken off by other machines, which clean, twist, and spin it; after which the filaments are doubled, in some cases as many as thirty threads being laid side by side, and twisted into one compound thread. Various *silk-winding machines*, *spinning and doubling machines*, etc., are exhibited, as well as that most ingenious and wonderful machine, the *Jacquard loom*. A silk fabric, of a complicated pattern, is being woven in this loom, or, more properly speaking, the Jacquard apparatus is attached to a loom, the object of which is to raise such of the warp threads for the passage of the shuttle as shall make out the previously arranged pattern.

The Jacquard apparatus is also highly useful in producing the various patterns of carpets, of which so rich a display adorns the Exhibition. Carpets are rather complicated products of the loom, and there are many varieties, such as Axminster, Venetian, Kidderminster, Scotch, Brussels, and Wilton carpets. It does not follow, however, that the particular kinds of carpet are made or were invented at the places whose names they bear. Axminster carpet

is similar to Turkey, the one being made of worsted and the other of woollen yarn. Kidderminster carpet is a double cloth, produced by incorporating two sets of warp and two sets of weft threads. Scotch is identical with Kidderminster. In these, the chain or warp is of worsted, and the shoot or weft of wool. In the Brussels carpet, the web is entirely of linen thread, inclosing worsted yarns of different colours, which are raised into loops as they are required to form the pattern. These loops are sustained upon wires, which are afterwards drawn out; whereas in the Wilton carpet, the wires are cut out by drawing a knife along a groove, left for that purpose in the upper part of each wire. In this way a sort of worsted velvet is produced.

The Exhibition also contains magnificent specimens of floor-cloth. The manufacture of this clean and durable substance cannot, however, on account of its peculiar nature, be shown. It consists in covering a surface of canvass on both sides with a number of coats of paint; laid on with a peculiarly shaped trowel, and printing the pattern by various wood-blocks, one block for each colour. In applying the paint, the canvass is hung in a vertical frame, and often presents an area of from fourteen

hundred to eighteen hundred feet on each surface, to which the men gain access by means of scaffolding and ladders, as in painting the front of a house. In the printing, the cloth is laid in a horizontal position; the printing is performed by means of wooden blocks, a separate block being used for each colour of the pattern.

The original model of *Fourdrinier's paper-machine* is an interesting object; with specimens of pottery tissue paper, two miles and a half long, made from old coal-pit ropes and hawsers. Machines for cutting paper in the continuous sheet, and for ruling paper, are likewise shown. The operations of paper-making and felting, while distinct from weaving, yet lead to somewhat similar results. In paper-making, the fibres, instead of being spun into threads, and the threads interlaced, are crossed in all directions, and combined into one sheet by mere compression and agglutination. In felting, the fibres of wool or hair are forcibly worked together, so as to make them loop or interlace, the serrated edges locking into each other, forming a compact cloth. In the manufacture of paper, we have another astonishing instance of the power of machinery to increase and cheapen articles in common use. Formerly, every sheet of paper had to be moulded by

hand. The rags were ground to a pulp, and diffused through water; a man then dipped a wire frame or mould therein, and skilfully distributing the pulp over it, raised it out of the water, which draining off through the wires, left the pulp on the mould. The wet sheet thus formed was transferred to a sheet of felt or blanketing, and piled up with other sheets similarly distributed; it was then pressed, dried, and sized, and then again dried and pressed, and by these tedious processes a sheet of paper was at length formed. In the paper-making machine, the ground pulp enters at one end, and the finished paper, winding up in a roll, issues from the other. If we tear away a small portion of the pulp as soon as it is distributed on the wire frame, we can trace the rapid progress of the pulp into paper more easily. The writer has traced the paper in this way, from the issuing of the pulp out of the vat up to its final completion, in about ninety seconds, a result which by the old method would require seven or eight days. In the paper-making machine, the ground pulp or *stuff* flows from a large reservoir through a straining apparatus upon an endless wire cloth, something like a jack-towel, and moving upon small copper rollers; the water drains off through this cloth,

and leaves the paper in a soft damp state. By the constant motion of the wire cloth, the paper is moved forward as it is formed, and passing between two rollers covered with felt or flannel, it is consolidated by a slight pressure. It is then taken off the wire by an endless felt, and, still in a wet state, is passed between two iron cylinders, where it receives a very severe pressure; it is then drawn over smooth hot iron cylinders, which dry it and polish it, and, lastly, it is wound on a reel.

In the Exhibition is a sheet of paper, 2,500 yards long, of the size known as *double long elephant*. We have heard of orders being given to the paper-maker for miles of paper in one unbroken length, and there is no difficulty in rapidly executing such orders by a machine which reduces weeks to minutes, as far as the quantity of work is concerned. In contemplating the wondrous perfection to which this machine has been brought, one cannot help being struck with its immense powers for good or evil. By its means the material is speedily and cheaply produced, which will be the medium of conveying truth or error to thousands. Without the facilities afforded by this machine, the cheap volumes of the present series could never have come into

existence, nor could the great mass of religious and educational works now so extensively diffused have been accessible.

The curious manner in which inventions hinge on each other is repeatedly illustrated in the Great Exhibition. A cheap paper requires cheap printing, cheap type, and everything on an economical scale; and here we are accordingly introduced to the inventions and contrivances of the last twenty years to facilitate these objects. In passing one day from the machines in motion to the department of mines and minerals, a block of the comparatively rare metal, antimony, caught our eye. We had just been viewing the model of the paper-making machine, and the gigantic printing-press; and how astonishing was the thought, that but for a remarkable and exceptional property of this rare mineral, those two wonderful machines would have lost half their value! Antimony, in passing from the liquid or molten to the solid state, expands; all other bodies (with the exception of water and perhaps one other body) contract on becoming solid. Now, by mixing a small portion of antimony with the lead of which types are cast, this metal is prevented from contracting as it cools. Were it not for this, the sharp indentations of the

mould would not be filled up, and thus it would be necessary to chase, or carve by hand, every individual type, instead of casting many thousands in one mould. Thus, the expense of printing would have been increased perhaps a hundredfold, and its benefits diminished in far greater proportion.

The steam printing-press, from the date of its introduction, less than forty years ago, to the present time, has been made the subject of repeated improvements by ingenious men, and has received its last improvement in the vertical machine, which prints the amazing number of ten thousand impressions of the *Times* newspaper per hour. On the 7th of May, 1850, the *Times* and Supplement contained 72 columns, or 17,500 lines, made up of upwards of 1,000,000 pieces of type, of which matter two-fifths were written, composed, and corrected after seven o'clock in the evening. The Supplement was sent to press at 7.50 P.M., the first *form* of the paper at 4.15 A.M., and the second form at 4.45 A.M.; on this occasion 7,000 papers were published before 6.15 A.M., 21,000 papers before 7.30 A.M., and 34,000 before 8.45 A.M., or in about four hours. The greatest number of copies ever printed in one day was 54,000, and the greatest quantity of printing in one day's publication was on the

1st of March, 1848, when the paper used weighed seven tons, the weight usually required being four tons and a half; the surface to be printed every night, at the time alluded to, including the Supplement, was 30 acres; the weight of the fount of type in constant use was seven tons; and 110 compositors and 25 pressmen were constantly employed. One of these machines which does such wonders is seen in action at the Great Exhibition.

