THE

COTTON MANUFACTURE

OF

GREAT BRITAIN

SYSTEMATICALLY INVESTIGATED,

AND ILLUSTRATED BY 150 ORIGINAL FIGURES,

ENGRAVED ON WOOD AND STEEL;

WITH AN INTRODUCTORY VIEW OF ITS COMPARATIVE STATE IN FOREIGN COUNTRIES,

DRAWN CHIEFLY FROM PERSONAL SURVEY.

By ANDREW URE, M.D., F.R.S.

Member of the Geological and Astronomical Societies of London, M. Acad. N. S. Philad., Corresponding Member of the Pharm. Soc. North Germany, and of the Société Industrielle of Mulhausen, &c., &c., &c.

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MDCCCXXXVI.

TO

THE MOST HONOURABLE

THE MARQUESS OF LANSDOWNE,

PRESIDENT OF HIS MAJESTY'S RIGHT HONOURABLE PRIVY COUNCIL,

&c. &c. &c.

MY LORD,

THE extensive survey of the industry of nations which I have had occasion to make, both at home and abroad, in composing the following description of its most productive province, has brought before me in auspicious perspective those recent improvements in laws, manufactures, and commerce, which must render the reign of our Gracious Sovereign, King William IV., the golden age of Great Britain.

The Textile Factories, which impart to cotton,

wool, flax, and silk, forms of countless variety and value, had become, in the course of their prodigious development, the subjects of some abuses, and of much unfounded obloquy. Under able Commissioners, selected by the Crown, factory employment was thoroughly investigated, and it has been since placed by Parliament under judicious regulation. Pauperism, that cancer which had long corroded the heart of English industry, and had eventually become so malignant as to be regarded by the ablest economists of Europe beyond the reach of cure, has been skilfully separated from the sound parts of the Commonwealth, and subjected to healing measures, successful beyond the hopes of the most sanguine philanthropist. The reluctant tasks of our Colonial Slaves have been converted into the cheerful labours of freemen. Our complex and restrictive code of fiscal laws has been so simplified and liberalized as greatly to facilitate foreign trade; while the vast empire of China has been made freely accessible to its operations.

These five legislative achievements, which come within the range of my researches, have already given an unparalleled impulsion to manufacturing enterprise, and will shed imperishable glory upon the Statesmen by whose wisdom they were planned and made practically effective.

Of productive industry, thus enfranchised and encouraged, to guide the ingenious toils by the lights of science and the lessons of economy, is my humble aim;—yet not inglorious, should it haply co-operate with His Majesty's Ministers in promoting our country's weal, and ameliorating the lot of humanity.

If the analysis of the cotton machinery and processes, now respectfully inscribed to your Lordship, at all corresponds with my endeavours, or their intrinsic excellence, the work will form the choicest gallery of mechanical invention ever laid open to the world; displaying that mighty system of the production, distribution, and con-

sumption of national wealth, in its mature state, of which the elements were first developed in the Political Arithmetic of your Lordship's illustrious ancestor.

I have the honour to be,

My Lord,

With the highest consideration,

Your Lordship's most obedient

And very faithful servant,

ANDREW URE.

London, May 18, 1836.

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INTRODUCTION.

In presenting this long-promised treatise* on the most important and intricate branch of manufactures to the public, I gratefully acknowledge their liberal reception of its precursor volume, and the kind manner in which influential journals of opposite political creeds were pleased to speak of its merits. It was obvious, however, that an inquiry into the factory system of Great Britain must necessarily touch too many delicate topics for an honest expositor to avoid giving offence to certain interests and prepossessions. The contrast which I had delineated, from ocular inspection, between the comfortable activity of our manufacturing operatives, and the listless penury of our agricultural labourers, as well as the hopes I had expressed, since so happily justified, of the improvement among the latter to be looked for from a better administration of the Poor Laws, could be little palatable to that portion of the periodical press, which had vituperated the proprietors of cotton mills, and denounced that legislative Act.

The most vehement maligner of this measure, which promises ere long to heal the heart-sore of English in-

* It was announced six years ago for Dr. Lardner's Cyclopædia, but in the course of completion it assumed a magnitude and style of illustration beyond the limits of that Cabinet Series.

dustry, is well known to be the gentleman employed to criticise the works on manufactures for the Edinburgh Review.* *He* could not be expected therefore to regard my volume with a favourable eye, or to give a fair report either of its tenor or contents. But no one could have supposed that a periodical which had earned so high a character, under the auspices of Mr. Horner, Lord Brougham and Lord Jeffrey, by its able advocacy of public economy, should suddenly become the eulogist of taxes, describe them, with the servile minions of William Pitt, as needful incentives to national industry, and defame a work in which its own liberal principles of trade were conscientiously, though temperately developed.

The title of that book was so worded as to leave no ambiguity, it is believed, in any candid mind, as to its scope.† The phrase Factory System has been long current in our parliamentary debates, newspaper commentaries, and popular harangues. It has been moreover settled and circumscribed three years ago by our Legislature in the *Factories' Regulation Act,* which restricts the term *Factory to such cotton, wool, flax, and silk mills as are moved by steam or water-power.* These establishments alone are placed under the superintendence of four gentlemen, named by the Government, *Factory Inspectors.* From the following cavil, the critic might excite a suspicion, that he had newly alighted, a wondering novice, from some lunar railway, entirely ignorant of the language, laws, and usages of this realm.

* See the Note at the end of this Introduction.

† The Philosophy of Manufactures; or an Exposition of the Scientific, Moral, and Commercial Economy of the Factory System of Great Britain.

"The title of Dr. Ure's book is eminently calculated to mislead. By a factory he means a cotton mill, a flax mill, a woollen mill, or some such establishment in which people are employed to attend to machines continuously impelled by a central power." "Few branches of industry, except such as are conversant merely with spinning and weaving, can be carried on in what Dr. Ure calls factories; and he expressly excludes from them iron-works, dye-works, breweries, distilleries, &c."*

A fine farrago I should have made of that post-octavo volume, had I introduced into it all these heterogeneous ingredients. By excluding from it the things which law and custom had excluded from its title,—Factory System,—I secured unity of design, and a manageable variety of topics. Had the slightest obscurity been left in the title page, the first sentence of the book would have cleared it away. "Manufacture is a word which, in the vicissitude of language, has come to signify the reverse of its intrinsic meaning, for it now denotes every extensive product of art which is made by machinery, with little or no aid of the human hand; so that the most perfect manufacture is that which dispenses entirely with *manual* labour." In fact cotton, wool, flax, and silk mills, the four subdivisions of the factory system, as defined by law, afford by far the finest models of the automatic arts, and form a peculiar group replete with objects eminently interesting in a scientific, moral, and commercial point of view. "And as the philosophy of the fine arts, poetry, painting, and music, may be best studied in their

* *Edinburgh Review for July*, 1835, p. 454.

individual masterpieces, so," said I, "may the philosophy of manufactures in these its noblest creations." If the critic looked at all into my book, he could not have missed seeing these explicit definitions in its first and second pages, when, even supposing him to have been an unfledged tyro, he was left without the shadow of a reason, or the slightest pretence, for declaring its contents to be irrelevant to its title.

In the first chapter of that work, the general functions of machines are discussed, and several valuable facts are detailed respecting mill architecture, communicated to me by one of the most eminent engineers of the age. The influence of improvements in machinery, upon manufactures and trade, are investigated at some length, as well as the effect of patents in keeping up new inventions at a monopoly price, so as to retard their general introduction, and prevent those abrupt transitions from hand-labour to automatic work which would be apt to throw operatives for a time out of employment. As to the details of machine-making they belong to a treatise upon mechanics, and would be strangely misplaced in one upon the philosophy of manufactures. Had I entered more largely into the subject of machinery, to suit the reviewer's caprice, I, should have been obliged to sacrifice inquiries much more appropriate to the title of the work and the wants of society.

The second chapter of the first Book of that volume, entitled "Topography and Statistics of the Factory System," is dedicated to the solution of the problem why manufactures flourish more in one district than another. Here the influence of cheap fuel, an abundant population, commodious seaports, streams of pure water, in-

land navigation, the energy of capitalists, a ready supply of the raw material, are severally specified as elements of our factory greatness.

Even the first page of the preface contains a summary of the circumstances upon which the manufacturing superiority of this country over the other European States depends. It is there said, "Great Britain may certainly continue to uphold her envied supremacy, sustained by her coal, iron, capital, and skill, if, acting on the Baconian axiom, 'knowledge is power,' she shall diligently promote moral and intellectual culture among her productive population." Yet the critic, under his anonymous mask, is so wantonly reckless of truth as to say, "If any one were to inquire why the factory system had not been carried to the same extent in France or Austria as in England, he will get no answer from Dr. Ure."

But his most flagrant misrepresentation is accusing my book of being "singularly defective on the influence of manufactures on the health and happiness of the individuals engaged in them."* Now I defy even a purblind man to glance over its leaves in the most casual way without perceiving that fully one-third of them is occupied with a methodical exposition of the moral economy of the factory system, distributed into three distinct chapters, entitled, 1, Comforts of Factory Operatives; 2, Health of Factory Inmates; 3, State of Religion and Knowledge in the Factories,—subjects occupying no fewer than 152 pages successively headed with these titles. Nor is there a single topic alluded to by the reviewer in his pretence to

* *Edinburgh Review for July*, 1835, p. 455.

supply my deficiencies, which is not deliberately discussed, with copious proofs and illustrations, many of them original, in that very work which he set himself rashly to revile, in despite of candour and consistency.*

In attempting to vindicate the factories from many misrepresentations, I have never shut my eyes to special abuses of any kind, nor have I tried to varnish them over in my narratives. When the reviewer charges me with saying that the statements as to the pernicious influence of factory labour have been proved to be *wholly* destitute of foundation, he himself is the only person who says what is *wholly so,* for I was most solicitous to discriminate between the comfortableness of a factory when administered by a humane and religious proprietor, and by one of a careless or corrupt disposition; and I have reason to believe that my general strictures on this delicate point, as they were prompted solely by regard to my fellow-creatures, have already tended to introduce ameliorations into certain establishments.

In reference to the health of our factory inmates, nothing has come to my knowledge since the publication of the Philosophy of Manufactures which should make me retract my opinion, that employment in a cotton-mill may be, and generally is, as salubrious as any other which the children of labour can obtain in the present state of the world. I should wish, however, to see warm-baths attached to every cotton-

* The book was only a few days out when the reviewer's poisoned dart came hissing after it, to cut short its career—*imbelle telum.* The second edition is already several months on sale. A translation of the work has appeared under the patronage of the French Government, with high commendations; it has come forth also in a German dress.

factory. They could be supplied without trouble or expense with the pure hot water discharged from the steam pipes which traverse the apartments. A set of such baths for males, and another for females, at opposite sides or ends of the building, each kept in order by a superannuated man and woman, who would receive a trifle from each bather for their attendance, would conduce greatly to the cleanliness, health, and comfort of the operatives. "When the perspiration," says an eminent physiologist, "is brought to the surface of the skin and confined there, either by injudicious clothing or want of cleanliness, there is much reason to suppose that its residual parts are again absorbed, and act on the system as a poison of greater or less power, according to its quantity and degree of concentration, thereby producing fever, inflammation, and even death itself; for it is established by observation that concentrated animal effluvia form a very energetic poison.

"If one-tenth of the persevering attention and labour, bestowed to so much purpose in rubbing down and currying the skins of horses, were bestowed by the human race in keeping themselves in good condition, and a little attention were paid to diet and clothing, colds, nervous diseases, and stomach complaints would cease to form so large an item in the catalogue of human miseries. Man studies the nature of other animals, and adapts his conduct to their constitution—himself alone he continues ignorant of and neglects; he considers himself as a being of a superior order, and not subject to the laws of organization which regulate the functions of the inferior animals; but this conclusion is the result of ignorance and pride, and

not a just inference from the premises on which it is ostensibly founded."*

Mr. Rickman, the able editor of the Parliamentary Population Returns, in an interesting communication published in the *Medical Gazette* of December 19, 1835, shows that the average mortality of females between ten and twenty years of age, in the four non-factory counties, Bedford, Bucks, Northampton, and Rutland, is annually one in 133; but in Lancashire, and the West Riding of Yorkshire, the two chief factory counties, only one in 172 for the first, and one in 177 for the second. He then observes, "I never yet could discover any fact which was likely to place the health of the manufacturing population below that of other occupations, nor have I ever met with any alleged fact to that effect which stood the test of strict examination; so that, in the conflict of opinion, I was bound to adhere to equality of health in the grades of female life (from ten to fourteen, and from fifteen to nineteen years) which chiefly constitute our manufacturing population. Moreover, I was the less prepared to discover disadvantage to young females in the counties of Bedford and Bucks than elsewhere, because in my youth I had traversed those counties oftener than once in pedestrian excursions, and was then much struck by the happy appearance of young girls and other females sitting at cottage doors or with open windows, busied in lace-making, especially as constant shelter from bad weather had preserved their beauty, so as to equal that of highly educated females.

"It is impossible to investigate retrospectively whe-

* *Principles of Physiology*, by Andrew Combe, M.D., pp. 67, 101.

ther in earlier times, in the days of Queen Elizabeth for example, the sedentary occupation of the *spinster* (which included all unmarried females, and is still their legal designation) had the same deleterious effect as in the four selected counties; if so, females are *positively benefited, not injured, by the introduction of machinery,* as well-meaning philanthropists too readily suppose; for I cannot imagine or believe that regular hours of labour, plenty of fuel, good clothing, and the many other comforts which spring from high wages, are injurious to the health of any human being. We all know but too well from the incessant clamours of hand-loom weavers, that there are many industrious men who, during a series of years, have carried on a domestic manufacture in small rooms, crowded by looms and weaving apparatus, breathing air loaded with dust, their hours of labour extending into the night, payment for such weaving very moderate,—preferring all these inconveniences to factory labour, because they cannot endure stated hours and the regular behaviour indispensable in every factory; nor do they send their children thither, because they are retained at home to prepare hand-loom work.

"The female mortality of the above four non-factory counties exceeds that of their males between the ages of ten and twenty in the ratio of 100 to 68, and female life in Westmoreland has the same unhappy bias. In Lancashire and the North Riding of Yorkshire the scale is rather in favour of females, female deaths to male deaths being in the former as 100 to 104, and in the latter nearly equal."

The professor of political economy blames me for not expatiating on the benefits which our taxation

has conferred on our manufactures. "An increase of taxation," says he, "is one of the most prominent causes of an increase of wages, and, independent of this direct influence on the manufacturer, is precisely similar to an increase of wages." What confusion of ideas! What contradiction of terms! So that because the manufacturers by direct influence first suffer from taxation as they would do from increase of wages, and have besides to pay their workmen increased wages from that "most prominent cause," taxation, they should congratulate themselves on being stimulated by such agreeable incentives to industry, while the *torpid manufacturers of the United States, who are now supplanting us in many foreign markets, are unfortunately destitute of these double-strong cordials.*

Nor was political economy overlooked in treating the philosophy of manufactures, as the critic would insinuate. Through every division of the book there flows a stream of that useful science, drawn from its purest fountains;* not, indeed, from those noxious pools where absenteeism, pauperism, and taxation are set off with the flowers of sophistry. Nurtured in the severe studies of physical science during a laborious life, I have been careful to search for truth, unbiassed by motives of place-hunting or political partisanship, happy if I can be of some little use to mankind in my day and generation.

In what light our manufacturing classes view taxation the following details will show.

The repeal of certain additional duties imposed by

* The speeches of Mr. Huskisson, *inter alios.*

Mr. Pitt in 1784 upon printed calicoes, was celebrated as a jubilee in Lancashire; and when the two gentlemen delegates to London, who had been particularly active in the application to Government, returned to Manchester, they were honoured with a triumphal reception, being met by a procession of all classes of people, which extended to Stockport, a distance of no less than seven miles—the most joyous and brilliant exhibition ever seen in that emporium of industry. The inhabitants of Manchester and Bolton combined to present handsome silver cups to these gentlemen, with suitable inscriptions.

Their ground of rejoicing was soon, however, taken away by the wants of the Exchequer, drained by the culpable expenditure of the American war, and heavy duties were imposed, which continued to cripple and annoy the elegant art of calico printing till 1831, when they were repealed; since which period, the business has more than doubled in extent. This repeal is one of the most judicious acts of modern legislation. It enables the consumer to get the article from 30 to 40 per cent. cheaper, and females of the lower ranks to clothe themselves in handsome comfortable dresses, such as their superiors previously wore. The taxed goods, which in 1795 were sold for 2*s.* 3*d.* a yard, now cost no more than 8*d.* A respectable dress may in fact be had at present for half a crown. The suppression of the tax has been further beneficial to the honest manufacturers by extinguishing the contraband trade, which had been carried on to an extent equally injurious to them and to the revenue. Another advantage of the repeal was, freeing a business, involving so much taste, skill, and science from the insolent and venal *espionage* of

poorly paid excisemen, who were easily bribed to steal secret processes which had cost great toil and expense to the proprietor, and sell them to jealous rivals.

Nor is it a matter of slight moment for a manufacturer to have the distribution of his own time and operations. He is now suffered to print his goods at any hour of the day in which he receives an order, instead of being obliged, as he formerly was, to wait for the arrival of the officer to measure and stamp the cloth, before he dared begin to pack it in bales for the market. Under the critic's *stimulus* of taxation, adventurers often bought printed calicoes on credit, and forthwith sent them abroad to raise a capital by the drawback, for carrying on a nefarious system of trading far beyond their legitimate means. Such goods were of course hurried off to foreign markets for which they were neither wanted nor suited, and caused disastrous competition, by their forced sales, against the responsible merchant.

Had not our cotton manufactures been cramped by taxation, they would long ago have acquired such a surpassing power as to have bid defiance to foreign rivalry. Goods would have been profitably produced by our admirable automatic machinery, guided by a comfortable and well-informed race of artisans, at such moderate rates as would have rendered all attempts at competition utterly hopeless; whereas they have been kept up by taxation of every kind, and by the discontents, conspiracies, and strikes among the operatives, mainly caused by taxes on the necessaries and conveniences of life, at such a pitch, as to encourage nation after nation to enter the field against us, and to take possession successively of many of our oldest and most valuable markets.

The paralysis of our factories during a strike is the immediate cause of the erection of rival factories in other countries. The foreign market gets bare, prices rise, and draw capitalists into the empty channels. The discontented and idle workmen migrate to France, Belgium, and America, and sow the seeds of opposition. Every strike in Great Britain has been the era of new factory creations abroad. The Unions ship off their members to maintain a maximum rate of wages. During the disastrous strike in Lancashire and Lanarkshire of 1829, many of our spinners who were prevented from working, went to France, Belgium, and the United States, and introduced improved and profitable methods previously unknown in those countries; all tending to subvert our cotton supremacy.

The mill-owners naturally try to indemnify themselves for the diminution of profits arising from taxation, by a proportional increase of their business. The excess of goods thereby created leads to a corresponding fall in their price, as well as in the wages of their production. The artisans who could barely maintain their families by the ordinary hours of labour before, are now urged to extraordinary exertions so as to make up by the quantity of work for its smaller remuneration. Such circumstances derange the natural order of production, and call forth certain articles out of proportion to the real demand of the market or the wants of the consumer. All objects are not alike necessary, and several are not susceptible of any sudden increase of sale. Before the consumption of corn is reduced one-half, that of butcher's meat will be reduced to one-fourth, and that of tea and sugar to nothing.

Goods suffer an undue depreciation when they are produced during a stagnation of trade, because the manufacturers are unwilling to dismiss good workmen who could not be readily replaced at the period of its revival, and they often also continue to employ them from feelings of humanity towards their families. These circumstances, which taxation at home, and fiscal restrictions abroad, always aggravate, if they do not create, by recurring at certain periods, dislocate the universal frame of industry and commerce. To panic-struck minds the mischief often appears irretrievable. The stagnation, fortunately, seldom lasts long, because the accumulated pressure never fails to force open new outlets of trade, or to widen the pre-existing channels, with the effect of not merely restoring the equilibrium between demand and supply, but of giving a fresh impulse to production. It is surprising how small a surplus of commodities is capable of inducing a great depreciation in their value. Addison remarked in the Spectator, that when the corn crops of England exceeded the average amount by only one-tenth, the price of grain fell one-half. Such a fluctuation from so trivial a cause, however, could occur only in a confined market. The wider and more numerous the channels of circulation, the more steady will be the level of international commerce.

Having shown with sufficient evidence the deleterious influence of taxes in general, few words will be required to expose the fallacy of their vindication, or rather of the panegyric pronounced upon them in a late Number of the Edinburgh Review, in a strain becoming the most venal parasite of absolutism. "On the contrary," says the Reviewer, "we believe that tax-

ation, though in a few instances it may have been injurious, has hitherto, in this country at least, operated as an incentive to industry; and that the stimulus it has given has powerfully contributed to impel us forward."*

The lash of the negro driver was in like manner an incentive to industry, a stimulus loudly lauded in its day, and declared to be the *primum mobile* of colonial prosperity. To what is the extreme depression of our agricultural interests now due, in the judgment of all candid inquirers, but to the pressure of taxes upon landlords and tenants? They regard the enormous demands of the Exchequer, which exhaust the energies of the rural classes in these rich islands, with equal abhorrence from the foresight of their consequences, and the retrospect of their origin—wars, wasteful of blood and treasure beyond all ancient or modern precedent, carried on by a system of rapine and fraud not merely against the existing race of men, but involving the interests of our latest posterity. In former times the evils of misgovernment were ere long repaired after the disturber of the world's peace was laid low; but by the chicane of modern finance, rulers may not merely sacrifice, as of old, the happiness of their contemporaries to their mad ambition, but may mortgage the well-being of innumerable generations yet unborn. Such is the deplorable legacy of debt bequeathed to Britain by her sanguinary contests with the Americans and French—people with whom, as kinsmen and neighbours, she might, under wise statesmen, have lived always in a state of peace, if not of amity. The taxes hourly levied to pay the interest of the debts contracted in the im-

* *Edinburgh Review for July*, 1835, p. 463.

molation of myriads of innocent human victims, cannot be contemplated by the philosopher or philanthropist without shame and disgust, for they are the memorials of misrule and of outraged humanity.

As capitalists have the power of shifting the burden of taxation from their own shoulders upon those of the labouring classes, in the race of competition now run by rival manufacturers, taxes may, no doubt, be admitted to act as a spur to exertion;—but upon whom does the painful part of this exertion fall? Upon the operatives, to be sure. Their comforts are successively curtailed by taxation, while those of their employers are affected slightly, if at all. The taxes levied on the provisions consumed by a landed or factory proprietor are of very secondary consideration to either of them in the amount of family expenses, but they form a considerable item in the labourer's annual outlay, and deprive him of at least one-third of the necessaries and conveniences of life. Could he obtain three pounds of bread, butcher's meat, butter, cheese, sugar, and coffee, or tea, where he gets at present only two pounds, in how superior a state of comfort would his family live! Were their employers in like manner relieved from the heavy fiscal exactions, their annual gains would be proportionately greater, they could afford to give a higher reward to labour than they actually do, without abridging their style of living, or abating the yearly savings added to their stock in trade.

The vast development of the manufacturing system of Great Britain, through the skilful application of capital to its resources of coal and iron, has fortunately counteracted, or masked in a great measure, the mischiefs of excessive taxation; had that system been

unclogged with national debt, it would certainly have enabled the people of these islands to live more comfortably than any other on the face of the globe.