That valuable boon, the penny postage, has led to an entirely new system with regard to letters, namely, that of envelopes, which, furnished with a little gum, can be wetted and made secure in an instant without the incumbrance of wafer and wax. As most things which can be made by hand can be much better and more cheaply and quickly produced by machinery, so we have *envelope-making machines* of great ingenuity. There are two of these in constant work at the Exhibition. The action of one of them may be briefly explained. As a preliminary step, a steel cutter cuts out many hundred envelopes at once, and these in their unfolded state are brought to the machine. A hollow arm, moving backwards and forwards, is alternately exhausted and filled with air; in its exhausted state, it arrives just over the pile of open envelopes,

the top one of which clings to it by atmospheric pressure; the arm then moves on, becomes filled with air, and drops the paper in a certain place over an opening. A dabber charged with gum then falls down, and applies a small quantity of gum along the exact line where it is wanted. A rectangular frame or plunger then forces the paper into a rectangular opening; each of the four corners is turned over by a puff of condensed air, which issues from a crack near it; a smooth-faced plunger then falls down, and completes the envelope. All these separate movements succeed each other with such rapidity, that when the machine is in full action they can scarcely be followed by the eye.

Among the machines exhibited, there is one which calls to mind the most triumphant engineering exploit of modern times—the huge *hydrostatic press* employed in raising the tubes of the Britannia Bridge, a model of which is also exhibited. The necessity for this form of bridge arose from the condition insisted on by the Lords Commissioners of the Admiralty, that it should in no way interfere with the navigation of the Menai Straits, which it crosses on the line of railway from Chester to Holyhead, and that the bridge should be at least 105 feet

above the surface of the water. A rock in the middle of the strait (called the Britannia Rock) served to divide the bridge, and from this to the tower on each side, tubes 460 feet long had to be constructed. Scaffolding would have obstructed the navigation, therefore ponderous iron tubes, each weighing 1,800 tons, were framed on land, floated to their place between the solid masses of masonry which were to receive and support them, and then raised by the mighty power of hydrostatic presses, the large press now exhibited having been used at one end, and two smaller presses at the other end of each tube. Thus, the tube was raised six feet at a time, and the masonry built up after it.

The model of another great national work is also here shown, namely, the Plymouth Breakwater, erected across the mouth of Plymouth harbour, and thereby rendering it capable of affording a secure place of refuge in stormy weather for forty ships of the line, besides a fleet of merchant vessels. This breakwater contains 3,768,879 tons of stone; it is 5,100 feet long at the top, and at the bottom about a mile, or nearly three times the length of the Crystal Palace; it is forty-five feet wide at the top, and was erected at a cost to the

nation of about a million and a half pounds sterling.

At one extremity of this breakwater is a noble lighthouse of granite, constructed on the same principle as the Eddystone, that great work of Smeaton, destined in all human probability to endure as long as the rock on which it is founded. But at the time when that astonishing structure was completed, the art of illumination had made so little progress, that the only light exhibited to the mariner was the feeble radiance of twenty or thirty tallow candles arranged on a hoop. This, doubtless, in clear weather, was a warning against the dangerous rocks which cross his track on the passage to and from the much frequented port of Plymouth or Devonport; but in foggy or tempestuous weather, when the beacon was most needed, it was lost in the haze. As time rolled on, and as the arts of peace came to be more extensively cultivated than those of war, the five-and-twenty tallow candles were replaced by as many brilliant Argand lamps, backed and reinforced by burnished silver reflectors, carefully shaped into the form of the parabola, whereby the light is economized and reflected to the ocean. Even this beautiful and efficient apparatus (which is shown in the Exhibition)

was destined to be superseded by one still more effective, namely that of Fresnel. A single lamp, with three or four concentric burners, the largest burner four inches in diameter, stands in the centre of the lighthouse lantern ; this lamp is surrounded by glass lenses ; and from the impossibility of making a large lens of the true mathematical form in one piece of glass, each lens is built up of a separate number of glass rings, the external surface of which is so formed as to have precisely the same optical effect as if it were one entire piece. By this arrangement, each lens transmits to all points of the horizon in succession a light equal to that of three or four thousand Argand lamps ; yet this wonderful effect is produced by a single lamp. The *Fresnel apparatus* is exhibited in the nave of the Great Exhibition. The reader may perhaps be surprised to learn, that what appears a mere barrel of glass, refracting the rays of light, and producing many colours under the ordinary light of day, is worth five thousand pounds.

The display of glass in the Exhibition is not unworthy of the palace whose roof is of that beautiful material. The fusion together of silicious sand and an alkali produces glass ; but different modes of manufacture are adopted,

in order to obtain certain qualities appropriate to the uses for which it is intended. Thus, window glass ought to be hard and durable; mirror glass, highly polished and transparent; glass for decanters, chandeliers, etc., bright and lustrous; glass for optical purposes of the same quality throughout, free from veins, specks, and striæ—such glass, however, it is seldom possible to obtain. In order to make good glass, sand of the purest quality is necessary, but this is very difficult to be procured; the best in this country is from Alum Bay, in the Isle of Wight, and from Aylesbury, in Buckinghamshire. Sand has been brought from Australia for the use of the glass-maker, and the sand of the Wenham Lake (which furnishes ice for cooling our summer drinks) is said to be well adapted to the purpose. There are chiefly three kinds of glass manufactured, namely, *crown*, or window glass, *plate* glass, and *flint* glass. In the Exhibition there is an instructive set of specimens, illustrative of the manufacture of crown glass: the first is the lump of glass taken out of the glass pot at the end of an iron tube. In its heated state, this kind of glass can be moulded and blown out with comparative ease. The solid lump is first rolled upon an iron table into a cylindrical form; then, by blowing through

the iron tube, the man makes it assume the shape of a pear. By heating and blowing, it is then flattened, and transferred to a solid rod or *punt*; the opening into the flattened globe being now turned away from the workman. The glass is again held in the furnace to be softened, and when at the proper consistence, the man turns round the rod, slowly at first, but with gradually increasing velocity. The centrifugal force thus communicated to the glass is first felt at the hole to which the iron tube had been applied, and this hole becomes larger and larger, until at length the whole vessel suddenly flies open into a plane disk or *table*, fifty or sixty inches in diameter, and of uniform thickness throughout, except at and about the spot where it is attached to the punt, and where there is a knot or lump called the *bull's eye*. One of these tables at the Great Exhibition is sixty-four inches in diameter, and weighs twenty-two pounds four ounces.

The operation above described is very remarkable, and in some respects unaccountable. Indeed, the scientific student, in his progress through factories and workshops, is constantly taken by surprise at the production of results by means so extraordinary that the wonder is how they could ever have been discovered. Long

before the dawn of science, the most important of the useful arts had attained a degree of perfection, which it would be presumptuous to attribute to mere human skill and ingenuity. In the absence of science, what could be more difficult than the art of baking bread, making wine, tanning leather, and smelting iron and other metals? In all these arts there are numerous processes of the most exquisite ingenuity, many of which science is unable, even at the present day, to explain. How all these processes were invented is a question which we might try in vain to discover, did not the word of God throw light upon it? In the concluding verses of the 28th chapter of Isaiah, it is distinctly stated respecting the important processes of the husbandman, "For his God doth instruct him;" and again, with reference to the threshing of wheat and the preparation of bread corn, "This also cometh forth from the Lord of hosts."

To return to the processes connected with the beautiful substance which led us to this digression. Another method of making crown window glass is illustrated at the Exhibition. A quantity of molten glass, collected on the extremity of an iron tube, is first distended by blowing, into a spherical form; this being heated, the soft mass is whirled round, whereby

it becomes drawn out into a cylinder ; the two ends of this cylinder are then cut off ; a crack is made down the middle, and being placed in a flattening furnace, the cylinder is spread out quite flat upon a slab. It is then annealed by slow cooling, and is finished. The glass of the Crystal Palace was made in this way ; this glass weighs sixteen ounces the square foot, and each pane is forty-nine inches long.

In the manufacture of plate glass, the molten mass is poured upon a large iron table, and spread, several hundredweight at a time, by means of a roller. This is a beautiful, and, in many respects, an impressive sight. When the glass is properly cooled, it is cut up into pieces as large as possible without flaws, and these pieces are polished. Now, as it is exceedingly difficult to cast a very large piece of glass without flaws, we may thus, in some measure, be able to appreciate the value of the largest plate of glass in the world. This, silvered at the back, that is, covered with an amalgam of tin and mercury, and thus forming a splendid looking-glass, is an object of interest in the western nave of the Great Exhibition. The plate is 18 feet 8 inches by 10 feet, thus presenting to the eye a surface of above 186 square feet of glass.

Flint glass differs in composition from crown glass by the addition of oxide of lead and a minute portion of oxide of manganese, the object of which is to make it softer, and easier to work, to remove colour, and to make it more lustrous. By blowing, turning, moulding, and cutting, most of the complicated forms into which flint glass is thrown are produced. Indeed, every form that can be made at the common turning-lathe is to be met with in flint glass. Other shapes are cast in moulds, and many of these receive their final polish and finish at the glass-cutter's wheel.

By the addition of various metallic oxides to glass, colours are produced, and the glass is formed in sheets, or into vessels, or a portion of coloured glass is made to ornament white glass vessels. For example, the object is formed in transparent colourless glass, and allowed to cool and become solid; it is then dipped for a moment into a pot of coloured glass, and it thus carries away a thin coating thereof. The vessel is then shaped and annealed, and the glass-cutter, by cutting away more or less of the thin coloured envelope, produces a variety of pleasing results.

Intimately connected with the glass manufacture is that of pottery and porcelain, illus-

trated in so varied a manner in the Exhibition. The clay, by moisture, is rendered plastic, (as glass is by heat,) and can be moulded by the fingers, at a rudely-shaped lathe, into an immense variety of forms in every-day use, many of which are of classic beauty. The clay having been ornamented with devices in various colours, a vitreous glaze is then put on, and the whole being inclosed for some hours in a highly heated oven, the article is finished. Porcelain differs from pottery ware in the greater purity of the materials, and in their being semi-vitrified in the oven. The celebrity of the wares of China was due to the existence of certain fine clays in that country, which were not supposed to occur elsewhere. They have been discovered, however, in Cornwall and other places, and their peculiar suitability arises from their being the decomposed remains of ancient unstratified rocks, such as granite, porphyry, trachyte, etc., converted by some unknown agency into a soft friable mass. The felspar of the fine white granite of Devonshire and Cornwall is often found disintegrated to a great depth, and the rock converted to a substance resembling soft mortar. This finely divided matter is separated by washing from the quartz and mica, and the milk-like liquid

being collected in tanks, deposits the suspended clay, which, being dried, constitutes the celebrated Koalin, or porcelain clay. This is sent into Staffordshire to be manufactured, for the same reason that copper ores are sent from Devonshire and Cornwall to Swansea to be smelted, namely, because the presence of coal in Staffordshire and Swansea, and its absence in the counties named.

But we must pause—not because we have pointed out all the important classes of objects in this wonderful assemblage, but because our space will not permit of our going further. Well might we linger before that block of coal, eighteen feet in circumference and five tons in weight; or at that whose estimated weight is twenty-four tons; or we might pause before that huge locomotive, “The Lord of the Isles,” whose driving-wheel is eight feet and a half in diameter, and whose power is equal to that of five hundred horses. Many a lesson might we gain from the machines used for producing machinery, ponderous lathes for turning iron, machines for drilling, punching, and planing iron, under whose resistless force iron yields as if it were wood, curling off in large shavings, and pouring off like dust. A rough idea of the forces brought to bear may

be gathered from the fact, that the heat excited by these abrading processes is so great, that the water which drops upon the tool to keep it cool actually boils and passes off in steam, in consequence of the heat developed.

Among the machines for producing machinery, none is of greater importance than that beautiful contrivance the *slide-rest*. Before its introduction, nearly every part of a machine had to be made and finished to its required form by mere manual labour, but by means of the slide-rest, the tool used in cutting, turning, and planing iron, etc., is held firmly by a sort of iron hand or vice, which is made to move in the required direction by means of a slide, the sliding motion being given by the revolution of a screw, and the depth of the cut by an under slide, also regulated by a screw. By the separate or combined motion of these two slides, the tool can be made to act along or across the work with perfect accuracy.

In every part of the Great Exhibition we are constantly reminded of the wonderful *effect of machinery* in vastly increasing human power, in effecting a most valuable economy of time, and in the conversion to useful purposes of the most intractable and apparently useless materials. The English are the most skilful machine-

makers in the world; in Manchester and the surrounding district many thousand men are wholly occupied in making the machinery which gives employment to hundreds of thousands, and the beauty and accuracy of the results of their labours seem quite incapable of being surpassed. Some years ago, our machine-makers were forbidden to export their goods to other countries, from the apprehension that foreigners, aided by improved machinery, might be able successfully to compete with our own manufacturers. But at length this apprehension was removed by the investigations and considerations of a Committee of the House of Commons, who reported, that supposing the same machinery which is used in England should be available on the continent, yet that foreign manufacturers were so much less favourably circumstanced than our own as respects general arrangement, division of labour, skill and perseverance of workpeople, capital and enterprise on the part of masters, and many other circumstances which were detailed in evidence, that no degree of interference calculated to excite alarm could arise from foreign competition. It was confidently advanced, that although Europe were possessed of every tool and machine used in the United Kingdom,

along with the assistance of English artisans, which she may have in any number, yet from the natural and acquired advantages enjoyed by this country, the manufacturers of the United Kingdom would for ages continue to retain the superiority they at present have. Our many important facilities for the construction of machines and for the manufacture of commodities, are not collectively possessed by any other country ; nor is it likely that any community can enjoy them to an equal extent. It is admitted that our skill is unrivalled ; that the industry and power of our people are unequalled ; their ingenuity, as displayed in the continual improvement of machinery and production of commodities, without parallel, and apparently without limit. The freedom which, under our government, every man has to use his capital, his labour, and his talents, in the manner most conducive to his interests, is an inestimable advantage ; canals are cut and railroads constructed by the voluntary association of persons whose local knowledge enables them to place them in the most desirable situations, and these great advantages cannot exist under less free governments. These circumstances, when taken together, give such a decided superiority to our people, that no injurious rivalry,