From the paragraph formerly quoted the Reviewer evidently has more at heart the profits of the proprietors than the comforts of the people; whence he appears to take a very partial and erroneous view of the proper object of manufactures. "But an increase of taxation," says he, "is one of the most prominent causes of an increase of wages; and, independent of this, its direct influence on the manufacturer is precisely similar to an increase of wages. Whether he has to pay an additional sum to his workpeople, or to the tax-gatherer, is, as respects himself, not very material. In either case he will endeavour to meet the increased burden, without allowing it to diminish his capital or profits; and will thus be led to contrive and economize in a way and to a degree he would not otherwise have thought of."*

An increase of taxation being thus declared to be tantamount to an increase of wages, the master will naturally relieve himself in the only direction under his control, or which he can force to give way; namely, at the expense of his dependent workmen—for the tax-gatherer is inexorable. Economical improvements of machinery are too slow and uncertain to meet the exigency of competition with a country like the United States, which has few or no taxes to pay, and where effective wages are on that account proportionately lower. In fact, taxation affords not only a legitimate argument and ground to the manu-

* *Edinburgh Review for July*, 1835, p. 462.

facturer for reducing the wages of his workmen, but is too often used as a pretext or apology for an extent of reduction, through policy or fear, much beyond the necessities of commercial competition. As the masters have, in ordinary times, the power of accommodating the rate of wages to the general interests of their trade, they will infallibly meet the increased burden of taxation by *their* diminution, "without allowing *it* to diminish their capital or profits." Such solecisms and anti-popular dogmas as the above, are strangely out of place in a periodical so long celebrated for the soundness and liberality of its lucubrations.

Taxation acts thus as a two-edged sword against the people; it lowers the remuneration of their labour and raises the cost of their living. The inevitable result of the manufacturers exonerating themselves by tossing off the fiscal load from their own shoulders upon those of their operatives, is a universal feeling of distrust between the employers and employed, which exists in no other country upon the face of the earth. This civil warfare between parties whose interests are one and indivisible, is entirely due to the conviction which the workmen not unjustly entertain, that their comforts are offered up as a sacrifice to the necessities of the Exchequer. Hence the destruction of those amiable charities of social life which Providence designed in ordaining the gradation of ranks; hence contempt of legislators, and violation of laws akin to anarchy, among the less favoured classes in both the agricultural and manufacturing districts of the empire.

Far be it from me to give the slightest countenance to any deeds of violence done under the pretext of

obtaining a redress of grievances. Trades' unions have on so many occasions been actuated by prejudice and passion, and have so often abused their powers by controlling the freedom of labour, as to have lost all that salutary influence which wisely-regulated friendly societies among workmen would have exercised upon the upper ranks. It is, moreover, a well-established fact, that those artisans who are the worst paid seldom combine, and never with any force; but only those who enjoy the best wages, such as cotton-spinners, engineering mechanics, founders, colliers, carpenters, tailors, &c. The daily pay of the former is indeed too scanty to allow of the formation of a heavy stock-purse to pamper a stipendiary committee of demagogues; and they are also too much dispersed and too heterogeneous to combine. Strikes have besides commonly defeated their own ends; for, instead of raising wages, and subjugating capitalists, they seldom fail to lower the one, and emancipate the other.

In the following sentence the reviewer evinces a surprising ignorance of our manufactures, and ascribes their advancement to the two most formidable evils against which they have had to contend—namely, taxation-wages and unions. "Could we suppose that from the era of the discovery of the spinning-frame and the steam-engine, down to the present day, wages had remained stationary, and strikes and combinations among the workmen been unknown, we believe we shall not be accused of exaggerating when we state that, under such circumstances, manufactures would not have made half the progress they have done."

The author of the able Memoir upon the Causes of Manufacturing Distress, crowned in May, 1832, by the

Société Industrielle of Mulhausen, says, "Taxes hinder exportation by raising the cost of fabrication; it is the tradesmen of the nation least taxed who will always carry off the business from their competitors, from which we may judge what a brilliant career awaits the commerce of the United States—that favoured land, free from public debt, and nearly free from fiscal exactions. Switzerland, our next-door neighbour, prospers from the same cause."

If we take into our estimate all the operatives employed upon cotton, non-factory as well as factory, we shall find that their wages have fallen very considerably, relatively to their work, and the comforts which it will command. Even factory wages, as in Mr. Thomas Ashton's mills at Hyde, which may be regarded as a fair type of the general mean wages in cotton-mills, have not advanced in the space of many years, during which the most remarkable improvements have taken place in the machinery and processes of manufacture.

The encroachment of foreign competition upon the cotton trade of the United Kingdom has become so rapid of late as to excite alarm for its supremacy under our heavy taxation in any mind not besotted by national pride. The continent of Europe, and the United States of America, for some time after the peace of 1814, possessed factories upon so small a scale, that they could not be regarded as our rivals in the business of the world; but now they work up nearly 750,000 bales of cotton wool, which is about three-fourths of our consumption, and have become formidable competitors to us in many markets heretofore exclusively our own.

Ever since the ministry of Colbert it has been the pride of the French government to foster the manufacturing system. A considerable manufacture of cotton cloth was commenced about eighty years ago in the Vivarais, the yarn for which was chiefly imported from the Levant, just as the cotton-wicks for the London candle-makers still are. The first spinning machine in France on the factory construction was a mule introduced thither from England in the year 1787 by Monsieur de Calonne, Minister of State. This machine, and others made in imitation of it, were set to work at Rouen, Paris, St. Quentin, Lille, Amiens, and also at Montpellier, which was the ancient seat of the household cotton trade.

Soon after this period an attempt was made to spin water-twist at Louviers. Some slight hostility was evinced towards this new system of power-spinning, but, as household cotton-spinning had not been carried on beforehand to any extent, the people were soon conciliated in favour of the new manufacture by the good wages it procured.

The following table shows the progress of the French cotton manufacture during nine years after it was fairly established:

	COTTON WOOL CONSUMED.
	lbs.
1798	18,000,000
1799	10,290,000
1800	6,726,000
1801	11,008,000
1802	15,120,000
1803	15,780,000
1804	17,200,000
1805	18,412,000
1806	21,734,000

In the last of these years the cotton was manufactured into the following articles: about 1,000,000 lbs. into velvets; about 925,000 lbs. into nankeens, nankinets, crapes, and other small stuffs; about 1,155,000 lbs. into dimities, and about 14,880,000 lbs. into fustians, calicoes, coverlets, siamoises, muslins, &c. In the same year the French imported (per contraband) from England 2,000,000 pieces of nankeens, 1,000,000 pieces of cloth for printing, and about 300,000 pieces of other descriptions of cotton goods, such as muslins, cambrics, dimities, &c., valued at £300,000 sterling.

It was only in the larger spinning factories, of which, prior to the year 1817, there were few in France, that the power of water or steam was employed, and in the greatest part even of these the application of power was confined to the machinery for the preparation, or the carding and roving processes Since then the factory system of France has received an immense development. Mulhausen and Rouen may be considered its principal head-quarters, though the districts of St. Quentin and Lille also display extraordinary activity in its prosecution. Normandy and Picardy are peopled with weavers, who carry on the business on their own account at home, and send the goods for sale to the halls at Rouen, Abbeville, &c. The finest fabrics are made round St. Quentin and Cambray. The articles made in the districts dependent on Mulhausen and Rouen are calicoes coarse and fine, velvets, coloured goods of all descriptions, of superior beauty, from their skill in the chemistry of dyeing. At Tarare the finest book muslins are woven with yarn at one time smuggled from England, but now imported

under the new tariff of 30 per cent. on yarns above No. 140 = 165 English. Fine cotton stockings are made at Nismes, and fancy goods of many sorts, woven with silk warp and cotton weft. Lyons boasts the most tasteful articles in the cotton trade, and cotton mixed with silk, but charges a very high price for them. Madras handkerchiefs, in imitation of the Indian so called, constitute the cotton manufacture of Montpellier. The calico-printers of Alsace formerly drew their whole supplies of cloth from Paris, Rouen, and St. Quentin, but they now spin and weave goods not merely adequate to their own wants, but have a surplus for sale in the plain state.

It is in their coloured goods and sewed muslins that the French compete most successfully with the English manufacturers. They conduct their dyeing works on strictly scientific principles. The *Bulletin de la Société Industrielle de Mulhausen,* a periodical work, of which seven volumes have been published, affords a strong evidence in favour of their progress in this department of the arts; we cannot equal their madder-pinks and lilacs, nor their permanent greens.*

Power-loom goods have not been produced to any great extent in France, on account of the high price of fuel and machinery on the one hand, and of the low price of hand-labour on the other. There are not more than 5,000 looms of this description at work.

The following Table will give an idea of the progressive advance of the cotton trade in France for several years:—

* Alfred Binyon and William Nield, in Second Factory Commission Report of 1833.

COTTON WOOL IMPORTED FOR CONSUMPTION.

	1822.	1823.	1824.	1825.	1826.	1827.
Bales..	215,199	172,312	243,958	216,460	281,001	279,693

	1828.	1829.	1830.	1831.	1832.
Bales...	239,723	264,760	254,000	243,168	272,463

Table of the number of bags and bales of cotton wool imported into Havre-de-Grace in the following years :—

1831.	1832.	1833.	1834.	1835.
97,492	160,222	171,439	166,295	190,972

In 1827 reports were presented to the French government, by the several chambers of commerce and manufactories in France, concerning the causes of the distress which prevailed in that year. They stated that the protection given to their manufactures had produced an excessive stock of goods beyond the wants of the home consumption, and had caused other countries to refuse admission to the exportable surplus, though, indeed, it was that protection which had pampered them into a monopoly price beyond the level of the European market. This over-production operated disadvantageously on the French manufacturers till 1831, when the continued low prices had so augmented the home consumption, and favoured exportation of the remainder to the value of 54,000,000 francs, that the factories began again to be briskly employed, as they have been progressively since.

The cotton manufacture began at a very early period in Switzerland, for it produced, according to the annalists of that country, muslins towards the conclusion of the seventeenth century. It must have remained long dwarfish; for till Arkwright's era it attracted no notice from other nations. The first Swiss cotton-

mill was erected at St. Gall in 1798. Till the year 1817, however, nine-tenths of the yarn which they used in weaving was spun on the one-thread wheel. The weaver supplied himself usually with the yarn, and sold the cloth at the most convenient weekly market, or exchanged it with dealers for yarn. Latterly general manufacturers have sprung up, who provide yarn to the weaver, and pay him a stipulated price for weaving it into cloth, which they dispose of in various ways.

This state reminds us of the infancy of the trade in England, and while wages are high, relative to the means of subsistence, the operative may be comfortable and independent in his cottage mode of life; but when, from competition in the market, the wages become relatively low, the weaver can no longer afford to waste his time in hunting after yarn, and travelling with his small stock of goods to the market, and he sinks into penury, or a precarious dependence on petty dealers. In such circumstances the condition of the work-people at the great factories of Hyde in England, or Catrine in Scotland, is more enviable than that of the cotton peasantry of Switzerland, so extravagantly admired by some writers. The former are sustained in a steady state of comfort in good times and bad times by great capitalists, while the latter are seriously affected by every commercial vicissitude, and suffer occasionally the most painful privations.

Switzerland, being situated on the confines of European states which impose high duties on the importation of cotton fabrics, has derived great profits from the contraband trade. She has pursued the policy, therefore, of receiving goods freely, in order that her people

may get them cheap, and be able to smuggle them with advantage into the territories of her neighbours. Nor has she neglected to avail herself of the natural facilities for impelling machinery offered by her mountain streams and waterfalls. New spinning-mills have been progressively erected from year to year in the town and canton of Zurich, in the cantons of St. Gall and Appenzel, in Argovia, Thuringia, St. Blaye, near Basle, and Geneva. In some places, particularly at Zurich, water-power has been sold at so high a rate as £200 for each horse-power. Cotton wool to the amount of 56,000 bales was worked up by the Swiss manufacturers in 1832, though the cost of transmitting it from Trieste is 1*d.* per pound, and from Havre 1¼*d.* Upwards of 9,000 persons are now employed in the spinning operations, besides about 20,000 in weaving, dyeing, and calico-printing. The wages are very low; —to spinners from 8*s.* to 10*s.* a-week; to stretchers (men), 4*s.* to 6*s.*; to carders (men), 5*s.*; to drawers and slabbers (girls), 3*s.* Eighty hours are the weekly period of work in the mills. Weavers earn from 4*s.* to 4*s.* 6*d.* a-week, and 2*s.* a piece for calicoes. Mechanical looms, even with cheap water-power, could not there stand in competition against such low-priced hand-weaving.

The cotton goods resemble closely the English in their style. The fine tweels and the finer prints have successfully competed with those of Great Britain in the markets of the Mediterranean, and latterly in South America. Before the year 1822 water-twist and mule yarn, with cotton fabrics of every description, were sent from this country to Switzerland; but now all the yarns up to No. 60 are spun by the Swiss themselves;

fustians are the only article still supplied from England. The following statement of the comparative cost of spinning 40's twist was furnished by Messrs. Samue Greg and Co., of Manchester, to the factory commission.

Processes.	Manchester.	Switzerland.
	d.	*d.*
Preparation, &c. . . .	·713	·664
Spinning	1·855	1·236
Reeling and Bundling . .	·755	·513
Contingent expenses . .	1·071	1·041
Interest of capital . . .	·812	1·012
	5·206	4·466

Thus the only advantage in England is the lower rate of interest upon fixed capital, arising from more work being done by the same machinery. We must add to that advantage the saving on carriage of the raw and manufactured articles. All the children in the Swiss mills are able to read and write; they attend the Sunday schools, and other religious institutions. The modern mill-work is generally preferred to weaving and printing, in consequence of the regularity and constancy of employment. The condition of the people has been improved by the mills, in taking them from agriculture, weaving, and begging. The quantity of yarn turned off per spindle is from fourteen to sixteen hanks of No. 40's per week. All the machinery used is made either in the country itself or in France. The freight from England to Switzerland is about 20*s*. per 100 pounds' weight.

Cotton manufactures are becoming objects of interest to many of the German states. Several spinning-mills have been erected in the Austrian dominions, especially in the neighbourhood of Vienna, which are driven by water-power, and produce yarn of the lower

numbers up to 60's. Their fine goods are woven with yarn smuggled in from Great Britain, though its entry is not prohibited, like the coarser, but is permitted under a high duty. To facilitate this contraband trade, small mills have been planted at Reichenberg and other spots on the Bohemian frontiers, which enable their owners to bundle up the English yarn in their own fashion, and dispose of it as such to the Austrian weavers. It is said that 100,000 weavers are employed in the neighbourhood of Vienna alone; and many at Prague, and in general throughout Bohemia, Moravia, and at Gratz, in Styria. A few factories have been erected in the Tyrol, to take advantage of the abundance of water-power, as well as the low rate of wages, and the protecting duties against foreign yarn. The goods manufactured with these yarns are of a stout quality, and well made. Nankeens are in much demand.

After many unsuccessful previous attempts, at length, in 1799, Messrs. Barnard and Brothers, aided by an English mechanic, erected at Schemnitz the first spinning-mill of Saxony. Many rival factories were soon thereafter mounted, but they all proved unprofitable from the fall in the price of English goods and their own imperfections. The Berlin decree, in 1806, which obstructed the introduction of English manufactures, revived the spinning trade of Germany, and restored it in two years to a prosperous state. After the defeat of Napoleon, in 1813, it once more gave way to the competition of England. Since the year 1818, however, the cotton-mills of Saxony have resumed considerable activity, and produce low-numbered yarns from Smyrna wool, to be woven into

thicksets, velvets, and coloured pocket-handkerchiefs. All the finer mule yarns, and nearly the whole of the water-twist, are imported from Great Britain. The yarn, whether of domestic or foreign produce, is sold to the weavers dispersed through the country villages, by whom it is woven. The cloth is sold by them at the market towns.

The imports of English cotton-twist in the excise district of Zittau, in Upper Lusatia, amounted in 1832 to 76,648 cwts. against 52,421 in the preceding year. In the other departments of excise the importation may be estimated at 30,000 cwts; so that the total import of British twist is from 10,000,000 to 14,000,000 lbs. into that small province, containing a population of only 220,000 individuals. The yarn spun round Zittau amounts to from 5,000,000 to 6,000,000 lbs. annually.

The cotton manufactures of Prussia and the Rhenish provinces are extending rapidly, not only by weaving British yarns, but by spinning also. The number of operatives now employed in spinning by power is estimated at from 6,000 to 7,000. In 1830 no less than 35,000 bales of cotton wool were worked up. With the exception of Mr. Brugelman's mill at Cromford, near Dusseldorf, where the daily hours of work are only thirteen, the factory time is fourteen hours, beginning at six, closing at nine, and allowing one hour for meals.

The average wages are—

	s.	*d.*	
Men	9	0	per week
Women	4	0	
Children under 14 . .	2	5	
,, under 12 . .	1	6	

The price of provisions is—

4*d.*	for 7 lbs. of bread;
2½*d.* to 3*d.*	for 1 lb. of beef;
3*s.*	for 100 lbs. of potatoes.

There are several spinning-mills in the Grand Duchy of Baden, all of which are moved by water-power: the largest is in the Black Forest; it is called St. Blaise, and employs 600 work-people, four-fifths of whom are children. The working hours are fourteen a-day, or eighty-four a-week. No child is admitted unless *bonâ fide* twelve years of age. The weekly wages are 8*s.* 4*d.* for adults, and for children, after one year's employment, 4*s.* 3*d.* An able labourer earns in summer 5*s.* 6*d.* to 6*s.*, and in winter 5*s.* The best beef never exceeds 1½*d.* per lb., and is generally lower, which, with the corresponding low price of other articles of food, enables the operatives to live quite comfortably on their wages.

The chief cotton manufacture of Prussia, which is yearly on the increase, is the weaving and dyeing of British yarns, supplied mostly through Elberfeldt. Some of the goods thus made have been sent back to England for shipment to the East Indies. The quantity of English yarn imported into Prussia in 1831 for the above manufacture was 15,600,000 lbs.

Hitherto the attempts to establish the cotton-factory system in Russia have not been very successful. But Russia consumes a very great quantity of British yarns; to the amount, in 1832, of 19,000,000 lbs., and last year of 21,478,499.

There were eleven spinning-mills two years ago in Lombardy, but they are supposed to be used chiefly as masks for the contraband trade in British cotton yarns.

About 12,000 bales of cotton wool are annually consumed in these factories. Though the wages are lower than in Switzerland, a good spinner can earn 8*s*. a-week, while a good labourer in Lombardy can earn hardly 5*s*. A great deal of British yarn is introduced into the Milanese, which is manufactured into stockings and other fabrics. The yarns of the country are woven into heavy tweels and common calicoes. All other descriptions of goods are imported at a high duty, or smuggled from Switzerland, England, and France.

There are only four spinning-mills in the Sardinian dominions, with a considerable number of hand-mules. Goods are pretty extensively woven of cotton and linen mixed. The wages are lower here than in Switzerland.—See *The Table of Exports*, Vol. I. p. 326.

We have seen, in Vol. I. Book I., that cotton wool has been long grown in the Neapolitan territories, and that a handicraft cotton manufacture has been long carried on. There are several cotton-mills in different parts of Calabria. In the new mill of Messrs. Zublin and Vonwiller, at Salerno, there are about 7,200 spindles. The machinery is good, on the newest principle, and includes the tube-roving frame. The wages are,—for spinners, 6*s*. per week; carders, 4*s*. 3*d*.; rovers, 3*s*. 2*d*.; and piecers 2*s*. 6*d*. The cotton worked up in this mill is principally grown in the adjoining fields, and costs about 6*d*. or 7*d*. a-pound. The land on which it grows is let at the very high rent of £2. 10*s*. per acre. The importation of English yarn into the kingdom of Naples may be estimated at about 2,000,000 of lbs. Weavers earn from 2*s*. to 2*s*. 6*d*. a-week. Under a liberal government, Naples,

with its waterfalls and cheap labour, might soon become an important manufacturing country.

The following remarks from a broker's price-current at Antwerp, in 1833, show the general advance of Continental competition :—

"All the accounts we receive from the manufacturing districts continue to represent the cotton factories to be proceeding under a progressive state of improvement. The results of their operations last year having opened the eyes of the proprietors to their previous error in neglecting the home market in favour of the delusive prospects held out to them by the monopoly offered to them in India, they are now applying increased attention to this branch, the beneficial consequences of which are rapidly manifesting themselves in the diminution of the imports of British goods."*

The first cotton-mill of the United States of America dates from the year 1791, when one was erected in Rhode Island. A second was erected in 1795, at the same place, after which no more was done till 1803, when a third was mounted in Massachusetts, followed there by a fourth in 1804. During the three succeeding years ten more mills were erected in Rhode Island, and one in Connecticut, making altogether fifteen mills, containing about 8,000 spindles, and producing about 300,000 lbs. of yarn a-year. By a return made to the government in 1810 it appears that 87 additional mills had been erected by the end of the year 1809, of which 62 were then in operation, 14 of them being horse-mills, and 48 water-mills, con

* Mr. Birley, in *Factory Commission Report*, Part I., Manchester, p. 117.

taining altogether 31,000 spindles. Twenty-five mills besides were expected to be placed in activity in the course of the year 1810, when the total number of spindles would be 80,000.

The capital required to carry on the manufacture in the best manner is considered to be at the rate of 100 dollars for each spindle; but in general not more than 60 dollars had been expended. The yarn spun annually for each spindle is about 36 lbs., corresponding to 45 lbs. of cotton wool, and it sells for about one dollar 12½ cents per lb. Forty persons are employed for 800 spindles, of whom 35 are women and children, and five are men; this is at the rate of one person for every 20 spindles.

A report made to the House of Representatives, in 1816, states "that the quantity of cotton wool manufactured in the year 1815 was 90,000 bales, nearly equivalent to the consumption of France at that period; that the quantity used in 1810 had been only 10,000 bales; in 1805, 1,000; and, in 1800, 500 bales. The following general statement is officially made in the same report:—

Capital engaged in 1816	40,000,000 dollars
Males employed, of 17 years and upwards .	10,000
Women and female children	66,000
Boys under 17 years of age	24,000
Cotton manufacture, 90,000 bales, or . .	27,000,000 lbs.
Cotton cloth of various descriptions manufactured	81,000,000 yards
Cost	24,000,000 dollars

New tariff laws were passed, one after another, in 1824, 1828, and 1832, in each of which the duty upon cotton goods imported was declared to be 25 per cent.

ad valorem, rating the coarser fabrics as in the act of 1816.

Under such exclusive protection the cotton trade marched with an accelerated pace. Power-loom factories were established; while the most improved processes in spinning and weaving were eagerly sought after and adopted. The manufacture has accordingly expanded greatly in the New-England States, as well as in those of New York and Rhode Island, but is little known in the rest of the union.

From the reports of the Secretary to the Treasury, made to the House of Representatives on the 31st September, 1830 and 1831, it appears that the States exported the following quantities of goods :—

	1830. Dollars.	1831. Dollars.
Printed and coloured cottons, value	61,800	96,931
White ditto	964,196	947,932
Nankeens	1,093	2,397
Twist yarn and thread	24,744	17,221
All other cotton manufactures	266,350	61,832
	1,318,183	1,126,313

More than one-third of these exports were sent to Mexico, and the rest to the New States of South America, and in particular to Chili. A report of the Committee of Congress, appointed, in the spring of 1832, to inquire into the progress of the spinning and manufacturing of cotton in the United States, has furnished the following statement for the year 1831 :—

In 12 States there were—

Mills	795
Spindles	1,246,503
Looms	33,506

The weight of cotton worked up was . .	77,557,316 lbs.
Deduct 2 oz. for waste per lb.	9,694,664
Total weight of yarn spun was	67,862,652
Amount of ditto per week	1,305,051
Averaging 16½ oz. per spindle.	
The number of male workers was . . .	18,539
,, female ditto	38,927
Total employed in the cotton manufacture .	57,466

The sum paid for wages in that year was 10,294,444 dollars, or £2,144,780.