either in the construction of machinery or the manufacture of commodities, can reasonably be anticipated. Such were the reasons which induced our government to permit the exportation of machinery. Foreign nations have greatly benefited by this arrangement, and have gained valuable lessons thereby, in the art of making machines on their own account. They have also learned to prize the skill and ingenuity of the English workman. Machine-making is rapidly advancing in France. A Manchester engineer has established his son near Abbeville, and there are French competitors at Rheims and elsewhere, turning out excellent machinery. There is a gigantic machine manufactory in Belgium, employing three thousand workmen, and there the chief departments are superintended by seven skilful English engineers. At Zurich, another establishment makes iron steam-boats and fine-spinning machinery, under the direction of English foremen, and with an English partner at the head of the concern. At Vienna, the emperor has a large establishment, with an Englishman for one of its chief superintendents; and in Russia, there are large foundries and spinning factories, over which Englishmen preside. In Poland, Scottish engineers guide the

working of zinc mines, and the formation of public roads and canals. Viewing this rate of progress, the question naturally arises, "Will not the time come when other countries, having purchased our machines, and engaged the services of our skilled workmen, will at length cease to become purchasers, from the facilities with which they can manufacture from the models thus supplied?" This is answered by allusion to the fact, that constant, it may almost be said daily improvements take place in our machinery itself, as well as in the mode of its application, and that these improvements remaining for a certain period our own, will always insure us that eminence in this branch of manufacture which our experience and numerous advantages have already attained for us.

Machine-making, in common with nearly every important manufacture, is dependent on steam-power. No amount of human labour could produce the stupendous results attained by that wondrous agency. "Steam-engines," says Dr. Ure, "furnish the means, not only of their own support, but of their multiplication. They create a vast demand for fuel; and while they lend their powerful arms to drain the pits and to raise the coals, they call into employment

multitudes of miners, engineers, ship-builders, and sailors, and cause the construction of canals and railways ; and while they enable these rich fields of industry to be cultivated to the utmost, they leave thousands of fine arable fields free for the production of food to man, which must have been otherwise allotted to the food of horses. Steam-engines, moreover, by the cheapness and steadiness of their action, fabricate cheap goods, and procure in their exchange a liberal supply of the necessaries and comforts of life, produced in foreign lands." A remarkable change has taken place in the clothing, as well as in the food and lodging of the labouring classes—a change highly beneficial, and which must be traced to the operation of machinery. The wife of a labouring man may buy a neat and substantial printed cotton gown at fourpence per yard ; thus obtaining a dress for two shillings or two and fourpence, which in former times would not have been attainable at five times the cost. The low price of every description of clothing, consequent on the productiveness of our present system of manufacture, enables provident workmen and their families now to enjoy numerous comforts and conveniences in clothing, and in furniture, which were formerly confined to the upper

classes of society. The advance in this respect is of great importance in a healthful and intellectual point of view, increasing the physical comforts and the self-respect of the individual.

It is sometimes objected to the increase of machinery, that by its means a great multitude of articles of mere luxury are produced, which do not substantially add to the comforts of society, while they tend to produce imaginary wants, and lead to a highly artificial system. But this evil, if it be one, is overruled for good, for the production of these articles is of great importance, in giving exercise to the skill and ingenuity of a large number of persons. "What can be less necessary," says Paley, "or less connected with the sustentation of human life, than the whole produce of the silk, lace, and plate manufactory? Yet what multitudes labour in the different branches of these arts! What can be imagined more capricious than the fondness for tobacco and snuff? Yet how many various occupations, and how many thousands in each, are set at work in administering to this frivolous gratification!" And it is not the mere employment of the hands, but the habit of industry and perseverance, and the call for ingenuity and skill, that are beneficial in such cases. The mere supply of the neces-

saries of life might be obtained with little labour, but those who have no desire to possess themselves of its comforts, conveniences, and elegancies, speedily sink down to the indolent supineness which is characteristic of savage tribes.

We have now given a brief sketch of the various modes in which the manufacturing energies of England have developed themselves. If a review of the natural resources of our country furnished a call for gratitude to God, an additional motive for thankfulness is presented in perceiving the manner in which our population have been enabled, by their industry and skill, to improve these advantages. Nor ought we, surely, to forget the obligations which society owes to those useful classes, who, by their patient toil, have produced so many of the necessaries and comforts of life. May it be the study of those whom Providence has blessed with wealth and influence to repay these obligations, by cherishing a kindly solicitude in the welfare of our industrious operatives, and by striving to elevate their moral and spiritual condition! There is no boon which can be imparted to them so valuable as vital, evangelical religion—not the religion which consists in a round of forms and ceremonies, but that

which has its seat in the heart. A true sense of our condition by nature as sinners ; repentance from dead works ; a living faith in Christ, evidenced by holiness of heart and life ; the indwelling of his Holy Spirit, communicating peace of conscience, and shedding abroad the love of God in the soul—these form the grand truths, which, if cordially embraced, would form a panacea for all the ills, real or exaggerated, in the working man's lot. A religion springing from these sublime principles, would bind in harmonious connexion all the varied links in the chain of social interests. Labour would no longer envy capital. Capital would never stint labour of its due reward. There would " be no breaking in nor going out—no complaining in our streets. Happy is that people that is in such a case ; yea, happy is that people, whose God is the Lord."

SECTION III.

ON THE RESULTS OF BRITISH MANUFACTURES, WITH RESPECT TO THE PHYSICAL, INTELLECTUAL, AND RELIGIOUS WELFARE OF BRITISH OPERATIVES.

IN considering the whole subject of our arts and manufactures, and especially the results of machinery as displayed in the Great Exhibition, the question recurs—"Has all this commercial wealth been obtained, and this greatness reached, as some maintain, at the expense of the working classes? Is our present progress in manufactures to be looked on with pleasure or with pain, with pride or with regret?" These questions have been answered variously, according to the bias or interest of different parties. On one hand we are told, that the great increase of manufactures and machinery, consequent on the discovery of the steam-engine, is an unmitigated evil to the bulk of the people, accumulating the fruits of labour in the hands of a small number of capitalists, to the destruction of the health and comfort

of the labouring class. Such opinions were formerly held by some who have since seen good reason to change them. We doubt whether the writer of the subjoined paragraph, penned in 1832, when its author (Dr. Kay) was an assistant Poor Law Commissioner, would not be found now to have materially altered his conclusions. Speaking of the factory operatives, he says, "They are drudges who watch the movements and assist the operations of a mighty material force, which toils with an energy ever unconscious of fatigue. The persevering labour of the operative must rival the mathematical precision, the incessant motion, and the exhaustless power of the machine. * * Having been subjected to the prolonged labour of an animal, his physical energy wasted, his mind in supine inaction, the artisan has neither moral dignity nor intellectual or organic strength to resist the seductions of appetite."

Similar opinions were given before the Factory Committee of 1832, which was appointed to consider and investigate this subject; but out of the eighteen medical witnesses examined on that occasion, as to the physical effects likely to be produced by the system, sixteen were metropolitan practitioners, and only two were from the manufacturing districts. Their evidence went

to prove that the whole system was most injurious to the health of the workpeople, and that the employment of children in factories was little less than infanticide, the profit gained by the parents being death to the child. But this evidence was felt to be so unsatisfactory, that a new commission was afterwards appointed, for closer and more exact inquiry on the spot. The results obtained were strikingly different. Instead of the fearful catalogue of evils, of deformity, and disease, declared to be the consequence of the factory system, the general health of the operatives was pronounced to be excellent; no case of distortion presented itself which could be traced to mill-work, and there were very few individuals who bore any appearance of emaciation or stunted growth. These conflicting statements can only be reconciled by taking into consideration the fact, that weakly or deformed children are sometimes sent into factories, because the work there is light compared with the out-door employments, in which their hardier brothers and sisters engage. It is allowable to suppose, therefore, that during the existence of the first commission, such children might have been numerous in the factories examined, and their weakly state may have been, naturally enough, attributed to

their employment. The Manchester operatives, indeed, as a class, are small of stature and pale-complexioned ; but this appearance is in a great measure shared by the whole population resident in that town. This circumstance cannot excite surprise, when it is recollected that the facilities enjoyed by many other towns of access to parks, fields, squares, and public gardens, were until lately wholly denied to this great and densely peopled metropolis of the cotton manufacture ; being even now imperfectly supplied.