The sum paid per week was therefore £42,895, being no less than 14*s.* 11*d.* for each of the work-people enumerated.

The capital employed was 44,914,984 dollars; the number of yards of cloth manufactured was 230,461,990, and the number of pounds of cotton was equal to what was consumed in Great Britain little more than twenty years ago.

It is difficult to reconcile the above statement of the average wages with the evidence of Mr. Kempton, a cotton manufacturer in the United States, who has been acquainted with the manner of conducting manufactories in most of them, and who employs in his own establishment 400 work-people. He says, " A person ten years old would get 3*s.* a-week, a person twelve years old 4*s.* a-week, fourteen years 5*s.*, sixteen 6*s.*, eighteen 8*s.*; those more advanced in years would earn 10*s.* The smaller children in the carding-room (between nine and twelve years) are those who earn 3*s.*; those attending the drawing-frames earn from 5*s.* to 6*s.*; those who attend the roving-frames earn 8*s.* a-week; girls attending the throstle-frames earn from

5*s.* to 8*s.*; machine-makers earn about 5*s. a-day;* mule-spinners earn about 5*s. a-day;* overlookers earn from 5*s.* to 6*s. a-day;* assistant overseers earn from 3*s.* to 4*s. a-day.*

"No. 16 water-twist, made entirely of good cotton, sells in the United States at 10½*d.* per pound; in England, No. 16 yarn, made from a mixture of waste twists and a small quantity of Uplands, sells at 11*d.* per pound."

He gives the following statement of the comparative cost of weaving in the United States and in England:

	United States.	England.
Interest on dressing machine . .	£2 11	£1 12
Interest on 12 power-looms . . .	8 6	4 10
Cost per annum of one horse-power .	3 10	12 10
Cost of dressing 3,756 pieces . .	23 9	46 18
Cost of weaving	125 4	156 10
	£163 0	£222 0

American, 10½*d.* per piece; English, 1*s.* 2¼*d.*

Water-power exists in America in great abundance, at a very low rent, even in the best situations; whereas in Great Britain the power is mostly steam, or, if water, it is at a very high rent." Mr. Kempton expresses his conviction that the effect of a compulsory limitation of the working-hours in Great Britain to ten instead of twelve would enable the manufacturers of the United States to undersell the British, not only in markets abroad, but in their own home markets.*

The following important Table was furnished by Mr. William Greg to the Factory Commissioners in May, 1833:—

* *Factory Commission Report*, Part I., Evidence by Central Board, pp. 23, 24.

Rates of Wages in the Cotton Factories in the different Countries of Europe, and in America.

Authority.	Country.	Quantity of raw Cotton consumed in 1831.	Hours worked per Week.	Wages per Week.						Average Wages.	Age of Admission.
				Carders.	Drawers, Rovers, &c.	Spinners.	Piecers.	Reelers.	Weavers.		
———	England . .	234,000,000	69	3/0—10/0	4/6—8/0	25/0—33/0	6/0—8/0	..	9/0—12/0	7/0—12/0	9
Burns, C. G. .	America . .	77,000,000	..	..	..	..	..	..	..	14/11	..
K. Finlay . .	Ditto	..	78	..	6/8	20/0—28/0	7/0—9/0	..	9/0 –12/0	10/0	..
P. Ewart . . . Burns . . . . Melly, and . . A. Escher . .	France . . .	74,000,000	72—84	..	..	15/0—16/0	..	..	7/0—8/0	5/8	..
Melly	Prussia . . .	7,000,000	72—90	..	..	..	..	..	..	..	..
A. Escher . . Melly, and . . Myself. . . .	Switzerland.	19,000,000	78—84	5/0	2/6—3/0	8/0—10/0	2/6	6/0	..	4/5	10
A. Escher . . Melly, and . . Myself. . . .	Austria . . . Tyrol	.. 12,000,000	.. 72—80	.. 3/6—4/6	.. 2/0—2/6	.. 9/0—10/0	.. 1/10—2/0	.. 3/9	..	4/0 3/9	8 8
P. Ewart . . .	Saxony . . .	5,000,000	72	4/6—5/3	2/0—3/0	6/0—7/6	1/0—1/3	3/0—3/6	..	3/6	7
Melly	St. Blaise . . Baden . . .	..	84	Wages are 8/6 for grown persons, and 4/3 for children . .						5/1	..
Melly	Bonn . . . . Prussia . .	..	94	Men, 5/6; women, 3/0; and children, 1/6						2/6	..

A very large proportion of the cotton wool absorbed by the manufacture of America is made into domestic or other heavy fabrics, in which her advantages with respect to raw material tell with the greatest effect. Domestics comprehend a most important and extensive class of cloths used by the great mass of society for shirts, sheets, linings, and many other domestic purposes. Supposing one-half of the power-looms in Great Britain to be employed in lighter fabrics, the remaining half, or about 60,000 must be engaged in the same heavy fabrics as the American looms, which, from the above estimate, must be considerably upwards of 45,000; but, in fact, the power-looms of the United States employed upon heavy cloths cannot be much fewer than those occupied with similar goods in Great Britain. It is upon this most important class of fabrics that the tax on cotton wool, the expense of freight, and other burdens peculiar to this country, from which America is exempt, press most severely.

1. The manufacturers of the United States have the raw material of these heavy domestics much cheaper than those of Great Britain. Without insisting upon the advantages possessed by America as the grower of her own cotton for securing the tenure of her cotton trade, and the dependence of this country for her supply on foreign countries, which political contingencies may compromise or destroy, we shall merely advert here to the savings of the American manufacturer in freight and insurance. From New Orleans and Mobile to England the freight of cotton-wool is $\frac{3}{4}d.$ per pound, with 5 per cent. primage, and from the Atlantic States from $\frac{4}{8}$ to $\frac{5}{8}$ of $1d.$; from New Orleans to Boston the whole charges are no more than $\frac{5}{8}$ of a cent; hence the

savings to the manufacturer in New England in freight and insurance are no less than $\frac{1}{2}d.$ per pound, which upon cotton worth $7d.$ is equal to 7 per cent. upon its prime cost.

2. The American manufacturer saves likewise the average profits paid by the British to the class of middlemen between the sellers of cotton wool in the States and the spinners in Britain, commonly called the "cotton importers." It is through this order of merchants, who form the principal holders of the stocks of cotton wool in the Liverpool and Glasgow markets, that the spinners of the United Kingdom are supplied. A commission of 3 per cent. upon the invoice amount of the purchase is in this way paid. Besides the charge thus entering into the importer's own cost upon the cotton he is entitled to obtain a certain profit. Supposing him to carry on his business at the moderate profit of 5 per cent., this, along with the charges upon his commercial establishments abroad and at home, must be paid by the British spinner, forming permanently an extra ingredient of the cost of his material from which the American spinner is free.

3. The duty of five-sixteenths of a penny per pound, upon all cotton wool imported into the United Kingdom from foreign states, operates as a premium to the manufacturers of all other countries not similarly taxed; the difference equivalent to about $4\frac{1}{2}$ per cent. upon cotton wool at $7d.$ per pound operates against the British spinner in his competition not only with the American, but with the spinners of all other countries who receive either cotton wool duty free, or get a drawback on exportation equivalent to the duty paid; even when our spinners purchase their cotton wool through

an agent in the States, and thereby save the importer's profit, the amount of charges in freight, duty, insurance, &c., varies from 11½ to 14 per cent. more than is paid by the American manufacturer. If we add to this charge 5 per cent. for the importer's profit, paid in common cases, the sum may be estimated at fully 16 per cent.

In fine and ornamental fabrics, which contain little weight of cotton wool, and whose value is made up chiefly of the wages of labour, an extra cost of material, even to the above extent, would be comparatively of little consequence, but it is a most serious impost on the domestic cloths, in which American competition principally lies. Mr. William Graham, jun., of Glasgow, stated in his evidence to the Committee of the House of Commons on Manufactures, "that taking a piece of our staple articles in domestics, that cost us twenty shillings, I reckon that we use about twenty pounds of raw cotton; therefore that would be about twenty-two pence upon what would cost us twenty shillings."

4. The flour used in the processes of weaving and bleaching forms an item in the cost of cotton goods of much more consequence than even at first sight might be supposed; the quantity of flour used upon each piece of cloth is proportioned to the weight of cotton which it contains, so that the extra British cost arising from this source is greatest in those heavy fabrics in which foreign competition is most formidable, and in which the tax on cotton wool, and other causes of its enhancement, are most severely felt. Mr. Graham says that he has paid in duty on flour from £600 to £700 annually, on an average of several years.

5. The abundance of water-power, and its cheapness as compared to that of steam, are advantages of some consequence, especially in heavy fabrics. It is also one of which the most formidable rivals of the British manufacturers in these goods have availed themselves. The coarse yarns of Switzerland and Germany, which have superseded the yarns formerly sent to them from Great Britain, as also the heavy fabrics of the United States, which oppose those of Great Britain in many third markets, are all manufactured by water-power. See Mr. Kempton's statement above.

6. While combinations among the operatives of the cotton manufactures of America and the continent of Europe are unknown or ineffective, they have long existed among those of this country in a form completely organized and powerful, with the effect not only of raising the prices of labour, but also of imposing a variety of restrictions upon our manufacturers in the management of their factories, much to their inconvenience, and proportionally to the benefit of their foreign rivals.

7. The money prices of provisions have been much higher in Great Britain than in the manufacturing countries of the continent of Europe and America. Without referring here to the influence of this circumstance upon the price of labour, and supposing, *for the present,* the wages paid by the British manufacturer and his foreign rivals to be the same, still this state of things would not prove that the foreign manufacturers could derive no future advantage from the low-priced provisions of their workmen. In the event of that more serious struggle, which in the natural

progress of competition is likely to take place, the cheapness of the means of subsistence, by conferring a higher condition upon the foreign workmen, leaves more room for a reduction of wages. Mr. Kirkman Finlay, a great authority in these matters, says, "I think the difference would be this, that, if the amount of wages paid in Great Britain were absolutely necessary for the comfortable subsistence of the workmen, it would be quite clear that, whatever pressure there might be, those wages could not be permanently reduced; *but, if the money wages paid in America are sufficient to get a great deal more than the absolute necessaries and comforts of life, then, if there is a pressure upon its manufacturers, they can so reduce the wages as to meet that difficulty, and by that means undersell the manufacturers here.*"*

8. The heavy taxation, local as well as general, borne by all producers of commodities in Great Britain, must operate in favour of their rivals. High-priced provisions and labour are not the only media through which taxation increases the burdens of the British manufacturer. This cause operates still more directly by imposts upon almost every department of his business,—taxes on his postages, on his clerks, on his bills, promissory notes, and policies of insurance, on his advertisements, on the money which he borrows and pays, and on the transference of the landed property which he buys or sells. The duties on fire and sea insurances levied yearly on the cotton manufacturers of Great Britain have been estimated as follow:—

* *Report on Commerce, Manufactures, and Shipping.*

	£.
1. Annual duty of 3*s.* per £100, paid for fire insurances on £20,000,000 sterling, invested in mills, warehouses, &c.	30,000
2. Duty for sea-insurances of 2*s.* 6*d.* under, and 5*s.* above 30*s.* premium per £100 (being an average of 3*s.* 9*d.*) of duty on £20,000,000 (the exports of cotton in 1835)	37,500
Total insurance taxes	£67,500

9. Since combinations among workmen, high priced provisions, and heavy taxation, keep up the price of labour, and the absence of these three evils have just the opposite effect, the cost of spinning and weaving must be perpetually enhanced in Great Britain, compared to its amount in foreign countries. The Table of Mr. Greg, page xxxiii, shows the advantage of the Swiss over the British spinner in 40's yarns, to be in the preparation processes upwards of 7 per cent., in the spinning process upwards of 50 per cent., in reeling and bundling upwards of 47 per cent., and in contingent expenses nearly 3 per cent., upon the cost of these different items as compared in the two countries;—whilst Manchester has only 24½ per cent. of advantage in interest of capital &c. upon a similar comparison; the difference in the cost of the yarn being 16½ per cent. in favour of Switzerland.

The heavy cloths, in which the competition of America has been principally felt, are woven with coarse yarns from Nos. 10 to 20. It appears from the schedule of the prices of spinning in the factories of the United States, compared with the prices paid for the same work in Glasgow annexed to Mr. Kirkman Finlay's letter to Lord Ashley in 1833, that the prices of spinning these numbers of yarn were, for a given

quantity, 4*s.* in the United States, and 4*s.* 11*d.* in Glasgow, being 22 per cent. in favour of America. The prices of carding the same numbers were in the United States 6*s.* 7½*d.* per week, and in Glasgow 7*s.* 1¼*d.* per week, being 7 per cent. in favour of America.

In the operation of dressing the warp of heavy goods, the American has an advantage of 50 per cent. in price, and in weaving of 25 per cent.; being, upon the two taken together, an advantage of 36 per cent. The total charges of dressing and weaving, are—

In England, per piece . . . . 1*s.* 2¼*d.*
In America „ . . . . . 10½*d.*

Or, 36 per cent. of the charges per piece in favour of the United States.

10. While the wages paid by the foreign manufacturer are *less*, the labour performed in return for them is longer continued. By the Factory Regulation Act, the British manufacturer is subjected to a variety of restrictions with respect to the number of hours during which he is entitled to work his factory, and the description of persons whom he may lawfully employ, while in all these points the manufacturers of America and of the continent of Europe are perfectly unrestrained. Of this freedom they do not fail to avail themselves. The per centage of additional time thus gained by the manufacturers of these countries, in comparison with those of England, is, on the average, in America and France, 13 per cent.; in the Tyrol, 10 per cent.; in Prussia and Switzerland, 17 per cent.: the mean of the whole being no less than 14 per cent. gained on time. A piece of domestics containing 15lbs. of yarn, and costing 22*s.*, when spun and woven

in a factory working 12 hours per day; would cost only £1. 1*s.* 7¾*d.* in a factory working 13 hours; being a saving of 4¼*d.* per piece, constituting 7½ per cent. on the fixed charges of spinning, and 6 per cent. on the charges of weaving.

The superior skill and dexterity of British operatives have been assumed as constituting one of our chief advantages. Their experience must no doubt be more extended, in proportion as the range and variety of British fabrics are greater than those of any other country; but, in such goods as the foreigners carry into neutral markets, the superiority of the British operatives is a point by no means decided. Manufacturers of the United States, and of some parts of the Continent, claim for those employed by them at least an equality within the sphere of their own production, and to which their competition with the fabrics of Great Britain is necessarily limited. The late remarkable ingenuity of the American artisans, in their mechanical improvements, gives no countenance to the notion of their inferiority.

The impolicy of the import tax on cotton wool is so glaring as hardly to require illustration. A tax on the raw materials of such manufactures as are principally consumed within the United Kingdom, would be comparatively harmless; but since two-thirds at least of British cotton goods are exported, a tax upon their raw material operates as a bounty upon the cotton manufactures of other nations. Where duties have been imposed on importation, as in the case of sugars, wines, spirits, &c., a corresponding drawback on their exportation has been always allowed: yet cotton, as if undeserving of fiscal justice, has been ever since the

year 1798 persecuted with a series of imposts, in twelve successive rates, all tending to turn the balance in favour of our foreign rivals in that trade. No government except our own, possessing any pretensions to the title of enlightened, lays a tax upon the import of cotton wool, which is not countervailed by an equivalent drawback on exportation. The peculiar pressure of the competition in America is upon those coarse yarns, and heavy cloths, for the production of which it possesses the advantages of an indigenous raw material, unencumbered with taxation, and procured at the minimum cost of carriage. The spinning also of the continent of Europe has been hitherto directed principally to the coarse numbers of yarn which are worked up into heavy fabrics, and with the effect of depriving this country of almost all the European customers whom she not long ago supplied.

The very existence of this country depends on retaining an ascendancy in the cotton manufacture, as the principal means of enabling her to sustain the enormous burden of taxation accumulated by the war-funding system. Were Great Britain as free from taxes as the states of America or the continent of Europe, she might surrender to them a share of her cotton trade without suffering any national misfortune, but she has nothing to spare, without involving her people in distress, and her public credit in jeopardy

	lbs.
In 1833, the total consumption in Great Britain of foreign and colonial cotton wool was	293,682,976
Off, 11 per cent. for colonial	32,305,126
	261,377,850

	£.	s.	d.
Duty on above, at $\frac{5}{16}$ of a penny .	340,335	15	0
Duty on colonial, at 4*d.* per cwt.	4,807	6	0
Duty on total consumption . .	345,143	1	0

The average loss by waste upon cotton wool in spinning being about 12½ per cent., the manufacturer drawing back duty would be a loser to that extent, unless a correspondent allowance were made upon the exported weight.

The following facts place in a strong point of view the encroachments of the American cotton manufacture upon the British in foreign neutral markets.*

The Chinese Commercial Guide, which is a collection of details respecting foreign trade in China, published by John Robert Morrison, at Canton, states that, during the year 1834, the importation from America of cotton long cloths amounted to 134,100 pieces, and of cotton domestics to 32,743; while of cotton goods the whole importation in British vessels consisted of 75,922 pieces. It further appears, from Bell's Comparative View of the Commerce of Bengal during 1833-4 and 1834-5, that during the latter year the imports of American piece goods were nearly the double of the imports of the preceding year—*viz.*, 24,745 pieces for 1834-5, from 12,800 in 1833-4.

Mr. William Gemmell, of Glasgow, who was for several years in the habit of supplying Chili with cotton domestics, has latterly been obliged to abandon the trade, after an unsuccessful competition with the

* See an able pamphlet on *The Impolicy of the Tax on Cotton Wool*, by Alexander Graham, Esq., published by the Associated Cotton Spinners at Glasgow, in 1836.

manufacturers of the United States, although he combines in his own works the operations both of spinning and weaving, so as to ship his goods at the lowest possible cost in this country, and although he has the advantage of selling them by his partners abroad.*

Mr. George Wilson, of Rio de Janeiro, writes, "We fear that we shall be under the necessity of re-shipping to Rio all the domestics that we brought down with us, as the market of Port Allegré is completely overdrawn by the Americans in this article.†

Of the Manilla market, Mr. W. P. Paton reports 35,240 pieces of 36 inches wide, and 7,000 pieces of 28 inches wide grey of American manufacture; while of British manufacture, for the same period, there were only 1,832 pieces.

Mr. Gibson, Aux Cayes, writes in 1834, "that in unbleached domestics, a class of goods of great importance, the Americans were cutting out the British."

Mr. John Heugh, of Malta, states, "that the Americans had in a great measure driven the British article (cotton domestics) from the market."

Mr. Atkinson, of Smyrna, writes, "Domestics are a very current article of consumption, but almost 20,000 pieces have lately arrived principally from America."

A mercantile house at the Cape of Good Hope, about twelve months ago, sent patterns of American domestics, as sold at certain quoted prices, to their correspondent at Glasgow, requesting that supplies might be forwarded from this country, provided they

* See his affidavit in Graham's *Impolicy of the Tax on Cotton Wool.*
† Ibid.

could be afforded at the same rates as the American goods. As it was found on inquiry that British domestics could not be shipped at these prices without a loss, the firm could not procure the supplies of goods thus requested.*

In a statistical table, which was published in a late "Lowell Mercury," that manufacturing town is said to contain nine incorporated companies, possessing a capital of 6,530,000, under whose management there are 22 mills. These mills are mounted with 100,380 spindles and 3,554 looms. They employ 4,775 females and 1,415 males, and manufacture 702,000 yards of cloth per week; consume 229,700 lbs. of cotton wool per week, and 400,000 lbs. of sheep's wool per annum; they burn annually 7,250 tons of anthracite coal and 4,100 cords of wood; use 37,950 gallons of oil, 10,500 of which are olive oil. These companies manufacture 36,500,000 yards of cotton cloth per annum, in doing which they use 11,424,400 lbs. of cotton wool or 32,604 bales, each pound of cotton making $3\frac{2}{10}$ yards of cloth. The average wages of females in all the mills, clear of board, is 2 dollars per week, and that of males, boarding themselves, is 1.25 dollar per day.

This manufacturing town, now so great, was only 10 years ago a complete wilderness—not a tree was then cut down for the purpose of building the place.

The Prussian commercial league at present includes nearly the whole of Germany. The states that have actually joined in it are Saxony, Bavaria, Wurtemburg, Baden, Hesse Cassel, Hesse Darmstadt, Nas-

* See affidavits of the above statements in Graham's *Impolicy, &c.*

sau, Frankfort on the Maine, and two or three other minor states. Holland and Belgium, Mecklenburgh, Brunswick, and Switzerland, will also be obliged eventually, for their own protection, to give in their adhesion. In short, Austria being excluded on the one side, and France on the other, it seems likely that the league will comprise, in a few years, the whole of the countries now mentioned, together with the Hanse towns. The real object of the league is the encouragement of the manufactures of Saxony and Germany, with a view to the exclusion of England altogether. If the union be not disturbed by political convulsions, the United Kingdom may be effectually shut out at no remote period, unless by repealing our corn laws, and the duties on cotton wool, we shall be enabled to cheapen labour, and undersell the manufacturers of Germany. The mean price of wheat of the first qualities at Hamburg, Amsterdam, Antwerp, and Stettin was on the 18th January, 1836, £1. 8*s*. 1*d*. per quarter, while it was in London, £2. 4*s*. 6*d*. per quarter; being 58½ per cent. higher here than in the four above-mentioned places. The mean price of wheat at New York and Philadelphia for several years back may be taken at an average of £1. 18*s*. 6*d*. per quarter, being about 38 per cent. below the British average of the ten years prior to 31st December, 1832. The extra cost of flour in Britain during these years, compared to that in the United States, will of course be in the same proportion.

In the weaving of heavy fabrics of average breadth, made of yarns from No. 16's to No. 24's, each power-loom requires about 250 lbs. of flour per annum, while in the lighter yarns from Nos. 40's to 50's,

each power-loom requires 156 lbs. Now, supposing the one-half (say 50,000) power-looms to be employed in heavy, and the other half in light fabrics, and the hand-looms estimated at only 250,000, to consume on an average eighty-three pounds each, the whole flour used annually by the British cotton looms will be 146,607 bags of 280 lbs., which at £1. 15*s.* per bag (the lowest average price of the monthly rates of the year 1834,) will amount to the sum of £256,652. If to this we add one-third more, on account of the flour used in making up the bleached goods, and take the cost of the whole above that of flour on the continent, corresponding to the comparative average prices of wheat there, during ten years prior to 1832, at 50 per cent., we shall find the British manufacturer's whole extra cost annually, in flour used in his business, above the cost of the same quantity on the continent, to be £171,041. Thus,

50,000 power looms, on heavy fabrics .	at 250 lbs.	12,500,000
50,000 ditto on light ditto . .	at 156 lbs.	7,800,000
250,000 hand looms, on heavy and light do.,	at 83 lbs.	20,750,000
		41,050,000

41,050,000 lbs. at 35*s.* per 280 lbs. . .	£256,562
Add one-third for bleached goods . .	85,521
	£342,803

Fifty per cent. extra cost on that sum is, £171,041.

Observations made by the Author in a Tour through the Cotton Factories of France and Belgium, in the Autumn of 1835.

During the years 1825, 1826, and 1827, the number of cotton factories increased with such rapidity in

France, under its pampering system of home monopoly and export bounties, as to raise their supply of goods far beyond the demand, at least, relatively to the prices of production. The consequences were a rapid and unparalleled fall in their value. Credit was withdrawn by the capitalists from the manufacturers at the moment of their utmost need; many mills were shut up; and the cotton trade suffered losses which it has but lately been able to repair.

Towards the end of 1829, indeed, the equilibrium being well nigh restored between supply and consumption, manufacturers began to resume their former activity; but this gleam of prosperity was soon clouded by warlike alarms, political disorders, and the cholera, all of which, unfortunately, came in the train of the revolution of 1830. It was not till the spring of 1833 that confidence and comfort became the lot of the French cotton trade.

These crises have not, however, been unfruitful of good. They have compelled cotton-mill proprietors to improve their establishments, to spin better yarn, and at a cheaper rate; introducing everywhere most remarkable ameliorations into the whole system of the cotton industry, becoming the spirit and intelligence of a mighty people.

The yarns which have been during the last two years exported into Switzerland, from Alsace, in considerable quantities, have stood their ground against English yarns in all the ordinary degrees of fineness. At Tarare also the fine yarns from the Mulhausen market fetch the same prices as the English. In this case, however, the French spinner has the duty on our yarns as an additional profit over the English spinner. The

principal part of these improvements is due to the perfection of the modern machinery constructed in the workshops of Alsace, in consequence of which the spinning-frames go far more rapidly, and turn off far more work, than they formerly did. I have seen a machine in Alsace which cards, draws, and roves cotton waste, for low numbers of yarn, with an economy of labour and time truly marvellous, and unequalled, I believe, in any part of Great Britain.

This was in the factory of MM. Schlumberger and Bourcart, at Guebwiller, one of the most magnificent valleys of the Vosges, where water and steam work with gigantic rivalry.

The bobbin-and-fly frames of 200 spindles each, constructed and mounted in M. Schlumberger's factory, are, I believe, the most productive machines of the kind in existence. The spinning motion is communicated by leather straps, running upon the edges of horizontal discs fixed to the spindles, in a very ingenious manner, so as to give a smooth motion without the possibility of slipping.

The castings of iron and brass, as well as the machines made from them, seem to be as perfect at Guebwiller as in the best workshops in Manchester. The fluted drawing-rollers are peculiarly beautiful, and, as well as the spindles, fetch a higher price all over France than those imported from England.

M. Schlumberger's mules have 396 spindles, and spin everything from No. 20 up to No. 230 English. On counting the time of a stretch of both 130's and 150's E., I found them to be exactly 52 seconds each, the length being 56 inches E. Hardly any of the threads broke, affording the best proof of the good-

ness of the preparation, the excellence of the mule, and the skill of the spinner. One spinner with three piecers works a pair of mules.

This establishment contains 54,000 mule-spindles, which are employed as follows :—

27,000	for spinning from	47's to	82's E.
24,000	,,	118 to	200 E.
3,000	,,	35 to	47 E.
600	for waste from	5 to	6

In one of his mills there are 94 double cards, in another 190 single ones; 1,200 operatives are employed in them both.

Messrs. Dollfus, Mieg, and Co., at Doernock, near Mulhausen, have 500 operatives employed in their factory, in which they spin 30's F. warp=35·4's E., and 40's F., weft=47·2's E.

There are 150 cards, of which the one-half are finishers, and the other breakers; 44 of them have drums 36 inches F. in diameter; and 106 have drums 18 inches.

There are four successive drawing-frames.

The bobbin-and-fly frames have 120 spindles each. They are constructed by MM. André Kœchlin, and Co. The spindles revolve by means of a snail working in bevel wheels, with oblique teeth. Rovings vary from Nos. 10 to 20's F. (=11·8's to 23·6's E.). From 15 to 16 kilos. (31 to 35 pounds E.) are turned off in 12 hours' work, of No. 10 F.

Most of the mules have 240 spindles; a few have 360 spindles. Each pair is worked by a man and two girls. The stretch of 56 inches F. (60's E.) for No. 90's F. (106·2's E.) is performed very uniformly (by the second's watch) in 54″. A stretch of 36's E. is spun in

25″ by one spinner, and one piecer for the pair of mules.

There are 107 mules in the factory.

50 cards are arranged in one superb gallery, about 14 feet in height. The card-ends do not fall into tin-cans, as in England, but each of them is conducted down to a covered conduit on the floor, mounted with a friction-roller opposite to the centre of each card. The tender fleece descends vertically from the delivery-roller, makes a rectangular turn as it enters the square opening in the lid of the conduit, glides along the friction-pulleys in company with the 49 other ribands, all in contact, which are sustained by a horizontal travelling apron. They advance without pressure or extension, and finally turn up at the end of the gallery to be wound upon a large bobbin. Whenever one bobbin is filled, the attendant turns round the swing frame in which it plays, and thereby puts its companion empty bobbin immediately in its place. The economy of labour by this arrangement is not the sole advantage. The card-ends are much more uniform in texture than those subjected to handling and breaking in the tin-cans (*pots* F.) Nothing can be more striking than to see 50 powerful carding engines, thus pouring forth their fleecy fillets in a spontaneous, never-ceasing stream, with only one attendant to swing round their receiving reels alternately. The mechanism is called *Couloir à cardes*, that is, *card-end ducts*, consisting of an endless travelling band, running along a range of horizontal guide-pulleys.

Before giving any further details illustrative of the very advanced state of other cotton manufactories in France, I shall lay before my readers an abstract of

Dr. Bowring's evidence before the Silk Committee of 1832, on this subject, which, in flattering the pride of the English people, has served to blind them as to the risk of foreign rivalship. Dr. Bowring had derived his information avowedly at second hand, and apparently from some of the visionary non-practical cotton spinners in the neighbourhood of Paris, who plunged into a complex mechanical art while utterly unversed in its mysteries. The Doctor's abstract principles are sound, but their application seems to me erroneous, from his estimating too meanly the intellectual and physical resources of the French nation.

"While, according to the best calculation, 7,000,000 of spindles are employed in England to manufacture more than 240,000,000 lbs. of cotton, in France, according to the return of the commission which reported on the cotton trade, 3,200,000 spindles are employed to manufacture 66,000,000 lbs.; so that where the protected French manufacturer produces only 66,000,000 lbs., the unprotected English manufacturer would, with the same number of spindles, produce nearly 110,000,000 lbs.; or if the English manufacturer produced at the same rate as the French, instead of 240,000,000 lbs. he would produce only 144,000,000 lbs. In England it is estimated, according to the Parliamentary Returns, that 700,000 persons are engaged in the different branches of the cotton manufacture, and they produce nearly four times the quantity which is rendered in France by 550,000 persons, according to the returns of the French commission: that protection has thus led to the waste of more than two-thirds of the whole amount of labour employed on the protected articles. The French cotton manufacturers have had

the benefit of this prohibitory system ever since the peace, and, according to the statement made by their commission, it costs the country 47,000,000 fr. per annum beyond the sum at which the same articles might be imported from England; this is the result of eighteen years' protection, yet the testimony of the French manufacturers is that the very existence of their business is rendered doubtful from year to year." —*Report of Silk Committee*, p. 586, 22d June, 1832.

"I think that in almost all the articles of taste and fashion the French possess a superiority of between 30 and 40 per cent.; I think the English have a greater superiority than this in those manufactures, such as cotton, where mechanical aptitude is brought to bear." —P. 593. "I have had evidence enough to satisfy me, in the peculiar position in which I was placed, that at the present moment the importation of cotton-twist (by smuggling) is from 15,000,000 fr. to 20,000,000 fr. I can also speak, from my own personal knowledge, of the large clandestine importation of cotton-twist from Switzerland into France."—P. 593.

"At this moment, of the capital invested in the production of cotton-twist, I think I may state the great proportion is absolutely lost, *and the loss of the rest is inevitable.* I have had occasion to examine the operation of the system upon a very wide scale, and I state, as a general result, on the details of which I should be able to give evidence to satisfy honourable members, that this protective experiment has cost the French nation since the peace £200,000,000 sterling; and their prohibitory experiment has wholly failed in accomplishing any one object for which it was intended. Wherever there are unfavourable circum-

stances, such as are now connected with the cotton-twist trade in France, they can be no more subdued by protection than a geranium can be made to flourish in Ireland. I am satisfied that no industry can or will succeed that is not of natural growth; that all attempts to force industry have been fatal and ruinous to the nations that have made the attempt.

" If I had expected that the general state of manufactures in France would have been gone into, I would have brought some information which would show that the situation of the cotton manufacture is discouraging in the extreme; the expressions of distress which have emanated thence are stronger than have ever been heard even in this country. I have now found among my papers an address to the King, presented in the present year from Mulhausen, the seat of one of the largest manufactures in France, the first sentence of which is, ' Our looms are wholly abandoned, and our labourers without food.' The whole number of looms in the district du Nord was stated by Chaptal at 10,000: now, as evidence of the prosperity of that district, I will mention that in March last the cotton manufactory of Rouval-les-Doullens, established only four years ago by a well-known individual (who came to England and visited our most improved establishments), at a cost of 1,400,000 fr., was sold for 308,000 fr.; there was a sacrifice therefore of between 70 and 80 per cent. of the whole invested capital.*

* Similar sacrifices were made two or three years ago in England upon some considerable iron works, now in the most prosperous state.

Q. " If this trade was so distressed in March last, how do you account for an article in the *Journal du Commerce*, which says—' that our manufactures and those of Torcoing are in a satisfactory state, because the manufacturers of Roubaix, who employ them, sell their woven goods easily; within the last eight months the manufacturers of woollen yarn cannot supply the demands which are addressed to them; their profits are enormous, also the number of looms has been trebled in two months; all labourers who wish to labour, can find labour at 125 to 150 cents per day.' "—*A.* " It is impossible for me to account for the introduction of a particular article into a foreign newspaper." —P. 631. " I am intimately acquainted at this moment with the proprietor of one of the largest factories in France for the production of cotton-twist, and he assures me that he considers seven-eighths of capital invested as irretrievably lost."

Q. " With what countries were we in competition when it (our cotton trade) was rising?"—*A.* " We were in competition with France."

Q. " Do you mean during the war?"—*A.* " Yes; there was great production of cottons there."

Q. " Do they find their way into this country now?" —*A.* " Yes, wherever there is a peculiar beauty; and, notwithstanding the disadvantages under which the French labour, they bring some cotton articles of fashion into this market. Kœchlin, of Mulhausen, a large manufacturer of cottons, has, I know, been a considerable exporter for this market."

Q. " Is it not the fact, that as soon as any inventions took place in the cotton manufacture in this country, they were carried to France, and manufactories esta-

blished upon the same principle?"—*A.* "Yes, but not immediately.* In France a great change has taken place in opinion; this prohibitory system has been tried in all its bearings; its consequences are beginning to be felt; the people are gradually setting right their miscalculations, and the Government is beginning to feel its way."

In opposition to this last statement everything which I saw and heard during my recent tour in France, warrants me to say, that the people and the Government are more than ever enamoured of their prohibitive system.

How adverse the prevailing spirit in France is to freedom of trade, appears in a very striking light from the *Avant-propos* prefixed to the translation of my "Philosophy of Manufactures," lately published in Paris under the patronage of the *Ministre de l'Intérieur.*

"If we compare the exportations of France and England in the products of the four textile manufactures of cotton, wool, flax, and silk, we shall obtain an exact indication of the superiority of our neighbours, and the result cannot fail to attract the meditations of our manufacturers towards the work of Dr. Ure, in which they will see the causes of these advantages; and the means of procuring them. We have not ventured to modify the opinions of the author, notwithstanding the difference which we have remarked between his theories in political economy, and the ideas received in France. Even the painful sentiments which

* There are foreign agents in Manchester who send over to the Continent, drawings and descriptions of every new machine of any importance.

we have experienced as Frenchmen, in reading certain passages of the 'Philosophy of Manufactures,' has not prevented us from maintaining a strict neutrality. In fact, as the work was written with the best intentions, it should be published in France just as it appeared in England, in order that the whole of it may be properly judged, and that the system may be fairly unfolded before the eyes of the reader."

Among the beautiful valleys of the Vosges mountains, which bound the plain of Alsace to the west, that of St. Amarin is not the least remarkable. At its mouth is the ancient but small city of Thann, famous for its cathedral spire, of the same style and age as that of Strasbourg, as well as for its scenes of useful industry. Higher in the expanded bosom of the valley is the vast establishment of Wesserling, the most picturesque, peaceful, and well ordered manufactory which I have ever seen. It bursts upon the traveller's sight like a vision of fairy land. The pine-topped and craggy mountains that tower on either side, the sunny slopes covered with clustering vines, the river here tumbling in a cascade and there spreading into a little lake, give life and brightness to the sloping lawns of the middle space, while the huge ruins of ancient castles, hung upon the cliffs, in contrast with the elegant mansions of the proprietors, embosomed in a grove of venerable oaks below, unite to make Wesserling an object of universal admiration. Wherever we turn our eyes, the greatest activity reigns; the meadows, the corn-fields, even the factories present the most agreeable variety of pictures.

Messrs. Gros, Devillier, Roman, and Co., the rich proprietors, of whom the first and the last-named

reside with their families always on the spot, devote much of their attention to the amelioration of their work-people, to the exercise of a noble hospitality towards visiters, and to the cultivation, ornamental as well as productive, of the country. The works of Wesserling consist of cotton-mills, power and hand-weaving of calicoes and muslins, bleaching grounds, and print works.

The calico printing was commenced so far back as the year 1760.

The spinning mills, the loom-shops, the bleach-field, and cylinder press-rooms, date from the year 1802.

The establishment is placed at a distance of two leagues from all towns, and in the central point of nine villages, containing a population of from 12,000 to 14,000 souls. There is no other manufacture within a league of it.

Feelings of philanthropy presided at the origin of Wesserling. The first founders had for one of their objects to give comfortable employment to the natives of the valley; and they have been rewarded by an invincible attachment on the part of their work-people. Most of them are proprietors of a house and a little land, which their families cultivate, and the whole of them have rights to the use of the pasture-common. Their chief agriculture is that of the potato and of meadow-grounds, and they all possess cattle. They are Roman Catholics, while their masters are Protestants of the Genevese church; but both live in the mutual charities of religion.

The language of the country is still German, as of old, and the temperament of the people is a little phlegmatic, but docile; their intelligence may be

developed with a little pains, especially that of the female sex.

The proprietors founded, 16 years ago, a savings' bank for the operatives, which pays interest at 5 per cent.; and they study to persuade the youths, at their outset in life, to become depositors. Its success increases from day to day. The work-people have besides benefit societies, managed by themselves; but as the state of wages and employment seldom varies, they do not suffer from the vicissitudes of trade.

A skilful medical man is attached to the establishment, who furnishes, gratuitously, the requisite medicines and attendance to the workers and their families.

Each of the villages round about has one or two well-conducted schools; and at Wesserling itself there is an upper school, erected by the public authorities, as the model seminary of the canton. It is calculated to form the judgment and morals of its pupils.

The partners of this great firm, ten, I believe, in number, have a paternal regard to their dependents, and enjoy, as I have said, their filial affection in return; so that the workmen of Wesserling are moral and faithful to a degree rarely equalled in any body of either manufacturing or agricultural labourers.

"It is to be desired," says the benevolent M. Roman, "that a law should be passed in France, like that of England, to regulate the daily hours of labour, as well as the ages of children employed in factories, and to provide for their education." In the absence of such legislation, the heads of this establishment have instituted rules which determine a regular course of promotion in the factory, for the encouragement of zeal, dexterity, and good behaviour.

Statistics of the Spinning Mill.

Its moving power is an overshot water-wheel made on the ventilating plan, by Mr. Fairbairn of Manchester, possessing a force of 60 horses. In summer, when the supply of water becomes scanty, it is aided by two steam engines, together of 52 horses' power, constructed upon Woulfe's principle, by Aitken and Steel, with three cylinders, and working at a pressure of $3\frac{1}{2}$ atmospheres. They consume only $6\frac{2}{3}$ lbs. avoirdupois of coal for each horse power per hour, which is about one half of what is generally consumed by the Lancashire and Lanarkshire steam engines. The mill contains 24,000 mule-spindles, and has recently been placed in connexion, when necessary, with a second water-wheel, built upon the spot by an able Welsh engineer settled lower in the valley. The quantity of yarn spun annually is 528,000 lbs. avoirdupois, or about 17,600 bags, into Nos. from 30's to 45's metriques (35·4's to 53·1's English). All the yarn is manufactured into calicoes and muslins by the company.

The mules are mounted with from 180 to 240 spindles each, and are worked by young women from 16 years and upwards. No girls are admitted under 13 years of age. The number of spinsters was about 260 at the period of my visit, but they were to be increased ere now to 320, when the new mill would be finished. Each mule is worked by a young woman and a girl piecer. Every spindle produces upon an average $29\frac{1}{2}$ lbs. avoirdupois of yarn in 300 days of the above counts. Louisiana cotton-wool is used for warp, and Upland Georgia for weft. The hours of labour are $14\frac{1}{2}$ per day; and the wages are

1 fr. 50 c., about 1*s.* 2½*d.*, to the spinner (who is however paid by weight), and 90 centimes, about 8½*d.* to the piecer. The workmen in the preparation rooms earn 1*s.* 2½*d.* a-day; grown-up girls from 9*d.* to 10*d.*; younger girls from 5*d.* to 6*d.* Mechanics, carpenters, &c., earn from 1*s.* 3*d.* to 2*s.* 10*d.* a-day, according to their power and skill.

The Weaving Department.

At Wesserling itself there are 150 power-looms, which weave very beautiful goods, not only plain and tweeled calicoes, but also striped muslins for the elegant prints, which render this establishment celebrated all over the world. There are besides 1,650 hand-looms, distributed through 70 work-shops, belonging to the firm, and dispersed among the nine villages above noticed. One hundred looms are scattered in private houses among the mountains; they weave altogether about 70,000 pieces, 33 aunes (42½ yards) long, 34½ inches E. wide; but some are broader and others narrower. The finest yarns worked up into the best muslins are procured from the manufactories of Guebwiller and Munster.

The looms and dressing machines altogether occupy about 2,000 persons, who are mostly young men and women 16 years of age and upwards. The daily wages are as follows:—

Winders, 60 to 110 centimes,	from 5½*d.* to 10½*d.*
Warpers, 1fr. to 1fr. 50c.	,, 9½*d.* to 1*s.* 2½*d.*
Dressers, 2fr. to 2·75c.	,, 1*s.* 7*d.* to 2*s.* 2½*d.*
Hand-loom weavers, 80c. to 120c.	,, 7½*d.* to 11½*d.*
Power-loom weavers, 1fr. to 1·75fr.	,, 9½*d.* to 1*s.* 5*d.*
Muslin hand-loom weavers. 1fr. to 1·50fr.	,, 9½*d.* to 1*s.* 2½*d.*

Total 1,748 workpeople employed in the weaving factory department.

The details of the bleach-works and print-works do

not belong to the present volumes. I shall content myself with stating the total number of operatives:—

In Spinning	320	
Weaving	1,748	besides those who work in their own houses.
Bleaching	38	
Calico printing	1,070	
Total operatives	3,176	

I can assure my readers that entire confidence may be reposed in the preceding statistics, most liberally communicated to me by M. Roman himself. The mechanical power employed at Wesserling is as follows:—

One hydraulic wheel for spinning . . .	60	horses' power.
One ,, for power-weaving, &c.	34	,,
One ,, for washing, pumping, &c.	20	,,
One ,, for the Calender, &c. .	10	,,
One turbine (new horizontal water-wheel) for calico-printing machine	7	,,
One hydraulic wheel, turning shop . . .	2	,,
One ,, at St. Amarin, power weaving	30	,,
One ,, bleaching	15	,,
Two steam-engines, for spinning. . . .	40	,,
One ,, and dressing warp	40	,,
One ,, madder dyeing	12	,,
One ,, power-weaving	30	,,
Total horses' power	300	

The power-looms worked very steadily at the rate of 96 to 100 pecks a-minute; and as they go 14½ hours a-day, instead of 11½, as in England, they will turn off more than an English power-loom, making 120 pecks a-minute. For $11\frac{1}{2} : 14\frac{1}{2} :: 100 : 126$. Thus the English loom would need to make 126 pecks a-minute to do the daily work of a loom at Wesserling. One young woman tends two looms, as in our factories.

In the several power-weaving establishments which I visited in France and Belgium, I always found that potato-starch was greatly preferred to the best flour for making the dressing paste. The following recipe was obligingly given me by M. Philip Gros at Wesserling.

In 275 lbs., or 27½ gallons of water, heated to 154° Fahrenheit, in a copper, dissolve one pound nine ounces of blue vitriol (sulphate of copper), mix thoroughly 33 lbs. of potato-starch with 5½ gallons of water at 90° Fahr. in a pail, and pour this mixture into the copper-boiler (not iron), and let the whole boil for half an hour, stirring all the time with a wooden ruler. The sulphate of copper prevents moulding and fermentation. It should be employed fresh, and made from day to day. The semiputrid paste used in some of the Scotch and English loom-sheds is an abomination. The most skilful manufacturers on the Continent have carefully proved the decided superiority of potato-starch over flour-paste for their power-looms. They consider it cheaper and better. A pound of it may be made in Lancashire for twopence, and it will go much further than a pound of flour.

In the year 1834 there were 540,000 mule-spindles at work in the department of the Haut-Rhin (Alsace), which consumed annually about 15,600,000 lbs. E. of cotton-wool; being nearly 52,000 bales of cotton chiefly American and Egyptian; and produced 13,200,000 lbs. of yarn of many different numbers.

The raw material may be valued at .	18,000,000fr.
The yarns at	35,000,000
Difference	17,000,000

Of the cost of manufacture, one-half may be reckoned wages of labour, and the other half general factory expenses. The number of operatives of both sexes employed in the mills of that department is about 18,000, old and young.

M. Nicolas Kœchlin, one of the Deputés of the Haut-Rhin, a cotton manufacturer, and President of the Chamber of Commerce of Mulhausen, in his examination before the Enquête Commerciale of the French ministry in 1834, as well as in his *Replique*, to certain observations made upon that evidence, published in 1835, gives the following statement of the cotton trade of the world.

"The manufacture of cotton-wool amounts, in—

	Kilogrammes.*
Great Britain, to	150,000,000
France	40,000,000
United States	18,000,000
China, being one-half the crop of India .	15,000,000
Switzerland, Saxony, Prussia, and Belgium	17,000,000
Total	240,000,000

"The consumption of cotton in France is nearly one-fourth of that of the United Kingdom, and as we spin in France, for reasons to be afterwards specified, a little more per spindle than they do in England, we must have about 3,500,000 spindles, producing annually 34,000,000 kilogrammes of yarns of every sort; 105,000,000fr. (£4,200,000 sterling, nearly) may represent the reduced actual value of the machines and the factories, calculated at the rate of 30 francs per spindle. Formerly well-mounted mills,

* One thousand kilogrammes is very nearly one ton English; and 50 kilogrammes, therefore very nearly 112lbs.

like those of Alsace, cost from 50 to 55 francs per spindle, whilst at present they may be erected, with the most improved machinery, at the average price of from 40 to 43 francs per mule spindle.

"In regard to the quality of our yarns, I think that for the numbers which constitute nine-tenths of the consumption, we have nothing to envy in the English. Alsace exported, during the late commercial crisis, a considerable quantity of yarns to Switzerland, and it was able to stand well in the market against those from England. Several of our leading mill-owners paid a visit to the English factories in the course of last summer (1833), and they have assured me that they saw nothing particularly interesting, and that except in the higher numbers, Alsace was not a whit behind hand. It is, besides, of little consequence to France to spin the finest numbers, as there are but a few establishments for the purpose in England, and they produce enough for the wants of the whole world. Most of these fine-spinning mills have existed for many years; their sunk capital is long since realized, and hence they could easily destroy the competition of any new factory.

"Our 3,500,000 spindles produce annually, as I have said, 34,000,000 kilogrammes of yarn, worth upon an average . . . . . 170,000,000 fr.