The prejudice against machinery—a prejudice which has, at one time or other, pervaded all classes except those immediately benefited by its action, can only by slow degrees be worn away. There is, indeed, something very startling in the facts connected with the giant power now at work in the kingdom. For instance, two hundred men, with machinery worked by steam, are estimated to manufacture as much cotton as twenty millions of persons could do without machinery ; that is, one man, by the application of inorganic motive agents, can now produce the same amount of work that formerly required one hundred thousand men. To produce the annual results of the machinery worked in Great Britain at the present time,

would require, we are assured, the physical energies of one-half the inhabitants of the globe, or four hundred millions of men; while the various applications of steam in different parts of the world, produce an amount of useful labour, which, if performed by manual strength, would demand the incessant exertions of every human being. Now, if it were required of man to keep pace with this enormous power, and, as Dr. Kay says, "to rival its mathematical precision and incessant motion," then, indeed, would the fate of our operatives be hard in the extreme—a state of slavery more destructive of life and hope than that from which we have released the Negro population of our colonies. But let us hear what another Commissioner (Mr. Tufnell) has recently advanced on the same subject: "Of all the common prejudices that exist with respect to factory labour, there is none more unfounded than that which ascribes to it excessive tedium and irksomeness above other occupations, owing to its being carried on in conjunction with the 'unceasing motion of the steam-engine.' In an establishment for spinning or weaving cotton, all the hard work is performed by the steam-engine, which leaves for the attendant no manual labour at all, and nothing to do in general but

at intervals to perform some delicate operations, such as joining the threads that break, taking the cops off the spindles, etc. And it is so far from being true that the labour in a factory is incessant, because the motion of a steam-engine is incessant, that the fact is, the labour is *not* incessant on that very account, because it is performed in conjunction with the steam-engine. Of all manufacturing employments, those are by far the most irksome and incessant in which steam-engines are not employed ; and the way to prevent an employment being incessant is to introduce a steam-engine into it. And these remarks, strange as it may appear, apply peculiarly to the labour of children in cotton factories. Three-fourths of the children so employed are engaged in piecing at the mules, which, when they have receded a foot and a half, or two feet from the former, leave nothing to be done ; not even attention is required either from spinner or piecer, but both stand idle for a time, which, if the spinning is fine, lasts in general three-fourths of a minute or more ; consequently, in these establishments, if a child remains during twelve hours a day, for nine hours he performs no actual labour. A spinner told me, that during these intervals he read through several books. The scavengers,

who have been said to be 'constantly in a state of grief, always in terror, and every moment they have to spare stretched all their length on the floor in a state of perspiration,' I have seen idle for four minutes at a time, and certainly could not find that they ever displayed any symptoms of the condition described in this extract from the Report of the Factory Committee. The objections urged against the factory system, from its collecting a large number of persons together under one roof, are equally unfounded. In truth, so completely erroneous is this notion, that the complaint ought to be just the reverse, that there are not enough large factories, and too many small ones. I invariably found that the large factories were those in which the health, comfort, and convenience of the workmen were most attended to, and where they were best off in many respects. And it would be an extraordinary circumstance if it were not so. When a large body of workmen are collected together under one employer, he is able to allow them many indulgences, at a comparatively small expense, but which would cause a serious outlay to the proprietors of a small establishment. It is the interest of a master manufacturer to do all that lies in his power to

accommodate his men, as he is thereby enabled to attract the best workmen into his employ, owing to the good repute which his factory will bear among them. Therefore a large establishment is certain to be best regulated, as it can be most cheaply well regulated. Accordingly, the greatest mills I have always found to be the cleanest, the machinery most securely fenced off, and the hands of the neatest and most respectable appearance." These statements are strictly in accordance with what the writer has himself observed and ascertained of the working of the factory system.

But it is not necessary to take the opposite extreme, and to declare with another party that the extension of arts and manufactures has been in every respect beneficial to our own people, as well as to the whole world. The congregation of large masses of persons can never lead to unalloyed good. Whether it is the assembling of boys in a public school, the collecting of soldiers together in barracks, or the working under the same roof of hundreds in factories, the depraved tendencies of human nature are sure to be developed, and "evil communications corrupt good manners." This is a general evil belonging, not to the factory system in particular, but to that in common with all other trades and occupations carried on in large towns, and requiring

the aid of numbers under one roof. Nor would we for a moment pretend that factory labour is the best occupation that can be found for children. They are not enough in the open air, they go to work too soon after eating their meals, and they have not sufficient time for the natural sports of childhood. Their work is not laborious, but is regular and monotonous, and carried on within doors; although it must be added, in purer air, owing to the excellent systems of ventilation introduced, than the children are likely to breathe in their own homes. There is, however, a great advantage connected with it in the law now in operation, requiring all factory children to attend school during a stated part of each day; so that while they are earning something towards their livelihood, they are at the same time acquiring knowledge. In a mill at Manchester, the writer found most of the children pale-complexioned, but lively, and apparently happy. He stopped a group of little girls, as they ran up-stairs at the sound of the factory bell which called them back from dinner, and asking them if they did not get weary of standing so long, they readily answered, "No;" but one said, "I used to be tired at first, but I do not mind it now."

After watching the entrance of the throng of

operatives to one of these mills, it cannot fail to strike the observer who follows their footsteps, that within the walls their numbers seem suddenly to dwindle into insignificance. This is caused by their wide dispersion over different departments of the mill. The "crowding together" which people are accustomed to associate with factory work is altogether a delusion. Crowding may exist to a painful extent at the operatives' own homes, (and this, we believe, is where the grand evil lies,) but not in the scene of their labour. The space required for the proper arrangement of the machinery is so great, and the number of human attendants needed so comparatively small, that it is an utter impossibility to crowd the work-people, and only those who have never entered a factory can remain impressed with such a notion. For instance, as it respects the children, who are supposed to be especial sufferers in this way, nine-tenths of them are employed at the mules, machinery whose advancing and retreating motion requires so large a space, that in the apartment where they are at work there is no room to insert a crowd of children, even if it were wished to do so. The evils of factory life are, in this respect, non-existent, while those of ordinary workshops are great.