"And consume 37,000,000 kilogrammes of cotton-wool, worth . 88,000,000

"Leaving for the cost of labour, fuel, repairs, interest of money and profits 82,000,000

"The number of work-people employed in our cotton-mills may be estimated at from 80,000 to 90,000.

Their average daily wages are 1fr. 30c. (1*s.* 2½*d.*) per individual.

"In comparing our cotton industry with the English, I may observe that during the war, and for want of intercourse with our neighbours, the construction of our machines was infinitely inferior to theirs. I was personally struck with this difference, when I made a tour in England in 1810, by means of a foreign passport; I was the better qualified to judge, as our own firm then undertook to fit up factories for spinning, and furnished in fact the first machinery to M. Nicolas Schlumberger. But at the present day, in his establishment, as in the others of Alsace, traces of the old machines are hardly to be found. Many proprietors have renewed them three several times. MM. Schlumberger, and Co., have erected their mill for spinning the fine numbers in a style of perfection which has many a time astonished even the English spinners.

"In England, in consequence of the competition among the numerous machine-makers, and the low price of the iron and coal, the machines are much cheaper than in France. A mule costs in Alsace ten francs per spindle,—in England it may be had for six; but luckily for us the greater expense of building among our neighbours makes a compensation of about 25 per cent. in our favour on the edifice itself. Upon the whole, the cost of erection may be reckoned one-third less in England than in France, a disadvantage which our government should study to compensate by a reduction of duty on the importation of machines, by improving the means of internal intercourse, and especially by facilitating the transport of

coals. Most of the mills in Alsace are moved by water-power; those which depend upon steam-power place from four to five per cent. of the price of their yarns to that account. At Manchester the fuel forms not more than one per cent. of the cost of spinning.

"Yet the English do not economize their fuel as we do. They employ five kilogrammes of coal (11lbs.) per kilogramme of yarn, of Nos. 30 to 40, whilst we consume not more than four kilogrammes for the same weight of yarn."

"From a calculation, taken from one of the most considerable cotton-mills in Manchester, it appears that a spinner conducting two mules containing together 620 spindles, produces no more than 125 kilogrammes of yarn in the week (280lbs. English) Nos. 36 to 38 English, or one kilogramme for five spindles per week. Our spinners in Alsace are at least equally productive. It must be remarked, indeed, that the hours of labour in the English mills are limited by law to 11½ hours per diem, whilst they extend pretty generally in Alsace to from 13 to 14 hours, without reckoning the meal-times."

"The following are the mean weekly wages at Mulhausen, Manchester, and Zurich; there are mills, however, in the valleys of the Vosges, where the wages are one-third lower than at Mulhausen.

"Nicolas Kœchlin and brothers pay—the spinner 14fr., the piecer 5fr., the card-tenter 6fr., the labourer 9fr.

"Mr. H. at Manchester, pays—his spinners 38fr. each on an average, the piecers 10fr., the card-tenters 12fr., the labourers 20fr.

"Mr. E. at Zurich, pays—the spinners 12fr., the piecers 3fr., the card-tenters 5fr., the labourers 8fr.

"These three establishments spin chiefly from Nos. 30 to 35$^{m}/_{m}$ (35·4's to 41·2's English).

"At Mulhausen the expense of spinning one half a kilogramme of the said yarns, is as follows:—wages 31 centimes; power, heating, and lighting, 11c.; interest of sunk capital and sinking fund (from 10 to 15 per cent.) 17c.; general expenses, repairs, &c., 13c. Total 72c.

"At Manchester—wages 52c.; power, &c., 3c.; interest, &c., 11c.; general expenses, &c., 10c. Total 76c.

"At Zurich—wages, 10c.; water-power, 0; interest &c., 15c.; general expenses, &c., 15c. Total 60c.

"The following is a statement of the cost of spinning half a kilogramme of weft from Nos. 42 to 47·2 English.

"Wages 17c.; interest, &c., 11c.; general expenses, &c., 19c. Total 47c.

"One of the principal spinners of Alsace gave me the following statement for last year.

"A mule of 396 spindles produced daily 18 kilogrammes of No. 30$^{m}/_{m}$ warp, (No. 35·4's English), which at the then current price of 5fr. 20c. per kilogramme, amounted in value to 93fr. 60c.

"In spinning these 18 kilogrammes, 20 kilogrammes of Louisiana cotton wool were consumed at the price of 2fr. 60c. per kilogramme . . . 52fr.

"Cost of spinning per mule (everything included) . . . . . 20fr.

Total 72fr.

Hence the daily profit on this mule of
396 spindles was . . . . . 21fr. 60c.

This spinner reckoned no more than 56c. for the cost of spinning his half-kilogramme of yarn.

"It results from these calculations," says M. N. Kœchlin, "that Switzerland has a slight advantage over us, especially wherever our mills are driven by steam-power; that France, everything being taken into account, has an advantage over England; an advantage which will increase in proportion as the duties on the raw materials, and on the iron shall be reduced, and that the privileges of the ports which give the English at present an advantage in the purchase of cotton wool, shall be suffered to pass away with the prohibitive system. Our house at Loerrack in the grand duchy of Baden, received a few weeks since some yarns from England, which came to very nearly the same price as the Swiss.

The import duty on the cotton wool in France increases the cost of the yarns from Nos. 30 to 40$^{m}/_{m}$ (35·4's to 47·2's English) by about 5 per cent., and that of the coarser yarns by about 10 per cent. The actual duty on the cotton wool of the United States is 20fr. per 100 kilogrammes, or about 8*s.* 2*d.* per 110 lbs. English; nearly 9*d.* upon 10 pounds, that is, nine-tenths of a penny per pound,—but there is a fully equivalent drawback on the exportation of the manufactured cottons.

"In regard to the weaving department, if we assume for a basis the manufactures of Alsace, it would follow that the 34,000,000 kilogrammes of French yarns, would require, to convert them into cloth, 270,000 looms, employing 325,000 operatives, at the average

daily wages for each, of 75 centimes (7*d.* English). The following is a statement which I received the other day from Switzerland, where weaving has always kept its ground against English competition. This statement is calculated for a cut of 50 *aunes*, which is afterwards divided into two pieces, three-quarters wide, and 75 *portees* (porters).

Cotton yarn, at the market price . .	29fr.	55c.
Cost of weaving	7	20
Warping and dressing	0	60
Repairs and interest	0	75
	39	18

The *aune* (ell) therefore costs in Switzerland 78 centimes, of a quality equal to what is now sold in Alsace at 90c.; including the extraordinary profit at present on yarns. Thus between the *cost* price in Switzerland, and the *sale* price in Alsace, just now when business is very brisk, there is a difference of only 15 per cent. It appears that the cost of manufacturing calicoes in Alsace is 22c. the ell, in Manchester (power-loom cloth) 24c., and in Switzerland 19c.

"The bulk of the Alsace fabrics is a calico intended for printing, which is exported to the Swiss printers only in certain cases; *viz.*, when the yarns are cheaper in Alsace than in Switzerland, from an occasional glut in our markets. The qualities for printing which suit the consumption of France, suit neither the English nor the foreign markets in general; so that the French surplus can find no other good vent. This circumstance, however, will, on the other hand, prevent the surplus stocks of England, manufactured for different

markets than those of France, from inundating our country." The subject of printed calicoes, extensively considered by M. Kœchlin, does not fall within the scope of the present publication.

Great misapprehensions prevail concerning the physical and moral condition of the factory operatives abroad, especially in the fertile region of Alsace. They have been represented as being mostly Protestants, and in very comfortable circumstances.* There can be no greater mistake. Indeed the most remarkable proof which can be adduced how greatly Protestantism is propitious to enlightened industry, is the fact, that among the great multitude of factory proprietors in Alsace there is but one Catholic, though the country is covered with popish shrines, and the working classes are devotees of the Romish communion.

The *Société Industrielle* of Mulhausen, distinguished for the science and patriotism of its members, when recently called upon by the Minister of Instruction, to give him an account of the state of the operatives of that district wrote as follows:—" They are allowed a quarter of an hour for breakfast, and an hour for dinner: working for the most part from five in the morning till eight at night. Each family sleeps generally together in one room, which is a cellar or a garret of the smallest possible dimensions. Their furniture is wretched, often only "un grabat pitoyable pour toute la famille." They are very ill-clothed, often need the aid of the *Société de bienfaisance;*

* The French (in Alsace) "appeared a very comfortable set of people." See Edwin Rose's Evidence before the Factory Commission, First Report, D. 1, 121 and, Mr. Cowell's comments upon it in the Supplementary Report, p. 119.

and are very dirty, especially those in the spinning mills. "Dans les ateliers on entend souvent les propos les plus scandaleux, que les enfants saisissent avec avidité, et repètent avec une satisfaction révoltante. Beaucoup des ouvriers vivent en concubinage. Ils appellent ces sortes d'unions mariages à la Parisienne, et en ont fait un verbe allemand, *parisiren*."

"If Sunday be a day of rest and tranquil pleasure to those who work in a moderate manner through the week, it is, on the contrary, a day of debauchery and orgies to those who, having been kept at labour beyond all reasonable bounds, take that occasion to riot in their liberty. Hence it is not uncommon here to see drunkards of from 12 to 15 years of age. Their degree of instruction is very slender. All their physical, and in consequence all their intellectual faculties, are exhausted with toil. This grievous evil can be removed only by a law like that enforced in England during the last two years. Certain enlightened proprietors have established at their own expense schools within their mills, at Mulhausen, and especially M. Nægely.

"The cruel conduct of parents in sending their children at an almost infantine age to the factory, seldom fails to entail fearful retribution; for whenever the children begin to discover the mercenary bargain of which they have been made the victims, they take the first opportunity of renouncing the filial engagement, and of abandoning their parents. And this alienation (*désaffection*) in the family, aggravated often by the brutality and ignorance of its head, is one of the main causes of the misery which prevails among multitudes of the workpeople."

"The operative spinners of Mulhausen are generally pale, and subject to chronic catarrhs which degenerate often into phthisis. The piecers and card-tenters sometimes lose the first joints of their fingers. The weavers are often seized with chronic rheumatism."

It is to be hoped that the French Ministry and Legislature will no longer lend a deaf ear to these powerful appeals of their most enlightened manufacturers in favour of humanity; nor allow the world to suppose, that like their late master Napoleon, they are willing to sacrifice the well-being of their people to international pride and rivalry,—a patriotism meanly spurious.

Cour de Lorraine, in Mulhausen—Factory of Jean Kœchlin and Co.

No. 32's. Fr. = 38's. English; warp, a stretch of five feet English in 28″. 300 spindles in each mule, two pairs being worked by one spinner, one piecer, and one creeler or scavenger: three halfpence are paid for spinning one pound of cotton into such yarn: 20 lbs. of yarn are turned off daily by each mule. But of No. 28's. Fr. = 33's. E. from 22 to 23lbs. are turned off in the day.

Each floor is 120 feet long, 40 wide, and 11 high, and contains 12 mules. There are three floors in that mill.

40 cards, 22 fine and 18 coarse.

3 bobbin-and-fly frames, containing 88 spindles each.
5 do. . . . . 50 do.
3 do. . . . . 42 do.
3 drawing frames of 8 heads each.

Time of work from five in the morning till eight at night; out of which 15 hours 1½ hours are allowed for meals, leaving for employment 13½.

The workman who superintends the batting and spreading-machine is paid 50 *sous* a-day. Piecers earn from 10 to 12 francs in 15 days, or from four to five shillings a-week. Creelers, or scavengers, from 5 to 6 francs in 15 days.

Card-tenters, 20 sous a-day.

Bobbin-and-fly tenters, 30 sous a-day.

Manager of the factory, 100 Louis per annum.

The factory of M. Nægely at Mulhausen is a modern structure in comparison with that in the Cour de Lorraine. It forms a great quadrangle of masonry, with a spacious court in the middle. There are 80,000 spindles mounted in mules, bearing from 300 to 396 each, one-half of them being of the latter number. I counted three stretches in 76″, each 56 inches long, of warps, No. 35's English counts. His new mules were to go still quicker, though this is very good work. Breakages very few. There is, in fact, no handsomer or better going factory for these numbers of yarn than M. Nægely's at Mulhausen. A pair of mules of 396 spindles is worked by one spinner, two piecers, and one creeler or scavenger. The spinner receives two francs upon an average for 13¾ hours work; the piecer one franc, and the creeler (*bobineur*) eight sous, (something less than eight halfpence). Only 800 operatives were employed at that time in the mill; but a great many more would be engaged, when the new part, just built, was filled with machinery. Thirty hundred weight of cotton yarn was then spun daily with his existing 37,000 spindles; and seven hundred-

weight of cotton-wool was put through each breaker finisher-card in a day of 13¾ hours.

The cost of bringing the cotton-wool from Havre over-land to Mulhausen, and all the district round, is 5½ sous per lb., which includes also the duty on importation.

Of the order maintained in the cotton manufactories of Mulhausen, the following *Public Regulations* of Mr. Charles Nægely's mill afford evidence:

Article 1. Every operative who enters the establishment may quit it within 15 days, and his master has in that time the power of dismissal; after which he and the operative must each on his part give a month's notice. This notice of discharge or quitting must be given in the counting-house on the pay-Saturday, before the time of receiving pay; it will be inscribed in a register with the date; those operatives, however, who are dismissed by the master for ill behaviour or mismanagement lose that benefit, and may be discharged upon the instant.

2. The hours of employment will be stated in a printed bill. If any derangement of the steam-engine, or the preparation machines, or any other circumstance, should call for night-work, each operative is bound to give it; provided it do not exceed one night in the week without his consent.

3. The ringing of the bell will announce the entrance of the workpeople; a quarter of an hour after it ceases, the janitor will shut the gate and make a report to the counting-house of those who are too late. The sick are required to give previous intimation, in order to avoid a fine. The bell-ringing will in like manner announce when the operatives are to quit the mill.

4. Every operative who comes too late, or who stays at home without leave, will be fined in double the value of his absent time; the minimum of this fine will be one-third of a day's wages.

5. There is no suspension of employment but on the Sundays and legitimate festivals; absence on every other occasion will be considered as misconduct, and punished according to the preceding article; an appeal being always open, however, to the *Concile des Prud' hommes.*

6. No operative can quit the mill during the working hours, unless he shows the janitor a permission to do so; and if the janitor neglects his duty in this respect he will pay a fine of 50 centimes, and the operative will be punished for misconduct.

7. If an operative is enquired for, the janitor will call him, and make the visiter wait at the door. It is strictly prohibited to admit, without permission, any one not employed in the mill; and operatives who shall introduce any person, under any pretext whatever, will incur a fine of fifteen days' work.

8. The overlooker, or the workman charged with repairs, each in his own department, is alone empowered to remedy what is wrong; they will be called upon for this purpose by the operative; but he himself must not pretend to make the slightest repair, under the penalty of a fine of two days' work, and the damages which may proceed from his interference.

9. All the operatives, without exception, employed in the workshops of the mill are personally responsible for the preservation of the tools and other objects entrusted to them; such of these objects as cannot be found when wanted will be replaced at their expense.

10. No operative is to remain in the mill during meal-time; he must enter only into the apartment assigned him, and if by any accident the moving power is stopped, the operatives are strictly forbidden to run into the other rooms; they must, on the contrary, remain close by their machines. Every disobedience of this order will be punished with a fine of half a day's work.

11. A bell will be rung daily, at an appointed hour, to warn the operatives to clean their spinning machines, which they must attend to under a penalty of 25 centimes; and after every general cleaning, which will take place once a week, an inspection will be made, and those operatives who have ill cleaned their machines, will be fined in one day's work, or more according to circumstances.

12. Every operative who gives in bad work will be fined in proportion to its defects; as also every one who returns his waste stuff ill sorted. The breakages committed in the workshops will be paid for by all the workmen of that shop, unless they point out the individual in fault. This order comprehends also the passages, staircases, and dining-room.

13. The rate of wages, and the remuneration paid to operatives working by the piece, as well as the minimum of the amount of work to be done, are to be settled according to circumstances, and will be intimated in bills. Each operative is held bound to conform to them, as well as to the regulations hung up in each room.

14. It is strictly forbidden to smoke within the precincts of the factory, under a penalty of a day's work.

15. The operatives who come to work in a state of drunkenness, or who disturb the peace, will pay a fine equal in value to two days' work, besides the correctional punishment authorized by the laws.

16. It is forbidden to make or deposit any nuisance in the court-yard. The *lieux d'aisance* must be kept clean; and whoever defiles them will pay 50 centimes to the porter in charge of them.

17. The janitor is ordered to inspect every operative on going out of the mill; every person must conform to this measure, often indispensable, as well for the interests of the proprietors, as of honest workpeople themselves.

18. To prevent the risk of fire, no workman is allowed to extinguish his lamp without an order. The lanterns of the workpeople will be in general furnished with a candle, and kindled by the porter, under the penalty of a day's labour.

19. It is strictly forbidden to enter, or leave the mill, unless by the door leading to the high-way, or to go out by the windows of the ground-floor under a penalty of six francs.

20. Spinners cannot change their piecers or creelers without the consent of the overlooker, under the penalty of half a day's labour.

21. The operative who will make known at the counting-house a breach of trust committed by another operative, will be recompensed, and his name will be concealed.

22. Every act of disobedience on the part of the workpeople against their master, or against the persons invested with his authority, will be punished according to circumstances, with from one day's to five days'

labour; and the violator will be held responsible for whatever mischief may occur.

23. The operative detected in throwing cotton or waste into the water-closets, or any other place, will be fined in five days' work.

24. The workpeople are forbidden to touch the heating or lighting apparatus, the water-stop-cocks, and conduits in the apartments, as well as the moving power, under the penalty of a day's work, and paying for the damage they may occasion.

25. In return for the protection and paternal cares which all employed in the establishment may expect from their *chief,* they promise him attachment and fidelity as well as the disclosure of everything contrary to order, or to his interest, which may come to their knowledge.

26. The present Regulations will be suspended in all the apartments, and if any one of them be defaced or torn, the persons in that apartment will pay a fine of five francs, should not the person in fault be pointed out.

The above *Règlement de Police,* is printed in two columns; the one French, the other German.

I passed some agreeable days at Rouen, visiting under the hospitable auspices of M. Barbet, *Maire* and *Député,* the objects most interesting among its cotton manufactures, but I need not occupy my reader's time with the details, which would be nearly a repetition of what has been already laid before them. Should any one entertain doubts concerning the excellence of the engineering and machine-factories of France, he may have them very readily dissipated by calling, on Messrs. Barker, Rowdcliffe, Sudds, and

Atkins, at Rouen, who can show him as perfect tools as any which exist in England. They will see one of Fox's best planing-machines, value £900, Sharp and Robert's key-groove cutting-tool, and many others of equal beauty and productive power. These gentlemen prefer the coal of Mons to that of Newcastle at the same price; the former being more dense and durable in the furnace.

The cotton manufacture round Lille, and in the whole of the department of the North of France is also in a state of signal prosperity.*

Political events have within these few years operated very injuriously against the cotton industry of Belgium; hemmed in by prohibitive France on the one side, by hostile Holland on the other; exposed to the Prussian League on the northern land frontier, and the formidable competition of Great Britain by sea. The cotton-spinners of Ghent merit more sympathy than they seem to receive from the actual government, which dislikes them on account of their very natural attachment to their late king, who aided them with capital, and laid open to their enterprizes the richest islands of the Indian Archipelago. Belgium enjoys, however, excellent facilities for manufacturing cottons, in the cheapness of her fuel, iron, and labour, as well as in her central situation, her admirable means of internal transport by roads and canals, and her commodious harbours of Antwerp and Ostend.

Some of the factories which I visited at Ghent are most creditable to their proprietors. I know of no power-loom-shed in Great Britain so magnificent, so

* No fewer than 60 new cotton-mills were in course of erection last year in France.

well lighted, and so well aired, as that of M. Claes-Decocq, in that city. Here 600 looms are distributed in two lofty glass galleries, each 275 feet long and 50 feet wide, more like a royal conservatory of plants, than a weaving factory. The looms are of the best construction, they make 110 shots in the minute, and as they work 14 hours a-day, except on Mondays, when they work only 9½ hours, it is easy to see that in produetive power they surpass most of the power-looms of England.

The dressing-machines, 32 in number, turn off each per week from 40 to 50 cuts, of 100 Flanders *aunes*, equal to 76½ yards English. The dressers receive in wages 20 French francs (16*s.*) weekly for the above stated hours of employment. The whole of these machines are moved by a steam-engine of 40 horses' power, on the system of Woulfe, working at a pressure of 3½ atmospheres, and consuming hourly, about seven pounds of coals per horse power. The establishment, including the purchase of ground, cost altogether 800,000fr. or £32,000, very nearly.

M. Claes-Decocq has a spinning-mill at a small distance from his weaving factory, where I was not a little surprised to see mules making four stretches of number 32 yarns regularly every minute. Each mule carries 240 spindles, and is worked by one spinner, one piecer, and one creeler; the wages of the three is 18 francs (somewhat less than 15*s.*) a-week; of which 10½*d.* English, are daily paid by the spinner to his two assistants, leaving about 9*s.* 6*d.* a-week to himself. One spinner was pointed out to me who had turned off 115 kilogrammes (241lbs. avoird.) of yarn No. 30 in the course of the preceding week; but he worked 14

hours instead of the average 13½, and was reckoned a superior hand. The waste was only eight per cent. in Upland Georgia cotton-wool, indicating very careful and cleanly manipulation in the whole process.

There are excellent machine factories in Ghent, one of which, belonging to Mr. Bell, an English mechanical engineer, has lately produced an improved bobbin-and-fly frame which turns off 350 kilogrammes of rovings (770lbs. English), being about 26 per cent. more than had been previously produced.

I visited several other cotton factories in that city, and observed them to be all actuated by a zealous spirit of emulation, against their French and English competitors. They complain, and probably not without reason, that from the moderate import duties into Belgium, the refuse articles of the English and French trade of the preceding season, are not unfrequently poured into the Brussels market at very low prices, and from the caprice of public taste preferred to the home-made articles of more recent date. It is well known that many of our great manufacturers can afford to make a sacrifice upon the remainder of their printed goods at the end of the season, in consequence of the profits which they have realized at its commencement.

The cotton manufacture of Belgium receives its raw material nearly free from import duty; for it pays only 4½*d.* on 112lbs., whereas that of the United Kingdom pays 70*d.* The mean price of wheat in Brussels, per English quarter, is about 34*s.* Good beef costs at Ghent 4*d.* per pound English; refined sugar 7*d.*, coffee 4*d.*, tobacco 9½*d.*

The following comparative table of wages is given by the merchants of Brussels in their *Mémoire sur la*

Fabrication et le Commerce des Tissus de Coton en Belgique. Dec. 1834.

Daily wages in Ghent,	Mulhausen,		Rouen,		Manchester.	
Spinners . f. 2·50 to 3·00	2·00 to 3·00		2·50 to 3·50		6·25	
Weavers . 1·25 1·50	1·25	2·00	1·50	1·75	2·90	
Printers of calico 1·25 2·00	1·25	3·50	3·00	6·00	5·00	
Labourers 1·00 1·50	1·25	1·50	1·50	2·00	2·00 to 3·00	
Women .. 0·75 1·00	1·25	2·00	1·25	1·50	1·60	3·00
Children . 0·35 0·75	0·25	0·75	0·6	1·00	0·50	1·50

The import duty on 100 kilogrammes of white cotton goods into Belgium is 60 florins (108fr. 84c. French, about 21*s.* 9*d.* per cwt. English); and 80 florins (145fr. 12c. French) on importing 100 kilogrammes of printed calicoes. Upon the heavy white goods for common wear, the actual duty amounts in some cases to from 30 to 50 per cent. *ad valorem.* This law is favourable only to the importation of the finer and lighter qualities of cotton goods. Cotton yarns, Nos. 30 to 40, are, according to the writers of the above memoir, somewhat cheaper in Belgium than in Manchester, and considerably cheaper than the protected yarns of Mulhausen and Rouen. The same holds true of the cloths woven with these yarns.