There is no idea respecting large factories more unfounded, than that of their being so hot and polluted in their atmosphere, as to be very injurious to the health of those who work in them. The fact is, that in most large factories at the present time, the system of ventilation is far better than in our finest public buildings. The engineers have not trusted to the mere draught of chimneys for their supply of fresh air, because they know how ineffectual are such means for the rapid removal of the dense carbonic acid gas generated by many hundred powerful lungs. "The factory plan," says Dr. Ure, "is to extract the foul air, in measurable volumes, by mechanical means of the simplest but most unfailing kind, especially by eccentric fans, made to revolve with the rapidity of nearly one hundred feet per second, and thereby to insure a constant renewal of the atmosphere in any range of apartments, however large and closely pent they may be. The effect of one of Fairbairn and Lillie's four guinea fans upon a large factory is truly admirable; it not only sweetens the interior space immediately, but renders the ingress of odorous nuisance from without altogether impossible. When such a fan, placed at one end of an apartment about two hundred feet long, is in full action, it

throws the air so powerfully out of it, as to create a draught at the other end of the apartment capable of keeping a weighted door six inches ajar. Its operation on some old and ill-ventilated mills which I have examined is most satisfactory."

To advert to a mental evil which is associated with factory labour:—Several able writers appear to consider that it is the inevitable effect of the division of labour, and of the extended use of machinery, to lower the human mind. A man who thinks of nothing, but putting on the head of a pin, it is thought cannot be so intelligent as an individual whose intellect is sharpened by a great variety of employments. But the question arises, whether the workman does indeed pursue his task without a thought beyond the object before him, or whether, while engaged in an operation requiring only manual dexterity, his mind is not frequently employed on other things. Facts seem to favour the latter conclusion; for we are told of some workmen who manage to read during their labours, and of others who take it in turns to read aloud to a circle of busy listeners. Besides this, in the opinion of an eloquent writer, "the action of the very machine with which the workman becomes familiar is a constant lesson"

to human ingenuity. It shows what that ingenuity has done, and suggests what it may do. Less demand may be made on the manual skill of the mechanic, but this does not prevent his thoughts from being familiar with a wide range of ingenious operations. If an old man, he will know something of the history of his craft, and of others carried on before him, and, in many cases, his mind will be a chronicle of the inventions which have so greatly changed the processes of manufacture since the days of his boyhood. He lives in the midst of the skill and enterprise of his country, and he necessarily hears much concerning the skill and energy of other countries. In his mind, the leading idea is that of progression, and not as in the case of the peasant, who, whatever he may see of change in his implements, is doomed to look on matters about him as destined to be, in the main, as they have been."*

Throughout the manufacturing districts, the state of the population, old and young, is far from being one of mental inactivity. This is proved by the vast demand for books and periodicals which arises from that quarter; the book trade of this country is indeed said to

* Dr. Vaughan, "Age of Great Cities," p. 159.

flourish and fade with its manufactures in vital sympathy, while it is very little affected by the prosperous or depressed state of agriculture.

It must not be imagined, however, that anything like an adequate provision is yet made for the education of the factory operatives. In Birmingham alone, it is calculated that there are twenty-five thousand children requiring aid in providing for their education, while the provision made in daily schools is only for about eight thousand. It remains, therefore, that the larger number must either be altogether uneducated, or dependent solely on Sunday-school teaching ; while of those who are professedly trained in daily schools, the attendance is exceedingly irregular, varying with the state of trade. When there is great activity in the latter, the attendance both at day and evening schools falls off rapidly ; but when it declines, the number of scholars increases. Several manufacturers have been honourably distinguished for the efforts which they have made to improve the condition of their workmen, by the erection of schools for the education of their families.

It is to such exertions we must look for the means of counteracting the peculiar dangers accruing from the assemblage of masses of

human beings, and the temptation which unnatural parents feel to sacrifice the education of their children for the sake of the trifling earnings they can acquire. Great, indeed, are the powers vested in the hands of the manufacturer. He has hundreds, perhaps thousands, under his control, and dependent on him. He can lay down rules, and adopt plans, that shall affect, not only the physical, intellectual, and moral welfare of his people, but which shall, by the blessing of God, be of everlasting benefit to their souls. It is only doing justice, therefore, to add, that in the building of churches and chapels, in the establishing of infant, day, evening, adult, and Sunday schools; in the opening of libraries for the use of the work-people; in the encouragement of benevolent societies, loan tract societies, district visiting societies, Christian instruction societies, and every other institution calculated to reform the vicious, to instruct the ignorant, and to relieve the wretched, (not forgetting also plans for their physical improvement,) many of our great manufacturers set an example which is worthy of imitation throughout the land. The same laudable efforts are also made in mining districts, so that a steady progress has long been going on in the moral and religious habits of

that portion of our population. To take but one example: a Parliamentary Commissioner is able to speak of the South Gloucestershire collieries as having experienced a great moral change within the last half century. "The colliers were formerly the terror of the surrounding neighbourhoods, and for gross ignorance, rudeness, and irreligion, were almost without parallel in any Christian community. The labours of those great reformers of life and manners, the celebrated Wesley and Whitfield, began a work which has been making progress ever since, in the hands of not only their disciples, but those of the national church, happily aroused and stimulated by their example." At one time, "the Kingswood colliers" was a phrase that conveyed every idea offensive to civilization, order, and religion. "At the present period, there is, perhaps, as much decorum in the manners of the population as is witnessed in the generality of rural districts, and the numerous places of worship are well attended, many of the colliers being members of various religious societies. Any open desecration of the sabbath is considered reproachful, even among the non-professing portion of the community who are of sober habits. So, also, in the Staffordshire coal districts, there are instances of a

state of religious feeling, which supply a lesson to Christians generally. In a mine which had been long free from accidents, the reason assigned by the men was, that they met together to pray every day in the dinner-hour. Their superintendent, describing their proceedings, said, that at about one o'clock every day they sing and pray, and ask a blessing on what they are going to have, and then they sit down in the road and eat their dinner. "After dinner," he added, "one reads out of the Scripture, and explains it, and tells the others what the preacher said about it." And, in answer to an inquiry as to their morals, it was stated, "A man would not be allowed to join in singing and praying, unless he was thought to be living as a man ought to do."

Those who are not personally acquainted with the manufacturing districts can have little idea of the importance of Sunday school teaching in that region, or of the grand scale on which it is carried on. This department of instruction is often spoken of in a disparaging manner, as being an inadequate and inefficient means of educating the lower orders, and certainly, inasmuch as it does not deal with mere secular knowledge, it is most desirable that it should be pursued in connexion with daily

tuition of a more general kind. It will be readily admitted, however, by all who have carefully studied the subject, that, independently of its important bearings on the immortal interests of the children instructed, the system has been proved by experience to have aided most effectually in the rearing of an intelligent, moral, and well-disposed population.

An example of Sunday school teaching on a gigantic scale may be witnessed in the busy town of Stockport. That town contains about seventy factories, and a vast population of operatives. The different mill-owners, as long ago as 1805, united to erect a most capacious and substantial building, the hall of which alone is capable of accommodating three thousand persons, while forty other apartments provide suitable space for male and female Sunday school, library, committee-room, etc. This building was raised at a cost of ten thousand pounds, and its completion and opening formed an interesting era in the history of educational effort in Stockport. Multitudes assembled on the occasion, and in an address by the treasurer, the objects of the new building were thus stated: "Our meeting together to-day has nothing in it of parade or show; nothing that can allure the eye by its splendour, or

beguile the imagination by its pomp. It is nevertheless of the highest importance to the rising generation of the town of Stockport. We meet to erect a perpetual standard against ignorance and vice, to confirm and render permanent an establishment intended to train up the children of this town in knowledge and virtue. We expect thousands of children will be here taught, not only the grounds of human science, but the first principles of the Christian religion—that religion which is the true source of all sound morality, of all public and private virtue. This building is to be erected and maintained on the principle of pure and genuine benevolence, and is intended to consecrate as much of the piety and charity of this town as will supply a succession of gratuitous teachers. I feel happy to declare thus publicly the sentiments of the committee, that this building is not to be confined to any sect or party, nor to be under any exclusive direction or influence.”