Concluding Remarks.

One of my principal aims in writing this treatise, and the Philosophy of Manufactures, has been to make our legislators and other influential citizens, familiar with those factory arrangements, operations, and machines, which constitute the main sinews of our national strength, so that they might learn to enact such wise and equal laws as would at once maintain the revenues of the state, and ease the burdens of the people. An

experience of many years in teaching the principles of the mechanical and chemical arts to pupils of every grade of education, has, I trust, enabled me to present the objects of research in as intelligible a manner as their complexity would permit. In the present, as in my preceding work, I have used the utmost diligence to collect the best information upon every subject, and have had the good fortune to procure the assistance of several skilful manufacturers, and mechanicians, in surmounting various difficulties which I encountered in the explanation of the diversified and intricate series of operations of our cotton manufactures.

The chef d'œuvres of mechanism, like those of music, poetry, and painting, can be ill appreciated by persons unacquainted with their respective principles, or who have not qualified themselves by special study to compare their results with the difficulties conquered, and to trace out the scientific resources put in requisition. The ordinary education and amusements of life, indeed, may in some measure cultivate a taste for the fine arts, and may lead individuals to contemplate with real or pretended pleasure even their more homely productions; but they afford no adequate preparation for scanning the devices of ingenious machines. Few fine gentlemen, however much they may have been distinguished by academical honours, have any accurate conception even of the mechanical and physical mysteries shrouded within their watch-case; and fewer still can recognise the beauty, wisdom, and beneficence embodied in those factory machines which now bear up their country through all the financial embarrassments which have been created by its classical statesmen, making it triumph over an invidious world, which,

more justly afraid of its peaceful industry than of its military prowess, holds Watt and Arkwright in higher reverence than all its proud patricians.

From this neglect of the practical sciences in the education and studies of English gentlemen, it happens daily, that undue encouragement is given to empirical projectors, that false judgments are formed concerning "enterprizes of great pith and moment," that the most absurd questions are put to witnesses by the members of parliamentary committees, that the most irrelevant or inconsistent answers are recorded in their reports, and that the criticisms of many of our periodical writers on works of a scientific cast are preposterous in the extreme, praise being lavished on the gossip compiler because he exacts no intellectual effort from the common run of readers, but withheld from the experimental inquirer and discoverer of new facts, whose researches tend to raise the standard of public thought, and to enlighten the paths of national industry. Thus they do double injustice; by undeserved obtrusion of frivolous books on the public eye, and by casting as far as they can, a transient shade over others of solid merit. The evil, indeed, is of no long duration, for substantial knowledge will outlast vague verbiage; but it betrays an unsound state of mind, in a country so dependent as this is upon the application of science to the arts of life—to disparage or undervalue it, because it lies above the routine of novel reading, and may cost a little pains to comprehend. Many an Aristarchus in literature would be sorely puzzled to understand the simplest implements of modern manufacture; for if the mind be not opened in youth by such studies, it becomes imper-

vious to them when its faculties lose their pliancy with advancing years. They should, therefore, form an essential part in the education of all classes of society; of the noble and rich, as well as the humble artisan.

Academical philosophers have been long wont to regard the polished instruments of their minute researches in pneumatics, optics, and astronomy, as the most exquisite specimens of mechanical skill, and to consider the larger machines subservient to commercial industry, as of a far less refined and elegant description. Yet a dispassionate judge of mechanism, who should now compare the most exquisite apparatus of the London or Parisian philosopher, with that of the Manchester tool-maker or spinner, would arrive at an opposite conclusion; for there is certainly no instrument made for the purpose of pure science which can compete in truth of adjustment, delicacy of finish, or elaborateness of design, with the planing machines, the bobbin-and-fly frames, the bobbin-net machine, or the self-acting mule-jenny. The spirit of factory invention has, in mechanism at least, given to the Lancashire mind and fingers a decided superiority over the nicest handicraft artisan of the metropolis, and has changed their old contemptuous term of country-work, into one of genuine eulogium. The tiny bobbin and carriage* of the bobbin-net lace frame would puzzle a London workman to make with due delicacy of form and mobility of adjustment in the course of many hours, and would thereby, at least involve an expense of a crown; but it is made with the precision of a mathematical instrument by the factory operative, in the course of a few minutes, and at a cost of only *threepence.*

* See Plate IX.

The student, therefore, who is solicitous to learn the resources of mechanics, must not stop short at the frivolous and inoperative models, so extravagantly be-praised in schools and colleges, but investigate the admirable engines of the cotton trade. Here he will find a series of organs, instinct with intellectual purpose, conspiring to form fabrics inimitable by the most dexterous hand, and working for years with undeviating promptitude. In complexity, as well as perfection of organization, the factory machines surpass all others, just as the human body does a zoophyte.

Our fine spinning-mills are, as Mr. Tuffnell justly observed, the triumph of art, and the glory of England*, they need fear no competition, nor are they, in fact, objects of foreign rivalry. The delicacy of their machinery, the difficulty of keeping it in order, the dexterity of their hands, and the limited and fluctuating demand for their products, are well known to other nations. Of the perfection at which the art of spinning has now arrived in Manchester, a wonderful specimen was a few days ago given me by Thomas Houldsworth Esq., M. P.:—yarn, spun in his magnificent factory for the French weavers, of which a single pound contains 450 hanks of 840 yards each, the whole, therefore, extending 215 miles in length, or nearly the distance between London and Paris. The Sea-island cotton wool, from which the yarn is made, is of exquisite quality; consisting of regular cylindric filaments, about one three-thousandth of an inch in diameter, as measured in the micrometer microscope.† The thread itself is only one three-hundredth of an inch thick,

* Supplement to Factory Commission Report.

† See Vol. i. p. 82, fig. 9.

being much finer than a human hair. The tissues made of it will surpass the far-famed robes of Dacca, styled in Oriental hyperbole—the *woven wind.*

May I be permitted to conclude with the general observation, that there is no greater act of injustice, none more detrimental to society, than to withhold or withdraw the meed of renown from the real benefactors of our race.

" Quique sui memores alios fecêre merendo."—*Virgil.*

A desire to possess the esteem and gratitude of our fellow creatures, though not the highest, is yet one of the most legitimate motives of meritorious exertion; one which should never be wantonly repressed by giving currency to either contemporary or posthumous calumny against a useful citizen. Under a conviction of the moral importance of this maxim, I have taken considerable pains to investigate anew the early inventions of our factory system, and to award the share of commendation justly due to their respective authors. My researches have been altogether dispassionate, influenced by neither local nor party bias, but solely by the love of truth and fair dealing. They have led me to conclude that the genius of Sir R. Arkwright has been most unduly depreciated in some modern publications, and that it deserves to hold, as formerly, a pre-eminent place in the temple of English fame. No one ever denied him the praise of sagacity and prudence in completing his new system of industry, which has made the world tributary to England, upholding its energies amidst wars unparallelled in expenditure. Would a man of his sound discretion, in claiming parliamentary protection for his patent, against a partial decision of a court of

law, have appealed by name to prior inventions, as he did in his *case* to the patent of Paul, if he had stolen from that source, as his modern detractors insinuate or, indeed, if there had been any true similarity between them? In such circumstances his very appeal for redress would have ensured his condemnation.

It is therefore obvious that if Arkwright had perchance looked into the original specification of Paul, which is not likely, for it was so completely buried in oblivion, that his antagonist lawyers, in the course of their elaborate investigations during two Chancery suits, never alluded to it, he must have seen its impracticable structure, and essential difference from his own operative machine, as I have demonstrated at page 216 *et seq.* of the present volume.

Note to Page viii. of the Introduction.

But for the regenerating functions of the Poor-Laws Amendment Act, the manufacturing industry of England, and especially its most fruitful field, the cotton trade, would have soon fallen under the same blight as the agricultural had done, and have eventually shrunk under the freely expanding growth of rival nations. That master-piece of human legislation, framed, it is said, in a great measure, by our all-accomplished jurist, N. W. Senior, Esq., Professor of Political Economy in Oxford, was passed with most triumphant majorities in both Houses of Parliament. There was but one economist in Europe, of any note, who did not hail it with delight as the harbinger of a brighter day to the morals, agriculture, and manufactures of England. His furious tirades and false predictions may be seen in the London Courier, of May 5, 7, 10, 12, 13, 14, 16, 19, and 24, 1834. They are instructive, but do not come within the scope of the present Work.

THE

COTTON MANUFACTURE.

BOOK I.

ORIGIN AND PROGRESS OF THE COTTON MANUFACTURE IN ITS HANDICRAFT STATE.

THE object of this work is to describe cotton in its various forms, from the development of its filaments in the seed-vessel of the plant, through their several mechanical combinations, till they compose a web of exquisite beauty. I shall first, however, present a view of the history of the manufacture of cotton from its long but graceful pupilage in the plains of Hindostan, till its recent growth into a gigantic manhood under the fostering genius of Great Britain.

The wool-bearing shrub, called Gossypium by botanists, would be universally regarded as a miracle of vegetation, did not familiarity shamefully blunt the moral feelings of mankind. This singular class of plants has been largely distributed all over the torrid zone, a conspicuous gift of Providence to its inhabitants, destined to afford them, in its fleecy pods, a spontaneous and inexhaustible supply of the clothing material best adapted to screen their swarthy bodies from the scorching sunbeam, and to favour the cooling influence of the breeze, as well as cutaneous exhalation. While

the tropical heats change the soft wool of the sheep into a harsh, scanty hair, unfit for clothing purposes, they cherish and ripen the vegetable wool, with its slenderer and more porous fibres, admirably suited to Southern, as the grosser and warmer animal fibres are to Northern India. No sooner does the cotton plant arrive at maturity, than its swollen capsules burst, with an elastic force, in three or five gaping segments, in order, as it were, to display to the most careless eye their white fleecy treasure, and to invite the hand of the observer to pluck it from the seeds, and to work it up into a light and beautiful robe. Thus held forth from the extremity of every bough, by its resemblance to sheep's wool it could not fail to attract the notice of the first tribes which migrated southwards, after the primitive dispersion of the human family on the plain of Shinar; and would naturally lead them to employ it for making raiment—an art undoubtedly known to the sons of Noah. Accordingly the earliest accounts given by historians and travellers of the intertropical nations show them to have been acquainted with the fabrication of cotton cloth. Of all textile materials, cotton is the most easy to twist into a fine thread, a process which may be performed upon the plucked filaments with the fingers and thumbs alone. How readily these threads may be converted into a web, the simple weaving machine of the Hindoo sufficiently attests.

It would appear that the older Egyptians were unacquainted with cotton, for no traces of its peculiar fibres can be found among the swaddling bands so profusely rolled round the ancient mummies, nor are there any paintings of the cotton shrub upon the

tombs of Thebes, where accurate representations of flax occur in its different states of growth and manufacture. Linen was, in fact, the clothing staple of that industrious people; held in such esteem as to be used as a raiment by royalty, and diligently imitated by the neighbouring nations. The Jews first, and afterwards the Greeks and Romans, learned to manufacture linen from the Egyptians. If we consider how near to Syria and Egypt are the regions where the cotton shrub was indigenous, we may feel surprise that it should have remained so long unknown or neglected by nations to whom it would have furnished a far cheaper and more comfortable article of dress than the flax plant. Indeed the insulation of the cotton manufacture in India, for so many centuries after a considerable intercourse with the East had been established by the conquests of the Greeks and the Romans, is one of the most singular phenomena in the history of man, and shows how little inquisitive these highly-celebrated people were concerning the arts conducive to personal comfort.

War was, in reality, the staple trade, the sole factory system of the ancient world, so all-engrossing indeed in the Roman Empire, as to leave its citizens hardly any choice of a reputable handicraft of a purely pacific description. Nothing remained to the philanthropist, born to live by manual toil, but to select such a calling as, though necessarily connected with the universal business, would however tend to assuage its miseries. This was, in particular, the case with the trade of making tents to shelter the sick and harassed soldiery. As it could procure a decent livelihood to a skilful hand in every district, and needed but a few

portable tools, it was peculiarly suited to those artisan missionaries who travelled from region to region to regenerate the moral condition of mankind. Accordingly the Apostle Paul was a tent-maker, and indefatigable in his trade. He combined in his example and writings the best prudential lessons for the present life with the sublimest doctrines of the life to come. The principles of industry never had indeed so cogent an expositor as St. Paul. He commanded that if any would not work, neither should he eat, and he acted up to his own injunctions; for he ministered with his hands not only to his own necessities, but to them that were with him, showing how that, so labouring, they ought to support the weak, and remember the words of the Lord Jesus, how he said, "It is more blessed to give than to receive." How would modern industry thrive were it administered in conformity with this noble precept of the inspired economist; "Owe no man anything but to love one another!"

Generally speaking, the interests of the bulk of mankind were entirely sacrificed in the ancient military governments to the pride and luxury of a small number of chiefs, who, under the names of centurions, tribunes, consuls, archons, satraps, and kings, monopolized the means of enjoyment, and despised the mechanic arts.

In several of the ancient states of Greece, says Adam Smith, foreign trade was altogether prohibited; and in many others the employments of artificers and manufacturers were considered as hurtful to the strength and agility of the human body, as rendering it incapable of those habits which their military and gymnastic exercises endeavoured to form in it, and as

thereby disqualifying it, more or less, for undergoing the fatigues, and encountering the dangers, of war. Such occupations were considered fit only for slaves, and the free citizens of the state were prohibited from exercising them. Even in those states where no such prohibition took place, as in Rome and Athens, the great body of the people were, in effect, excluded from all the trades which are now commonly exercised by the lower sort of the inhabitants of towns. Such trades were at Athens and Rome all occupied by the slaves of the rich, who exercised them for the benefit of their masters; whose wealth, power, and protection, made it almost impossible for a poor man to find a market for his work, when it came into competition with that of the slaves of the rich. Slaves, however, are very seldom inventive; and all the most important improvements, either in machinery, or in the arrangement and distribution of work, which facilitate and abridge labour, have been the discoveries of freemen. Should a slave propose any improvement of this kind, his master would be very apt to consider the proposal as the suggestion of laziness, and of a desire to save his own labour at the master's expense. The poor slave, instead of a reward, would probably meet with much abuse—perhaps with some punishment. The finer sort of manufactures among the Greeks and Romans were excessively dear. The price of linens and woollens was extravagant, compared to our standards. Hence their dress was little varied, as the costumes of the antique statues show; and it was made very loose, so as to last for a long time.

The ancient geometers, best qualified by their

genius to improve the productive arts, held them far too cheap to bestow any thought upon them. The wonderful mechanical resources displayed by Archimedes, in defending Syracuse against the assaults of the Romans, proved him to have been eminently endowed with the constructive faculty, so capable, when rightly applied, of aiding the weakness of man in providing for his innumerable wants in food, clothing, and household accommodation. But according to his admirer, Plutarch, he disdained all such palpable problems, considering every art that ministers to common uses as mean and sordid, and placing his whole delight in those intellectual speculations which, without any reference to the necessities of life, have an intrinsic excellence resulting from abstract truth and demonstration. Plato was no less hostile to experimental researches. He inveighed even against Archytas and Eudoxus, the most eminent practical engineers of antiquity, for realizing their theorems in models of machines; thus, as he alleged, debasing geometry by transferring it from incorporeal to material objects which require manual labour, and appertain to servile trades beneath the notice of freemen.

How different is the spirit of modern philosophy since it was first directed into the path of utility by Galileo, Bacon, Pascal, and Newton! It places its chief delight and honour in investigating the relations of number, figure, and all material substances, in order to apply the resulting discoveries to assuage the evils and to multiply the enjoyments of social life. In its modern familiarity with the sublimest of speculations, that of the equilibrium and movements of the celestial bodies, mechanical science does not,

however, disdain to study the most humble machine of manufacturing industry; and, indeed, may hold many of them up to the admiration of the transcendentalist, as the happiest achievements of the human mind. Should any one ask where; let him enter a cotton-factory, and look around.

Herodotus, who wrote upwards of four centuries before the reign of Augustus, notices distinctly the cotton fabrics of India; and says that a species of plant in that country bears a fruit full of a wool superior to that of the sheep, with which the natives make cloth for their garments. The general use of cotton as an article of dress indicates that it was no novelty in his time, but that it had been established at a very early date, as we have already suggested. This statement of the father of history is confirmed by Arrian, in the account which he gives of the voyage of Alexander's Admiral, Nearchus, who, in sailing down the Indus, and along the coasts of Persia to the Tigris, had occasion to observe that the clothing of the Hindoos was a sort of linen made from a stuff which grew upon trees. He calls the cotton shrub *tala,* and says that the Indians' garments hung down to the middle of their legs, and that they covered their heads with turbans of cotton cloth. On the authority of the same great navigator, Strabo speaks of the printed cotton robes, or calicoes, with much commendation for the variety of their beautiful hues. This writer, who was contemporary with our Saviour, alludes to the cultivation of the cotton shrub, and the fabrication of cotton cloth in the Persian province of Susiana.

About half a century later Pliny presents us with a

more detailed description of the cotton plant:—"In Upper Egypt, on the side of Arąbia, grows the shrub called by some gossypium, and by others xylon, from which cloths called xylina are woven. The plant is small, and produces a fruit, like a walnut, which contains a woolly down, that may be spun into yarn. This cloth merits a preference over all others for its whiteness and softness; and is made into beautiful robes, which the priests of Egypt delight to wear."

When we call to mind the extensive traffic which the luxurious tastes of Rome occasioned with the Eastern world, we must feel surprised that such scanty notices exist among Roman writers of the beautiful cotton robes of India. Their trade with that remote region was said to have drained the empire every year of more than four hundred thousand pounds; and on this business, one hundred and twenty ships sailed annually from the Arabian Gulf, stretching out boldly from Oceles, at its mouth, across the great ocean to the coast of Malabar. They returned with the eastern monsoons, bringing back the spices and other rich merchandise of the continent and the islands, from the general mart, Musiris, to which the Indian vessels carried them for sale.

The *seriæ vestes,* or semi-transparent robes, with which the Roman ladies took so much pleasure in veiling their beauties in the decline of the empire, were most probably fine Indian muslins imported into Italy through the territory of the Seres—the Bochyra of modern times. It is known that a considerable traffic was then carried on through Alexandria, between Rome and the East, for the productions of India, the chief mart of which was Malabar.

Virgil alludes very beautifully to the cotton plant in the following lines in the second Georgic:—

> Quid nemora Æthiopum, molli canentia lana?
> Velleraque ut foliis depectant tenuia Seres?

"Shall I sing of the groves of Ethiopia, hoary with soft wool; and how the Seres comb out the delicate fleece from among the leaves?" can surely apply to nothing but a shrubbery of cotton plants.*

Dr. Vincent, however, in his learned commentary on Arrian, suggests, that the word *serica*, in the ancient writers, refers to silk; but Salmasius considers it, and in my opinion more justly, as alluding to cotton.

The word *cotonea*, which occurs several times in Pliny's Natural History, means clearly the quince-apple. In his 23rd book, c. vi., 54, we find boiled quinces prescribed as the preferable mode of using this apple—*cotonea coctu suaviora.*

The *cydonia mala* is another synonyme for quinces.

In the passage quoted in the foot-note, Pliny likens the capsule of the cotton-plant to the quince-apple in size, and adds, that it bursts on being perfectly ripe, and displays its woolly pile, from which a precious kind of linen raiment is made. These wool-bearing trees are called *gossympinoi.* Hence the Linnæan name, *Gossypium* †. The Tylos of Pliny, where these

* See Note A, at the end of the volume.

† Tylos insula in eodem sinu est, repleta silvis . . . Ejusdem insulæ excelsiore suggestu lanigeræ arbores, alio modo quam Serum. His foliis infecunda; qui ni minora essent vitium poterant videri. Ferunt cotonei mali amplitudine cucurbitas, quæ maturitate ruptas ostendunt lanuginis pilas, ex quibus vestes pretioso linteo faciunt. Arbores vocunt gossympinos. C. Plinius, Nat. Hist., lib. xii., c. x.

trees were found, is, according to Vincent, an island in the Persian Gulf*.

Instead of *gossympinoi,* Herodotus and Theophrastus use the simple expression, *wool-bearing trees—dendra eriophera.*

Of the Egyptian cotton shrub Pliny gives so very explicit a description as to render it surprising that no trace of cotton cloth has been found among the mummy bandages hitherto unrolled in England†. Such robes were, perhaps, too valuable to be buried with the dead body, and might be kept as heir-looms from generation to generation.

The 'Periplus Maris Erythrei' was probably written at, or a little before, the time of Pliny, the naturalist, —not by the celebrated historian of Alexander, but by another Arrian, most likely an Egyptian Greek, who went on a mercantile expedition, about the beginning of the second century, down the Red Sea, and along the whole extent of the Indian coasts, and who has left a record of his voyage, under the above title. He tells us that the Arabian trading-vessels brought Indian cottons to a port in the Red Sea, called Aduli; and that Barygaza, the Baroche of modern geographers, near the north-west coast of India, was a mart of cotton goods of many kinds; whence common cottons, calicoes, and muslins, plain and flowered, of

* Voyage of Nearchus, p. 321.

† Superior pars Ægypti in Arabiam vergens gignit fruticem, quem aliqui gossypium vocant, plures xylon, et ideo lina inde facta xylina. Parvus est similemque barbatæ nucis defert fructum, cujus ex interiore bombyce lanugo netur. Nec ulla sunt eis candore mollitiave preferenda. Vestes inde sacerdotibus Ægypti gratissimæ. Plin., lib. xix., c. i. No juster eulogium could be written on the cotton-plant and cotton goods by a modern naturalist. *See the translation, p.* 8.

Indian manufacture, were exported to various countries. It appears, moreover, that Masalia was at that time famous, as the same place has continued to be ever since, under its native name of Masulipatam, for cotton fabrics. The Bengal muslins were then celebrated under the title of Gangitiki, bestowed on them by the Greeks, because they were made near the banks of the Ganges.

The stationary condition in which the arts of India have remained since the earliest times is remarkably exemplified in the case of Baroche, a town in the Guzerat, which has been described by Forbes, in nearly the same terms as by the ancient author of the 'Periplus.' The cotton trade of Baroche is very considerable, and the manufactures of this valuable plant, from the finest muslin to the coarsest sailcloth, employ thousands of men, women, and children, in the metropolis and the adjacent villages. The cotton cleaners and spinners generally reside in the suburbs, or poorahs, of Baroche, which are very extensive. The weavers' houses are mostly near the shade of tamarind and mango trees, under which, at sunrise, they fix their looms, and weave a variety of cotton cloth with very fine baftas and muslins. Surat is more famous for its coloured chintzes and piece-goods. The Baroche muslins are inferior to those of Bengal and Madras, nor do the painted chintzes of Guzerat equal those of the Coromandel coast.

In the downfall of the Roman empire arts and commerce perished. At this dark period there are merely a few incidental notices of the cotton manufacture in the East. Omar, the successor of Mahomet, is described as "preaching in a tattered cotton gown,

torn in twelve places;" and Ali, his fellow-fanatic, who became caliph after him, "went on the day of his inauguration to the mosque, dressed in a thin cotton gown, tied round him with a girdle, and a coarse turban on his head." We may hence infer that cotton cloth was a common material of dress in Arabia at the time of the Hegira, and had probably been so for many generations, as the soil was too arid for the production of flax, and the climate too hot for favouring the growth of a soft fleece upon the sheep.