Such an institution as this, in which thousands receive a moral and religious training, cannot have existed so many years without important results. Accordingly, in one of their reports, the committee is able to speak as follows: “Part of the fruit of these pious labours has been reaped in a temporal point of view, in the general deco-

rum which pervaded this town and neighbourhood, and the regard for the liberties, lives, and properties of others, evinced by the Stockport population at a period of political excitement, when they were too much disregarded at other places. The well-judged liberality of the public has now made Sunday schools so numerous in our borders, that it is hardly possible to approach the town of Stockport in any direction without encountering one or more of these quiet fortresses, which a wise benevolence has erected against the encroachments of vice and ignorance." In the great school-house, from four to five thousand children assemble on Sundays for instruction, which is imparted by several hundred teachers, most of them factory operatives. Stockport is but a specimen of what may be witnessed in other manufacturing towns.

Mr. Baines, in describing the state of education in the manufacturing districts, says, that he has been personally connected with Sunday schools for five-and-twenty years, as secretary, teacher, and superintendent, and has marked among the teachers much intelligence, steady perseverance, and earnest humble piety, having found their efforts to be at once systematic and vigorous, many of them studying the

Bible, and preparing themselves to impart and enforce its truths on the scholars. They also take a personal interest in their pupils, and not unfrequently visit them in their own homes. "Who can calculate," he justly says, "the social, moral, and religious benefits of establishing a kind of spiritual superintendence on the part of sixty-six thousand teachers, generally taken from the middle class, over four hundred thousand scholars, generally from the working class? What advantage to the teachers themselves, by exercising their virtues! what advantage to the scholars, in regard to their manners, feelings, tastes, religious knowledge, regular observance of the Lord's-day, habit of attending public worship, the enlightening of their consciences, their associations and conduct in future life!"

In various manufacturing districts, adult schools also have been established. In Birmingham, some masters of large establishments have offered this privilege to their men, which has been readily embraced by those whose education had in youth been neglected.

In the iron district of South Wales, also, adult schools have been found eminently useful. The services of competent persons to superintend them are retained at moderate salaries, but

most of the work is done by voluntary teachers, who give their labours for one or more nights in each week. At Merthyr Tydvil, the number of volunteer teachers amounted to one hundred and twenty, and for a time the rooms were filled to excess; for instance, three hundred and ninety-six women managed to crowd themselves into the space provided for three hundred children. The men's school was equally numerously attended. This was during winter. In the long days of summer, the attendance gradually decreased, and did not again become so large; yet it remained good, and much benefit has accrued from the instructions imparted. The women, who are working all day at cooking, loading teams, and cleaning ore, assemble, we are informed, clean, orderly, and well-dressed, and the progress they make is remarkable. The governess can boast that many of her pupils, among whom a great part are married women, have learned to read the Testament and to write tolerably in one season. At Dowlais, also, there are very well conducted adult schools for both sexes, the average attendance of the men being one hundred and ten, that of the women one hundred; and the effect of these schools has been evident in the improved language and conduct of the young men and women in the streets and elsewhere.

Infant schools have likewise an admirable bearing on the welfare of our manufacturing population. Women are largely employed in the mills, and it is a great blessing to them to have their little children cared for as they are in the infant school. The young there learn to be orderly and obedient; they are taught important truths in a very simple manner, their health is attended to, and so evident, indeed, is the general advantage of the training, that they are preferred before other children for the earliest labours of the factory. "The mule-spinners," says Dr. Ure, "even the most rude and uneducated, and who do not make very nice distinctions, always prefer children who have been educated at an infant school, as they are the most obedient and docile. Such children are bespoke beforehand by the workmen who engage their own piecers." Nothing could speak more plainly for the discipline of infant schools than this fact. The change in the habits of these little ones must be strongly marked, or this decided preference would not be shown by the workmen.

In the same manner that it is necessary to the mule-spinners to find docile and obedient children to help them in their work, so it is the interest of masters generally to get well-trained servants in every department of labour.

The manufacturer who neglects the education and general conduct of his people, neglects also his own interest. Whatever pains he may take with the manufacture itself, and however anxious he may be to enforce punctuality and care, he is never able to produce satisfactory results, if the habits of his workmen be vicious and unrestrained. There is a moral machinery to be kept in order as well as a mechanical, and the one cannot be neglected without the other suffering damage. The mere payment of wages will not secure zealous services, and if the master does not command the respect, obedience, and attachment of his people by his own good qualities, and his efforts to promote their real welfare, then, with the greatest amount of vigilance, he will not be able to check the careless and defective workmanship which will be visible throughout the factory.

The cause of education is advancing at no tardy pace in the manufacturing towns and villages, so that they may bear no unfavourable comparison in this respect with other parts of the kingdom. With the advance of knowledge, many ameliorating influences are likewise at work to improve the condition of the labouring class.

An example is set by the highest personage in the land of lively interest in the welfare of that class, and of marked encouragement to the

efforts now being made to improve the dwellings and increase the comforts of working men and their families. This encouragement and these efforts have promoted the rapid extension throughout the country of the system of baths and wash-houses, and of model lodging-houses, to which our metropolitan population is already so much indebted. In manufacturing districts, where large numbers of families are attracted to a particular locality by the nature of their employments, it is manifestly impossible that they should be accommodated with distinct tenements; it is therefore the common practice in such cases for several families to reside in one house. Out of this practice, however, many and serious evils have arisen. Houses, never designed to receive more than one family, have been made to hold several on each floor, if not in each room. A filthy and over-crowded state of such dwellings became the rule, and not the exception; so that those who, in the course of benevolent exertion, were led to explore the lodging-houses and other dwellings of our great towns, were shocked at the discovery of an amount of vice and crime, which rendered many of them a disgrace to humanity, and a reproach to the Christianity of England. Public attention was first generally called to this important subject in the metropolis,

through the instrumentality of the London City Missionary Society, which exhibited in one of its publications, entitled "The Lodging-houses of London," a fearful picture of vice and degradation. Much had been previously revealed by the Health of Towns Commission, but their reports had not become generally known. The statements of the City Missionaries were at first deemed incredible, but the wretched reality could not eventually be denied. It only required the same amount of observation to discover that the condition of the population in manufacturing towns was very similar to that of London, with respect to the crowded state of the dwellings, and the immoralities resulting therefrom.

The knowledge of these evils led to the formation, in 1844, of a "Society for Improving the Condition of the Labouring Classes," under the patronage of the Queen, and with the Prince Albert for its president. An important branch of its labours consisted in arranging and executing plans as models for the improvement of labourers' dwellings, both in the metropolis and in the manufacturing and agricultural districts. A description of one of these dwellings, arranged as a model lodging-house for one hundred and four working men, will give a general idea of the plan pursued in other cases. The kitchen and

washhouse are furnished with every requisite and appropriate convenience ; the bath is supplied with hot and cold water ; the pantry-hatch provides a secure and separate well-ventilated safe for the food of each inmate. In the pay-office, under care of the superintendent, is a small well-selected library, for the use of the lodgers. The coffee, or common room, 33 feet long, 22 feet wide, and 10 feet 9 inches high, is paved with white tiles, laid on brick arches, and on each side are two rows of elm tables, with seats ; at the fireplace is a constant supply of hot water, and above it are the rules of the establishment. The staircase, which occupies the centre of the building, is of stone. The dormitories, eight in number, ten feet high, are subdivided with movable wood partitions, six feet ten inches high ; each compartment, inclosed by its own door, is fitted with a bed, chair, and clothes-box.