There is little doubt that the Mahometans carried along with their conquests into the western world the arts of growing and working cotton; and introduced also into India certain modifications of the ancient practices of that country, in spite of the unchangeableness due to the distinction of castes. The first step in the cotton manufacture is the separation of the downy fibres from the seeds, which was originally effected no doubt by the fingers alone, but for a very long period it has been done in Hindostan by a pair of rude rollers. The second step is the thorough opening up of these fibres, by the elastic stroke of a bow-string. It deserves special notice that the bow-string operation, though now a constant part of the Indian process, is never executed by Hindoos, but by Mahometans, proving it to be an innovation of their Mussulman conquerors. The hard twisted warp for certain fabrics is also spun by Mahometans—spinning the softer and more delicate yarns being the province of the Hindoo women, and constituting almost the sole occupation by which they can earn the trifle needed for the supply of their wants. The cause of the early perfection which the muslin manufacture attained in India must

be sought for in the exquisitely-fine organization of the natives of that region. Their temperament realizes every feature of that described under the title *nervous* by modern physiologists.

A marked excess of sensibility in the ordinary transactions of life; delicate fibres, a soft and fine skin, pliant limbs and fingers, a pathetic look; a feeling of anxiety attendant upon the play of the organs; lively sensations occasioned by very slight causes; are the symptoms of this temperament: they all predominate in the Hindoo constitution; and so qualified it for the delicate textile manufacture of cotton, that they kept, as it were, a monopoly of it for several thousand years.

The next authentic account of the cotton manufacture of the East is given us by Marco Polo, in the thirteenth century. In the vicinity of Mosul, now the capital of the Turkish pachalik, upon the western bank of the Tigris, opposite the ancient Nineveh, "there are places," says this great traveller, "named *Mus* and *Mareddin*, where cotton is produced in vast abundance, of which they prepare the cloths called *boccasini*, and many other fabrics." From Mosul the Italian words *mussolo** and *musselino* are derived, whence mousseline and muslin, in French and English. Ives states, in his Journey, that "this city's manufacture (or trade) is mussolen, a cotton cloth, which they make very strong, and pretty fine, and sell for the European and other markets." It was therefore a species of calico, so named from the city Calicut, in the East Indies. In 'Menagio's Origini della Lingua

* Sorta di tela bambagina, cosi detta dal nome del paese dove per lo più ella si fabbrica.

Italiana' we find, under the word *Mussolo*, the following explanation:—"*Al Mussoli* is a region in Mesopotamia, in which are woven webs of cotton, of exceeding beauty, which are called *Mussoli* among the Syrian and Venetian merchants, from the name of this region*." It is probable that Marco Polo occasionally confounded the silk with the cotton manufacture. The boccasini mentioned above was most likely a species of fine white and soft cotton cloth, as it is called, in the Italian translation of 'Ramusio,' boccasini *di bambagio*, or *of cotton*.

Cotton, says Marco Polo, grows abundantly in Persia, and also in Guzzerat; in which latter place it is produced from a tree about six yards high, which bears twenty years; but the cotton taken from trees of that age is not adapted for spinning, but only for quilting. Such, on the contrary, as is taken from trees of twelve years old, is suitable for muslins, and other manufactures of extraordinary fineness. In Cambaia, also, there is abundance of cotton cloth, as well as of cotton in the wool; and a great quantity of indigo is manufactured †.

At the city of Kue-lin-fu (Kien-ning-fu, in the province of Fo-kien), says Marco Polo, cottons are also woven of coloured threads, which are carried for sale to every part of the province of Manji: probably this cotton was not dyed on purpose, but was the native

* Al Mussoli est regio in Mesopotamia, in qua texantur telæ, ex bombyce valde pulchræ, quæ apud Syros et apud mercatores Venetos appelantur *Mussoli*, ex hoc regionis nomine.

† "Qui," says Barbosa, "si lavorano assai tele e panni di gotton bianchi, sottili e grossi e di varie sorte tessuti et dipinti." Here we see the antiquity of the printed calico manufacture.

orange-coloured cotton, called Nam-king by Van Branam.

In Murphili (the Masuli-patam of modern geographers), says Marco, they manufacture the finest cottons that are to be met with in any part of India. It has been, in fact, always celebrated for its chintzes. Of the kingdom of Malabar he says, "Here the finest and most beautiful cottons are manufactured that can be found in any part of the world." Hamilton has confirmed this statement in speaking of Raja-pore, a place near Gheria, observing, that "the country thereabouts produced the finest muslins and betillas in India," p. 243. It appears from the former authority that at that period various kinds of cotton goods were manufactured in the island of Socotra, then inhabited by a Christianized people, subject to a patriarch, residing at Badhdad. Astley, in his collection of old voyages, says—"Next day," speaking of a voyage performed in 1608, "standing off to sea, they met with a Guzerat ship, laden with cotton, calicoes, and pentathoes (chintzes), bound for Aden." Marco Polo was a Venetian, who travelled in the thirteenth century, from the year 1260 downwards, was confidentially employed in the service of the Tartar conqueror of China, and returned in the year 1295, after having visited a great many countries of Asia. His credibility is undoubted. The manuscript was first circulated in 1298, at Genoa, where he was confined as a prisoner of war, having been taken in a naval action with the Genoese fleet, against which he had fought bravely as captain of a Venetian ship, but was ill supported by his countrymen.

It is probable that in the time of Marco Polo the

cotton manufacture was just beginning to be introduced into China, for, in noticing the productions of many other parts of that empire, in which he held a high official rank, and enjoyed perfect freedom of observation, he makes no mention of cotton goods.

We know from other sources that the Emperor Ou-ti, of the small dynasty of Leang, who ascended the throne in the year 502 of the Christian era, had a robe of cotton. Towards the end of the seventh century the cotton shrub began to be cultivated in the gardens of the capital of China. *The whole town is full of cotton flowers,* says a Chinese poet of that time, in verses written upon the summer season. It was, however, only for the sake of the flowers that the plant was then cultivated. This fact will appear extraordinary, if we bear in mind that the court held in high estimation the cotton garments which were presented to their king by foreign ambassadors. Nothing shows in a more striking manner how blind the cleverest nations sometimes are to their best interests, and how much in all ages a peculiar genius and an ardent zeal are required to rouse the multitude from their indifference about new things; to make them see clearly what is before their eyes, and to give them energy to turn their labour and dexterity to account. We can hardly reconcile such backwardness with the supposed keenness of the Chinese temperament. It was not till the eleventh century that the herbaceous cotton plant passed from the parterres and gardens of China into the fields, and this only in a few districts of Kiang-Nan. As to the cotton-tree, it was known only in their books, till the dynasty of the Mongul Tartars, called Yuen in the country, who conquered it about

1280, and reigned thereafter eighty-eight years. The emperors of that dynasty took every possible pains to extend and render fashionable the culture of cotton plants of every kind; and, in fact, imposed on several great provinces an annual tribute of cotton. But this business was looked upon with an evil eye by the aborigines, and was much disliked, as interfering with corn-crops, with their forest-trees, and with the silk manufacture, so long cultivated among them. The nation felt itself aggrieved by the new-comers, and zealously tried to rouse the old proprietors to maintain the established usages of the people. But, eventually, these prejudices were overcome by the care and liberality of the government. All the provinces betook themselves diligently to the cultivation of cotton; and at present every nine persons out of ten are dressed in cotton cloth. The dynasty of Ming, the immediate predecessor of the reigning family, had the honour of effecting a revolution so conducive to national comfort.

In consequence of a dearth of provisions in China, about sixty years ago, an imperial mandate was issued to convert to the cultivation of corn a considerable portion of land then appropriated to the cotton plant; since which time the Chinese have been accustomed to import large quantities of cotton wool. Sir George Staunton found all the lower orders of the Chinese, of both sexes, dressed in cottons, and the upper orders in silks.

Spain, which had received the cotton manufacture along with its Mahometan masters, continued for many centuries to cultivate it with much success. The cotton plant still grows wild in many parts of the

Peninsula. De Marlès asserts that the Moors, who were mingled with the Arabs at the Spanish conquest, brought with them the husbandry of rice and cotton, as well as that of the mulberry-tree and the sugar-cane. From the narratives of subsequent Saracenic historians it would appear that the cotton manufacture was prosecuted to very considerable extent by the Spaniards during the thirteenth, fourteenth, and fifteenth centuries. Barcelona was famous in particular for its cotton sailcloth, of which it supplied great quantities to the squadrons stationed off its harbour. The term *fustaneros*, from which our word *fustian* comes, was first given in Spain to the weavers of cotton goods of a stout make, as the Spanish word imports substantial. Cotton paper seems also to have been first made by the Spanish Arabs; a paper was afterwards manufactured by them from linen rags at Valencia, which was much admired by the literary men of the time. The religious antipathy, however, which existed between the Moors and the Christians, prevented the propagation of these Oriental arts westward, so that, when the Saracens were expelled from Spain, the manufactures of this country relapsed into a barbarous state.

The following interesting account of the cotton husbandry of Spain under the Moors is given by M. Lasteyrie in his treatise on the cotton plant.

Eben el Awam, who lived in the twelfth century, and who farmed a small property near Seville, in a delightful situation, which we have gone over and examined with a lively interest, has described not only the mode of cultivating cotton employed in Spain, but also the methods followed in a great portion of

the countries which were at that period under the dominion of the Moors or Saracens. This Arabian writer has copied a part of his work from the ancient Egyptian, Greek, Persian, and Arabian authors, whose pages have since become the prey of time and human barbarism. This monument of ancient agriculture is the more valuable, as we do not find in the Greek and Roman writers any traces of the husbandry of the cotton plant, whence we may conclude that it was not established in Greece, Italy, Sicily, and Malta, and the other coasts of the Mediterranean, till the Mahometans, on the conquest of these regions, brought the arts of the Eastern world with them.

The Arabs, with less taste in the fine arts and in literature than the Greeks and Romans, appear to have surpassed the former and to have at least equalled the latter in agriculture. The precepts of Eben el Awam upon cotton plantations are contained in the twenty-second chapter of his *Book of Agriculture.* He says it is sown in Arabia Petrea, Egypt, at Ascalon and Bassora, on sandy grounds subject to irrigations; that in Sicily, as well as on the coasts of Spain, it is raised upon the inferior soils, which are found sufficiently good for it, and that the roots are transplanted, as is done with potherbs in a garden. They are set at eight palms' distance from each other, because in those countries the shrubs rise to the height of the fig-tree, which is usually from fifteen to twenty feet, and it endures for several years. It is treated in the same manner as the vine, and it yields every year a good crop by means of ploughings and irrigation. He says that the inhabitants of Syria are wont to prepare a year beforehand the land intended for cotton,

enriching it with plenty of dung, and freeing it from weeds. They then irrigate it, and as soon as it is drained they make holes an inch and a half deep, and a palm and a half asunder. Into each hole they put two or three seeds, which they cover with a little soil; and whenever the plant has risen a palm from the ground they repeat the irrigation, which is, indeed, done as often as is thought requisite; and in general, according to another Arabian authority, every fifteen days till the beginning of the month of August, the period when the capsules form. Then all further watering must be avoided, in order to favour the formation of the cotton fibres. If the vegetation be too active, the bottom of the plant must be beat with a stick. M. Lasteyrie properly finds fault with this practice, and suggests that it would have been better to prune off the extremities of the too-luxuriant branches. Thus, adds the Arabian, the juices do not run to waste; but are, on the contrary, concentrated on the fruit, so as to improve its quality. The harvest occurs in the month of September, when the capsules begin to open, and when the down is just seen peeping out of them. They ought to be plucked in the morning, when still damp with the dew of night, and deposited in a spot sheltered from the sunbeam, in order to preserve them in a somewhat damp state, when the cotton must be removed from the seeds by the fingers. The wool is afterwards exposed to the sun till it is thought to be dry, and then packed up for use. Aben Hajaij, another Arabian writer, says that the cotton plant can be cultivated with advantage only in islands and on level plains.

Documents exist in Biscelia, dated in 1050, which

prove that the priests of San Adveno were authorized to let their church lands for the growth of cotton plants; and there is other evidence of the existence at the same time of the cotton husbandry in Sicily. In Calabria the plant was biennial, and produced the best crop the second year *.

In 'Ramusio's Viaggi,' or collection of voyages, a copy of the original edition of which, printed early in the sixteenth century, exists in the library of the British Museum, there are several notices showing that the cotton manufacture was very extensively established, before that period, all over the southern shores of the Mediterranean. At Fez the natives raised a large quantity of cotton, and the townspeople were very generally weavers of cotton cloth, of a truly exquisite and beautiful texture †.

Hunain, a small African city on the Mediterranean, frequented in the fifteenth century by the Venetians, is spoken of with high commendation in Ramusio's volume, on account of its eminence in this manufacture. "The inhabitants were a noble civilized race of men, and almost all engaged in the production of cotton or cotton cloth ‡."

Of Amon, a place five days' journey from Damascus, it is said that a very great quantity of cotton was grown at it.

* Atti del Real Instituto d'Incorraggiamento alle scienze naturali di Napoli, Tomo II., 1818. This curious notice was politely brought before me by the librarian of the Jardin des Plantes in Paris.

† Si raccoglie gran quantità di bambagio, et gli habitatori della città sono per lo più tessitori di tele bambagine, molto sottili nel vero et molto belle.—Giovanno Lioni Africano Descrittione della Africa.

‡ Gli habitatori furono nobili et civili et quasi tutti lavoraron bambagio o tele.

According to Odoardo Barbosa, of Lisbon, who made a voyage to Southern Africa in 1516, the Caffres then wore cotton dresses, *drappi di bambagio*, denoting a high state of civilization for that race of people. At Cefala, he says, the Moors grow a large quantity of fine cotton, and weave it into cloth, which they use in the white state, from their being unable to dye it, on account of the want of colouring stuffs.

From Macpherson's 'Annals' it appears that cotton cloth, woven on the coast of Guinea, was imported into London from the Bight of Benin—in the year 1590; a fact corroborative of the above testimony.

The modern travellers who have explored the interior of Africa concur in showing that the cotton plant is indigenous to that continent, and that the wool is spun and woven into cloth, which is used for raiment by the inhabitants of every class and every region. From the beauty of the dye, and the designs observed on some of their cotton dresses, it may be justly inferred to be a manufacture of very ancient standing.

The state of the New World relative to cotton is very remarkable. When the Mexicans were first invaded by their European conquerors they had no sheep's wool, nor common silk, nor linen, nor hemp, but they supplied the want of wool with cotton, that of silk with feathers, and with the hair of the rabbit or hare. Of cotton they made large webs, and as delicate and fine as those of Holland, which were therefore highly esteemed on their importation into Europe. A few years after the conquest a sacerdotal habit of the Mexicans was brought to Rome, which, as Boturini affirms, was uncommonly admired on account of its fineness and beauty. The Mexicans

wove cloths with different figures and colours, representing various animals and flowers. We have seen some beautiful mantles of this kind, says Clavigero, which are still preserved by some lords. With cotton also they interwove the finest hair of the bellies of rabbits and hares, after having spun and dyed the thread; of these they made the most beautiful clothes, and, in particular, winter waistcoats for their grandees. A few days after Cortes arrived in Mexico he despatched to the Emperor Charles V., in July, 1519, among other rich presents, a variety of cotton mantles, some all white, others checkered with white and black, or red, green, yellow, and blue; on the outside rough, like a shaggy cloth, and on the inside without either colour or nap. A number of under-waistcoats, handkerchiefs, counterpanes, tapestries, and carpets of cotton, were sent to Europe. All these articles were, according to Gomara, more valuable for the workmanship than the materials. *The colours,* he says, *of the cotton were extremely fine, and those of the feathers natural. Their works of cast metal are not to be comprehended by our goldsmiths.*

The Mexican men used to wear two or three mantles, and the women three or four vests, and as many gowns, putting the longest undermost, so that a part of each of them might be seen. The lords wore in winter waistcoats of cotton, interwoven with soft feathers or the hair of the rabbit. The upper ranks in general used counterpanes of cotton and feathers.*

We have thus seen that from a very remote period

* Clavigero, Book VIII. Among the mummy-cloths brought from the ancient tombs at Arica, in Peru, by Lord Colchester, in

the natives of the tropical countries of Asia, Africa, and America, were well acquainted with the cotton

1831, and now deposited at the British Museum, three different textile fabrics may be distinguished.

1. A white flimsy web, like the coarsest calico at present used for linings in this country.
2. A coarse plaid stuff, woven in red and brown stripes.
3. A yellow fringe-looking stuff. The threads of the last two fabrics are pretty thick; those of the first are much finer.

No. 1 is a cotton cloth, of which the fibres, viewed in the microscope, are remarkably tortuous, like a cork-screw, and very regular in size and form. They resemble the fibres of the *Gossypium hirsutum*, probably the primitive cotton plant of South America.

No. 2 is a sort of worsted stuff, made of the wool of the Vicugna. Its filaments seem to be more minutely indented along the line of the edges than those even of the long-stapled sheep's wool of England, as figured at p. 91 of the *Phil. of Manufactures*.

No. 3 is a texture of the same fleece as No. 2, dyed of an orange yellow, having a few filaments of cotton, carded or mixed in and spun along with it. This mixture is very distinguishable in the microscope.

The application of this instrument to examine animal and vegetable filaments is of ancient date. It was very successfully employed by Ledermüller upwards of seventy years ago, and was illustrated by many fine engraved representations of the serrated structure of the hair of the sea-calf, and other fibrous matters. The celebrated Monge thought he saw in the serrations of wool, and similar hairy substances, the cause of that curious interlacement and condensation which they undergo in the process of felting, used in the manufacture of stuff hats. He promulgated his theory of this operation at considerable length, upwards of forty years ago, in the sixth volume of the 'Annales de Chimie,' whereby he made the serrated structure of wool familiar to every philosopher of Europe, since his memoir was translated into all its civilized languages, and particularly into our popular scientific journals at the time *.

Subsequent researches have shown that Monge's theory requires certain modifications. Though the woolly filaments which constitute the hair and fur of many animals be provided with asperities ("scales like those of fish, or imbricated zones, like the horns of animals," are

* Nicholson's Journal, and Repertory of Arts.

plant, and worked up the woolly down of its pods into useful and ornamental articles of clothing. The

the characteristic phrases employed by Monge), yet they are not susceptible of felting, he thought, if they were straight, because the kneading motions of the operator's hands would make them merely move progressively forwards, and cause no interlacement. This defect in the straight filaments he supposed to be removed by *secretage*, or the application of a solution of nitrate of mercury to the tips of the fur on the skin, which caused these to curl. M. Malard, M. Guichardière, and M. Robiquet, have controverted this theory, by showing that straight hairs, such as those of warren-rabbits, felt very well without *secretage*; while those of the hare and the castor, which are not straighter, require that preliminary process before they will felt. Again, certain straight-fibred sheep-wools, like those of the *beauce*, may be readily felted alone, whilst the Spanish wools, which are naturally curled, cannot be used for making hat-felt. Though the rectilinear form of the fibres be not the sole obstacle to felting, as Monge imagined, yet he undoubtedly was right in regarding the scales or asperities on their surfaces as co-operative towards felting, while they are not its only cause. The hairs of the seal, which present in the microscope a great many asperities or notches, arranged like the teeth of a saw, are not susceptible of being felted. "All the hairy filaments," says M. Robiquet, "viewed in the microscope, present very distinct scales, disposed symmetrically; but affecting sometimes one figure and sometimes another." He considers the flexibility of the fibres towards their tips to be another condition no less essential than the serrations to their felting property. *Secretage* communicates this flexibility, he thinks, by corroding off the natural varnish upon the tips of the hairs. "It is well known, in fact, that wools and hairs, subjected to the action of alkaline leys, readily form a felt; and that this tendency often presents a great obstacle to the working them up*." Hence, adds he, it is not astonishing that wools naturally curled are not fit for felting, because the inflexion should be merely successive, and should increase only in proportion as the felt-

* M. Robiquet, Membre de l'Institut, in the article Feutrage (Felting), published in the Dictionnaire Technologique for 1825. His description is remarkably clear—"Tous les poils, vus au microscope, présentent des écailles bien distinctes et disposées symmétriquement; mais affectant tantôt une figure et tantôt une autre," p. 527. The article from which this sentence is quoted is particularly interesting. A condensed notice of it is inserted at the bottom of page 92 and top of page 94 of my 'Philosophy of Manufactures.'

Europeans alone continued destitute of this admirable industry for many thousand years after it had been possessed by nations whom, from their less warlike polity, or less ferocious disposition, they looked down upon as inferior races, or regarded even as barbarians.

The Portuguese, after their discovery of the passage to India by the Cape of Good Hope, made large importations of cotton-stuffs and muslins into Europe, but did not attempt to establish any manufacture of the kind in their own country. When the Dutch, however, some time thereafter, succeeded in depriving the Portuguese of a part of their eastern colonies, they not only extended the traffic in cotton goods, but, towards the latter end of the sixteenth century began to fabricate them at home. Long prior to this period, a manufacture of indigenous cotton had existed in the southern parts of Italy, where the plant had been cultivated since the eleventh century, particularly along the shores of the gulf of Taranto. From a remote era, ladies of condition in that district occupied themselves in spinning cotton and knitting the yarn into stockings, articles of dress which were greatly admired, and fetched the prodigious price of a guinea the pair. The muslin of the same region was like-

ing goes on; otherwise the progressive motion of the fibres cannot take place.

M. Robiquet informs me, in a polite note, dated December last, that he made the observations on the structure of hairy filaments which are inserted in his article *Feutrage*, in conjunction with M. Lebaillif, who was very skilful in the use of the microscope, and that the most curious species which he saw was that of the otter. The wools which I examined in my achromatic microscope, were sent to me, with a note, dated the 29th of January, 1834, by Messrs. Loughnan and Hughes, of Basinghall-street, through James Cook, Esq., of Mincing-lane.

wise in vogue till towards the conclusion of the last century, when it came to be superseded by the large importations from India, and the superior fabrics of England. In that part of Italy, the soil is said to be so favourable to the culture of cotton, that an English acre will produce, in good seasons, ten cwt. of seed-cotton, which will yield 2 cwt. of cotton wool. A considerable quantity of this product was at one period exported in the raw state*.

The earliest notice of cotton, as an article of English trade, is to be found in Hakluyt's Collection of Voyages. It is copied from a little book, entitled, 'The process of English Policy.' "Genoa," says the author, "resorts to England in her huge ships, called carracks, bringing many commodities, as silk, paper, wool, oil, cotton," &c. This work was printed towards the conclusion of the fifteenth century. Before that period, England was probably supplied directly from the Levant with the small quantity of cotton then wanted, chiefly for candle-wicks. The Genoese lost their monopoly of the carrying trade in 1511, from which time till 1534, says Hakluyt, divers tall ships of London and Bristol had an unusual trade to Sicily, Candia, and Chios, and sometimes to Cyprus, Tripoli, and Baruth, in Syria. They imported thither sundry sorts of woollen cloths, calf-skins, &c.; and imported from thence silks, camblets, rhubarb, malmsey, muscadel, and other wines; oils, *cotton wool*, Turkey-carpets, galls, and India spices. The merchants of Antwerp soon thereafter engrossed the Levant trade, to the exclusion of the English. But after the sack-

* Travels of Charles Ulysses in 1787, published in London in 1795, p. 116.

ing of that city, the English resumed the Mediterranean commerce, and carried it on with great activity; importing, in return, cotton among other articles, according to the statement of Mr. Mann*. It appears from Wheeler, who wrote in 1601, that cotton was brought to England by the Antwerpians from Sicily, the Levant, and sometimes from Lisbon, along with many other precious articles, which the Portuguese imported in those times from India. The merchants of Antwerp obtained cotton goods from Italy before this time, for Guicciardini enumerates fustians and dimities among the valuable articles of import from Milan into the mart of the Netherlands. The people of the Low Countries soon took up this manufacture themselves, and in the subsequent emigrations of the Protestants from that country, during their religious persecution by the court of Spain, they brought it into England, and established it in the towns of Bolton and Manchester. The fustians were valued by Guicciardini at 600,000 crowns, but they were probably a mixed stuff. The consequences of the cruelties exercised by the Duke of Alba, are thus powerfully described by M. l'Abbé J. J. de Smet, in his 'Histoire de Belge.' "The news of the arrival of the Spanish general caused the workshops to be everywhere deserted. Carrying with them their industry, thousands of artizans quitted their country, or enrolled themselves under the insurgent standard. Holland, France, but especially England, offered them an asylum; the provident Elizabeth did not confine her views merely to the relief of her religious partizans, but sought to

* On the trade of India.

transfer into her kingdom those prosperous trades of the Low Countries, which the adjoining states had looked upon with invidious eyes. She succeeded beyond her most sanguine hopes, and thus eventually procured, with the aid of Belgian exiles, manufacturing pre-eminence to her country."