In addition to the ventilation secured by means of a thorough draught, a shaft is also carried up the staircase, for the supply of fresh air to the dormitories, with a provision for warming if required. The washing closets on each floor are fitted up with slate, having japanned iron basins, and water laid on.

Similar admirable arrangements in dwellings for single men or women, or for families, have

been carried out in most of our great seats of manufacture, and although these advantages are offered at no higher price than the previous miserable accommodation of ordinary lodging-houses, yet we believe the experiment has rarely failed of being remunerative to the projectors. Other societies are now in operation, and individual efforts are not wanting to promote the new system of building for the labouring classes. The improvement has extended in some quarters to the cottages of agricultural labourers, and many wealthy proprietors are endeavouring in this way to raise the social and moral habits of the peasantry. It is, however, within the power of persons even of comparatively limited means to aid in this good cause, as was shown in the case of Howard the philanthropist, more than a century since. Going to reside at Cardington, in Bedfordshire, he found his tenants ignorant and vicious, living in dirty, ill-built, ill-drained huts, imperfectly lighted and badly supplied with water. He resolved to aim at improving their physical circumstances, to supply them with the means of comfort, attaching them to their own fireside, and fostering in them a relish for simple domestic enjoyment. His first step was to render their homes fit dwellings for self-respecting men; and in carrying his plan into effect, he did not

trouble himself much about the per centage which would accrue from his outlay. He considered that what he possessed was merely held in trust for the benefit of mankind, and he did not hesitate to invest it with a view to returns, rather in the shape of order, virtue, and happiness, than in money. "Having decided," says his biographer, "that the miserable mud huts in which he found his cottagers living should be taken down, he carefully selected some good and convenient plots of ground, on which he caused a number of very superior cottages to be built, and transferred into them such persons as he most strongly approved of for tenants. His absolute requirements were—habits of industry, temperance, and observance of the sabbath."

It is pleasing to know that the example of this remarkable man is now followed extensively; and it is also satisfactory to learn that the evils which have undoubtedly arisen from the accumulation of operatives in large towns, are being checked by the new system of building, of which the manufacturers themselves are the most powerful promoters. They know, indeed, by experience, the evils which it is desirable to counteract, and they are well aware that attention to the habits and morals of their people is nothing less than a necessary act of self-defence.

To use the words of an eminent statesman :
“As civilization progresses, we have not only the advantages, but the evils of civilization, and unless we exert ourselves to counteract these evils among the people—and one of the greatest of these evils is overcrowding in insufficient dwellings—unless we exert ourselves from time to time to counteract such evils, our boasted civilization, instead of promoting religion, morality, and obedience to the laws, will tend to leave a great class of the population of this country without sufficient means for the comforts which they ought to have—without sufficient means of education, and, above all, without sufficient means for religious improvement and instruction.”

We have thus gone over the ground which we proposed to ourselves in the commencement of this little volume. We have attempted to convey a brief, but clear view of the present position of our country, as it respects her manufactures and commerce; we have traced the causes of her pre-eminence to her mineral treasures, her insular position, her favourable soil and climate, her free and industrious population, her mild and beneficent form of government, her facilities for internal communication,

the mutual dependence of the various interests throughout her dominions, and, above all, to the blessing of Protestant Christianity, which gives her the free use of the Holy Scriptures, the right of private judgment, religious toleration, and that general enlightenment and probity which command the respect of all other nations.

We have also noticed the effects of arts and manufactures in giving employment to our people, and have sketched the principal operations which furnish continual and extensive demands on human labour. The effects of machinery, in conjunction with the skilled labour of the operative, in increasing the comforts and conveniences of life, have also been alluded to, abundant illustrations being furnished by the Great Exhibition.

Lastly, we have inquired into the results of this vast system, as affecting the workpeople themselves, their physical, moral, and intellectual welfare, the employment and education of their children, the means of instruction within their power, the treatment they receive from masters and superintendents, the plans adopted for the improvement of their dwellings, and the interest now shown in the highest quarters to promote their general well-being.

It may probably be said that the picture is

drawn too favourably, that there are fearful depths of misery left untouched, and that we have fallen into the error of those who would make of the manufacturing districts a sort of terrestrial paradise. Now, any sort of misrepresentation is what we especially wish to avoid, and we have, therefore, taken care to mention the case of frame-work knitters, lace-makers, and other suffering classes of operatives, as well as that of the well-paid cotton-spinner and cloth-worker. There are, indeed, many scenes of misery and vice left untouched, as well as many scenes of profitable labour undescribed ; for we pretend not to a complete treatise on a subject of such vast extent. The misery and vice, however, in most cases result, not from the factory system, but from the "great town system," and may be witnessed in the lowest parts of the metropolis to a much greater extent than in the manufacturing towns. Association in vice, as well as association in virtue, will ever be witnessed in great towns ; and if men there have their faculties sharpened, their prejudices assailed, and their general intelligence promoted—so will they also have their principles tried, their corrupt tendencies appealed to, and facilities afforded for the development of every bad passion. The

knowledge of good and evil there abounds, and for those who are taught from above to choose the good and refuse the evil, a great town tends to invigorate the mind, and promote that wholesome activity which is so necessary to social advancement.

When every deduction, however, has been made, the spectacle of Britain's manufacturing greatness is one on which the mind may dwell with grateful admiration. To be the inhabitant of a country so blessed by Providence with natural and acquired advantages, so replete with everything that can minister to social happiness, and so honoured as one of the leaders of modern civilization, is in truth an exalted privilege. If to have been a Roman citizen was an honour cheaply purchased at a large price, to be a citizen of a far mightier empire is surely a still higher gift. May Britain's greatness long continue based upon the righteousness which exalteth a nation! May her industrial skill go hand in hand with evangelical effort! May the vessels that leave her shores for distant lands, freighted with the produce of her sons' ingenious toil, bear even more than hitherto those who shall proclaim the message of grace to a rebellious world—
“ God so loved the world, that he gave his only

begotten Son, that whosoever believeth in him should not perish, but have everlasting life." By bringing our political, our commercial, our manufacturing powers, as tributes to the Redeemer's cause, we shall have the best guarantee for their permanent continuance to us. "Therefore, O Lord, not unto us, not unto us, but unto thy name be all the praise. . . . Both riches and honour come of thee, and thou reignest over all. In thine hand it is to make great, and to give strength unto all. Let the many mercies which we receive from thee dispose our hearts to serve thee more faithfully, who art the Author and Giver of them all. And finally, O Lord, teach us so to use these earthly blessings, which thou givest us richly to enjoy, that they may not withdraw our affections from those heavenly things which thou hast prepared for those that love and serve thee—through the merits and mediation of thy Son Jesus Christ our Lord, to whom with thee and the Holy Ghost be all honour and glory."*

* Abridged from the archbishop of Canterbury's prayer at the opening of the Great Exhibition, on the 1st May, 1851.





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