Lewis Roberts, who published in 1641 a little treatise on trade, called the 'Treasure of Traffic,' says, "The town of Manchester buys the linen yarn of the Irish in great quantity, and, weaving it, returns the same again in linen into Ireland to sell. Neither does her industry rest here, for they buy cotton wool in London that comes from Cyprus and Smyrna, and work the same into fustians, vermillions, and dimities, which they return to London, where they are sold; and from thence not seldom are sent into such foreign parts where the first materials may be more easily had for that manufacture." This fact of returning the manufactured article from England to the native country of the raw material, which attracted the attention of Roberts in one case, has become in our times a general feature of British trade.

It would, however, appear, that long before the date of the 'Treasure of Traffic,' cotton fabrics must have been commonly wrought in this island, for we find a sumptuary Scotch law, enacted by King James in 1621, directing "that servants shall have no silk on their cloths, except buttons and garters, and shall wear only cloth, *fustians*, and canvas of Scotch manufacture." It is possible indeed that the name fustian, from its Spanish import of *substance*, may be here given to some kind of substantial mixed stuff, different from the cotton fustian of Guicciardini.

Considerable obscurity is occasioned by the different meanings attached to the word cotton in English works about a century and a half or two centuries ago. It seems to have been corruptly used for coating, and denoted a species of woollen stuffs made for that purpose. Thus Leland, in his itinerary, written so far back as Henry VIII., says, that "Bolton-upon-Moor market standeth most by *cottons;* divers villages in the moors about Bolton do make cottons." The sense of this passage is cleared up by the terms of an act subsequently passed, in 1552, under Edward VI., for regulating the manufacture of *woollen* cloth, in which it is stated, "that all the cottons, called Manchester, Lancashire, and Cheshire cottons, full wrought to the sale, shall be in length twenty-two yards, and contain in breadth three-quarters of a yard in the water, and shall weigh thirty pounds in the piece at the least." Camden also may be quoted to prove the woollen texture of the cottons of those days; for he says "that Manchester excels the towns immediately around it, in handsomeness, populousness, *woollen manufactures,* market-place, church and college, but did much more excel them in the last age, as well by the glory of its *woollen* cloths, which they call Manchester *cottons,* as by the privilege of sanctuary, which the authority of parliament, under Henry VIII., transferred to Chester." From an act passed in the reign of Elizabeth, in 1566, we find that a certain quality of goods at Shrewsbury bore the name of "Welsh cottons, frizes, and plains;" language applicable only to woollen fabrics. Nay, at the present day a strange solecism remains in the language of Cumberland, where a peculiar woollen article of the

coarsest kind still retains its ancient name of Kendal cottons, which it had five hundred years ago, when no such thing as genuine cotton was known in the kingdom.

But India continued to be so greatly a-head of Europe in the arts of spinning and weaving cotton during more than a century after Roberts's publication, as to give to the different Companies trading to the East a monopoly in the supply of cotton goods. The activity of this trade with England alone may be inferred from the following declamation of the celebrated Daniel Defoe in favour of our native manufactures:—

"We saw our persons of quality," says Daniel Defoe, "dressed in Indian carpets, which, but a few years before, their chambermaids would have thought too ordinary for them; the chintzes were advanced from lying on their floors to their backs, from the foot-cloth to the petticoat, and even the queen herself at that time was pleased to appear in China and Japan, I mean China silks and calico; nor was this all, but it crept into our houses, our closets, and bedchambers; curtains, cushions, chairs, and, at last, beds themselves were nothing but calicoes or Indian stuffs, and, in short, almost everything that used to be made of wool or silk, relating either to the dress of the women or the furniture of our houses, was supplied by the Indian trade. What remained, then, for our people to do, but to stand still and look on, see the bread taken out of their mouths, and the East India trade carry away the whole employment of their people? What had the masters to do but to dismiss their journeymen, and take no more apprentices? What had the journeymen to do but to sit still, grow poor, run away, and

starve? Let any man but look into the cargoes exported and imported between 1697 and 1699, and he will find the account so surprising that a man hardly dare put it in print; there being exported in bullion only, besides goods, and by the companies, besides private trade, 7,157,372 ounces of plate, and the cargo home amounted in the hands of the retailers to above £7,000,000 sterling; that several single ships brought home 200,000 pieces of goods at a time, directly interfering with our home manufactures, and, besides the humour of the times, being on many accounts to be sold beyond all proportion cheaper than anything could be made here."

"Let no man wonder," he adds, "the Parliament, as soon as they were made sensible of this, came readily into the prohibition."

"The several goods brought from India are made, five parts in six, under our price, and being imported and sold at an extravagant advantage, were yet capable of underselling the cheapest thing we could set about."*

The following description of Hindoo industry will account for this great production:— Women of all castes prepare the cotton thread for the weaver, spinning the thread on a piece of wire, or a very thin rod of polished iron with a ball of clay at one end; this they turn round with the left hand, and supply the cotton with the right; the thread is then wound upon a stick or pole, and sold to the merchants or weavers; for the coarser thread the women make use of a wheel very similar to that of the English spinster, though upon a

* Defoe's Weekly Review, January and February, 1708.

smaller construction. The mother of a family in some instances will procure as much as from 7*s.* to 10*s.* a-month by spinning cotton. The tanties or weavers are in six divisions, which have no intercourse with each other, so as to visit or intermarry.

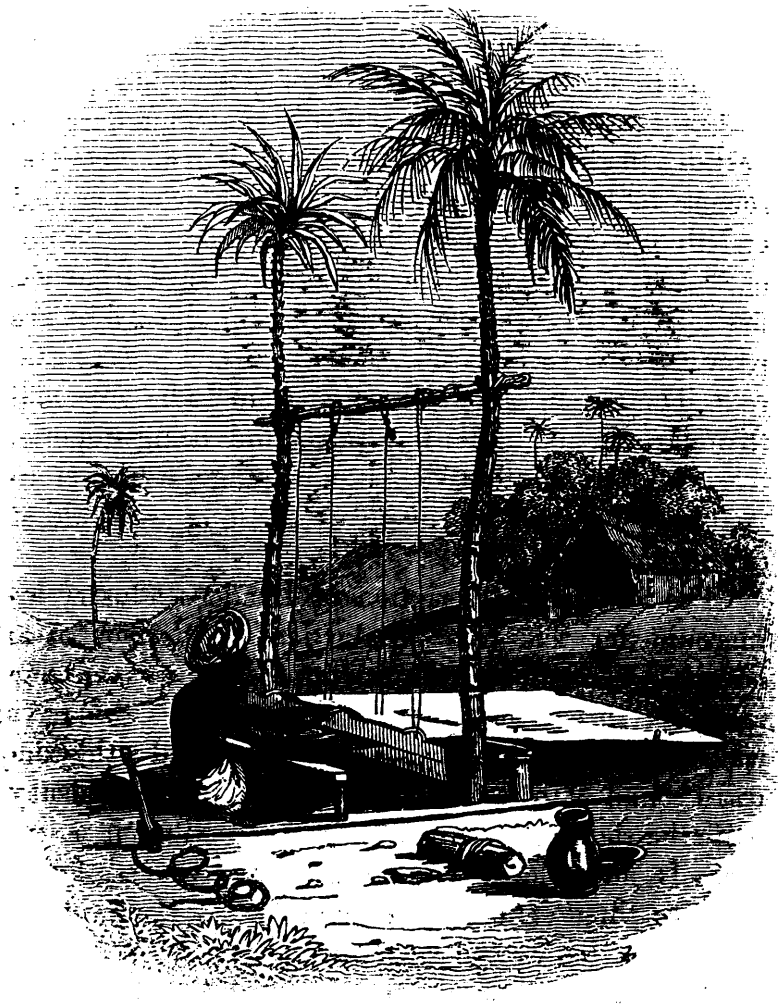

Fig. 1.—Hindoo Weaver at his Loom.

They lay the frame of their loom on the ground, and sitting with their feet hanging down in a hole cut in the earth, they carry on their work.—*See fig.* 1.

The coarse cloths worn by the natives are made in almost every village. At the Dhaku factory, some years ago, cloths to the value of 80 lacks of roopees were bought by the Company in one year; at Shantee-pooru the purchases in some years amount to 12 or 15 lacks; at Maldu to nearly the same sum, and at other places to 6 or 12 lacks; I give these amounts from bare report. Muslins are there made which sell at 100 roopees a-piece. Persons with whom I have conversed on this subject say, that at two places in Bengal, Sonar-ga, and Vicknum-pooru, muslins are made by a few families so exceedingly fine, that four months are required to weave one piece, which sells at 400 or 500 roopees. When this muslin is laid on the grass, and the dew has fallen upon it, it is no longer discernible. The wool, or rather hair, which grows upon the Bengal sheep is so short and coarse that a warm garment can scarcely be manufactured from it.*

Of the exquisite degree of perfection, says the eloquent historian of British India, to which the Hindoos have carried the productions of the loom, it would be idle to offer any description, as there are few objects with which the inhabitants of Europe are better acquainted; no modern nation can vie in the delicacy and fineness of its cotton textures with Hindostan. It is observed, at the same time, by intelligent travellers, that this is the only art which the original

* A View of the History, &c. of the Hindoos, by William Ward, of Serampore. 3d Edition, 1820, vol. iii. pp. 125–7.

inhabitants of that country have carried to any considerable degree of perfection. To the skill of the Hindoo in this art several causes contributed; his climate and soil conspired to furnish him with an abundance of the raw materials, and its fabric is a sedentary employment, in harmony with the dislike of locomotion generated by the atmospheric temperature. It requires patience, of which he has an inexhaustible fund; it requires little bodily exertion, of which he is always exceedingly sparing; and the finer the tissue the more slender the force which he is called upon to apply; the weak and delicate frame of the Hindoo, moreover, is accompanied with an acuteness of external sense, particularly of touch, which is altogether unrivalled, and the flexibility of his fingers is equally remarkable; the hand of the Hindoo, therefore, constitutes an organ adapted to the finest operations of the loom, in a degree which is almost or altogether peculiar to himself.

A people, says Orme, born under a sun too sultry to admit the exercises and fatigues necessary to form a robust nation, will, naturally, from the weakness of their bodies (especially if they have few wants) endeavour to obtain their scanty livelihood by the easiest labours; it is from hence, perhaps, that the manufactures of cloth are so multiplied in Hindostan; spinning and weaving are the slightest tasks that a man can be set to, and the numbers that do nothing else in this country are exceeding.

The following more minute picture of the manufacture of India as it has existed probably from primeval times, may prove interesting to some readers; I have extracted it from the second volume of a manuscript

account of Behar and Patna, by Dr. F. Buchanan, preserved in the Library of the East India Company.

"A great deal of the cotton is freed from the seed by the women who spin it, and a part of this is also beaten by the same persons; but the Dhũnĩyas, who make a profession of cleaning and beating cotton, separate the seed from some, and beat the greater part. Perhaps one-third of them have stock enough to enable them to buy a little cotton, which they clean and then retail; the remainder work entirely for hire. A man and his wife can make from three to four roopees a month. In country places they are very often paid in grain. At Arwăl they are allowed 1½ sērs of grain for beating one sēr of cotton; and in one day a man beats four sērs (45 s. w.) equal to about 4½ lbs., and of course receives 6¾ lbs of grain. Those who have a little capital may make 4 or 5 roopees a month.

" In every division I procured an estimate of the proportion of women who spin cotton, of the average quantity of cotton that each spins, and of the value of the thread. Such estimates are liable to numerous objections; but it is probable when a number of them are taken, that the errors of the one will be nearly corrected by those of the others, so that the average will be not far from the truth. Allowing that the women of an age fit to spin are one-fifth of the population, the estimates that I procured will give for the whole thus employed 330,426 spinners. Now by far the greater part of these spin only a few hours in the afternoon; and, upon the average estimate, the whole value of the thread that each spins in the year is

worth nearly 7R. 2A. 8P., giving for the total annual value 2,367,277 roopees; and by a similar average calculation, the raw material, at the retail price, will amount to 1,286,272 roopees, leaving a profit of 1,081,005 roopees for the spinners, or 3¼ roopees for each. But there are many women who spin assiduously, and who have no interruptions from children or family, and these make much more, especially where the thread is fine; there being no sort of comparison between the reward allowed for such, and that given to those who spin coarse thread. As the demand, therefore, for fine goods has been for some years constantly diminishing, the women have suffered very much. Another calculation agrees so well with the above that I have little doubt of the general accuracy of both. An estimate was made in each of the divisions of the number of looms employed, of the quantity and value of thread required annually for each, if employed in working at the usual rate, and the most usual kind of goods, and the following is the result:

		roopees.
Cotton thread required	for cotton cloths	2,229,979
Ditto	for mixed cloths	101,762
Ditto	for tape, carpets, tent ropes, &c.	37,125
Ditto	for sewing thread, &c. . . .	2,000
		2,370,866

"Some thread is both exported and imported. Taking the amount at the statements which I received, the excess of that imported will be worth 30,500 roopees, which would reduce the demand on the thread of this district to about 2,340,356 roopees in place of 2.367,277 roopees, which I have allowed to be spun;

but, at Bhagalpur, it was said that 1,450 roopees worth of thread was there imported from Patna; and at Puraniya there is imported to the value of 12,000 roopees, of which a half comes probably from the same town, while the merchants here only allowed an export of 3,420 roopees.

"The whole thread is spun on the small wheel common in India, and the implements for cleaning and beating the cotton are not different from those that are usual. No rank is considered here as degraded by spinning.

"The cotton weavers are numerous. Those of Phatuha are employed in weaving cotton diaper, (khēs,) which the natives use as a dress; but the great demand is for Europeans, who use the manufacture for table linen. By far the greater proportion of the cotton weavers is employed in making coarse cloths for country use, but a good many make finer goods for exportation. The amount of thread required is 1,771,379 roopees, and the value of the cloth 2,438,621 roopees, leaving a profit of 667,242 roopees, or 28½ roopees for each loom. It may be supposed that the finer qualities of goods taken for exportation would diminish the value of raw material, and increase the total value of the commodity, but that would not appear to be the case. Although the quantity of thread is no doubt less, yet as the reward for spinning the fine is much higher than that for spinning the coarse, the actual value is perhaps a little higher than I have stated, and may reduce the average profit to 28 roopees a-year for each loom. Each man on becoming bound (asami) to the Company receives 2 roopees, and engages not to work for any person until he has made as much as the

Company requires; no other advance has ever been made by the commercial residents. The agent orders each man to make a certain number of pieces of such or such goods, and he is paid for each on delivery according to the price stated in the tables. This shows clearly that the system of advance is totally unnecessary; but it is here pursued by all the native dealers, as keeping the workmen in a state of dependence little better, if so good, as slavery.

"The loom is of the imperfect structure usual in India; and where starch is used to facilitate the working, it is made from the root called kandri. It must be observed that all the Indian weavers who work for common sale, make the woof of one end of the cloth coarser than that of the other, and attempt to sell it to the unwary by the fine end, although every one almost who deals with them is perfectly aware of the circumstance, and although in the course of his life any weaver may not ever have an opportunity of gaining by this means. The same desire of illicit gain induces him almost universally to make the pieces somewhat shorter than the regular length.*

"The coarser goods intended for market sale are always sold as they come from the loom, but those intended for private sale are all bleached, and many of them undergo operations by different classes of tradesmen. It must be observed that in this district the weavers were bound to act as porters for conveying the goods of travellers; and when any person of rank or au-

* "Stamp-masters might be employed as a check; but the powers requisite to be vested in such persons could not, I doubt, be given to any persons to be found here, without producing greater abuses than those which stamp-masters could remedy."

thority calls upon the zemindar for such, the weavers are still required to perform this office. On some estates they are, on this account, allowed an exemption from ground-rent for their houses; on others they are taxed at a higher than usual rate.

"At Behur, a class of artists called parchahkush is employed to put all the threads in the bleached cloth at equal distances. The cloth made there being very thin, the operation of bleaching brings the threads into clusters, leaving many parts almost in holes. These workmen place all the threads at equal distances with a wooden comb. In some other places a needle is used. Many fine pieces of cloth are ornamented at the ends with the flattened gold and silver wire called bad-la, which, as the natives use the pieces entire, looks very showy. It is not woven into the cloth, but put in with a needle.

"In each piece of the muslins of Behar, the pieces of which are 2 cubits wide, the workmen who perform this operation stitch from 5 to 7 bands of this bad-la, each consisting of 350 wires. The workmen receive 4 anas for the 100; and a man can daily put in from 50 to 70. Allow that he puts in 60, and works 26 days a month, he will receive about 4 roopees, ($3\frac{9}{10}$); and 32,000 cubits of the wire costing 1 roopee, he has about $3\frac{7}{16}$ roopees a month for profit.

"The Chhapagars put gold and silver flowers on fine muslin by a very simple process. They stamp the cloth in the form wished with common glue, and then apply gold and silver leaf, which adheres to the glue, but rubs off where that has not been applied. Of course this cloth cannot be washed, but is very showy, and used only on high occasions.

All the blanket weavers are shepherds."

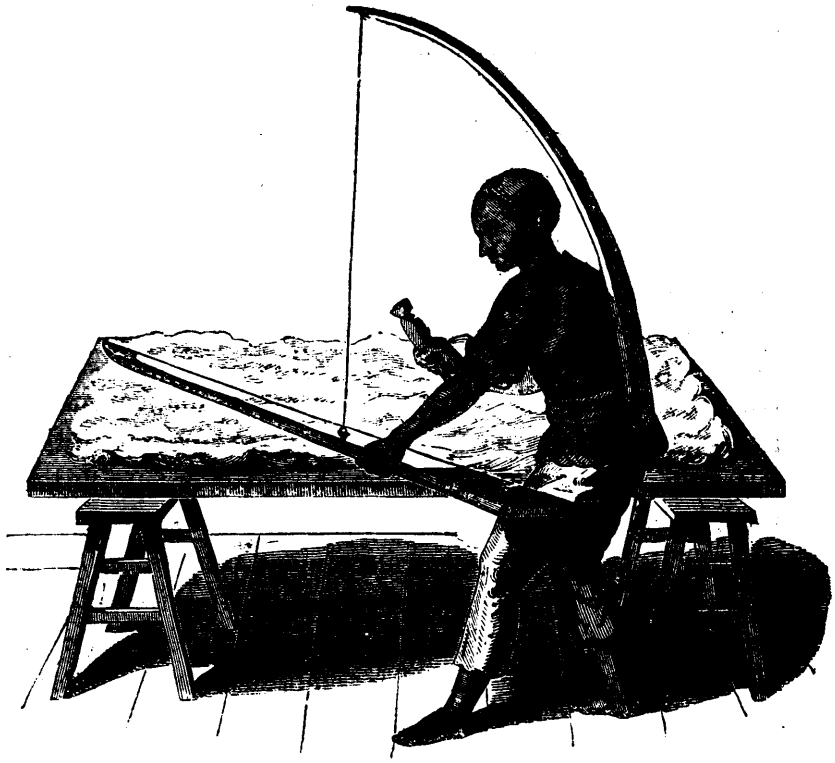

Fig. 2.—Bowing of Cotton, as practised in India and China.

The Hindoo bow for cleaning cotton is made of bamboo, and is fastened by strings to the wall of the room, at about five feet from the floor. To the middle of this bow a cord is tied, to which a second bow is attached of a larger size, strung with thick cat-gut. This second bow hangs about two feet above the ground. The man sits down, lays hold of it with the left hand, and holds a strong ebony club in his right. Thus equipped, he strikes the string of the bow with his club, so as to make it toss a flock of the foul cotton, spread upon the floor round about him, up into the air with great violence, and thus discharge its impurities.

I have already remarked, that the Mahometans spin the hard twisted warps; the softer woofs are spun by the Hindoo women, and are almost the only occupation by which they can earn the trifle requisite for the supply of their humble wants. They are indefatigable at their distaff, are at work before day-light, buy their weekly stock of cotton at the village market, and sell their weekly stock of yarn to their weaving neighbours. When the demand for Indian goods was considerable, it was delightful to contemplate the lively scene, for every man, woman, and child cheerfully plied their respective tasks in the open air. The universality of this trade in the Indian villages has been justly ascribed to the people being disqualified for robust exercise and severe exertions by the enervating influence of the climate. From the weakness of their bodies, therefore, they endeavour to satisfy their slender wants by the easiest industry.

In the northern parts of the kingdom of the Moguls, where the men have more bodily strength, they weave hair or the coarser cloth; whereas on the coast of Coromandel and in the province of Bengal, it is rare to find a village the least retired from the public road, where every man, woman, and child is not employed in making a piece of cotton cloth.

There are many districts in Asia and its islands equally propitious to the growth of cotton as Bengal, where the sun is as sultry and the people as unwarlike; yet this elegant branch of industry has hardly an existence among them. A more just cause for its *exceeding* prevalence in southern Hindostan is the peculiar delicacy of tact of the natives of that region, for as much as they are deficient in mere muscular strength,

so much are they endowed with exquisite sensibility and pliancy in every organ and limb. The hand of an Indian cook-maid is more delicately formed than that of an European beauty. An English workman could scarcely manage to work a piece of canvass with the simple loom with which the Gentoo weaves his gossamer muslin. His calling receives encouragement from public estimation. A weaver is there no ignoble caste, upon which patrician Hindoos can look down with disdain. He takes rank next to the scribe, and above all other mechanics. Were he to condescend to the performance of any drudgery out of the line of his business, he would lose his caste. This distribution of labour is of very ancient date. Every peculiar kind of cloth is the production of a peculiar district, in which it has been fabricated from generation to generation by certain races of men, each continuing to practise with minute precision the process of his predecessor. Thus it was their fine physical organization, guided by hereditary industry and experience, which, as we have already stated, gave to Hindostan the monopoly of the cotton trade for at least three thousand years.

Of this extraordinary delicacy of tact, Orme gives the following example in describing the silk manufactures of Bengal. "The women wind off the raw silk from the pod of the worm; a single pod of raw silk is divided into twenty different degrees of fineness; and so exquisite is the feeling of these women, that while the thread is running through their fingers so swiftly that their eye can be of no assistance, they will break it off exactly as the assortments change, at once, from the first to the twentieth, from the nineteenth to the second."

Concerning the fineness of Indian fabrics, many surprising stories are told. The Emperor Aurungzebe who flourished at the commencement of the last century, on perceiving his daughter arrayed in a semi-transparent tissue, reproached her with its indecency; she defended herself by assuring him, that her robe was wrapped nine times round her body. Tavernier relates, that a Persian ambassador, on his return from India, presented his king with a cocoa-nut, which contained a muslin turban, thirty yards long, and which when expanded in the air could hardly be felt. Some of their broad webs of muslin may be drawn through a wedding-ring.

The quantity of cotton goods manufactured in India must have been exceedingly great, though no accurate statistical accounts of them are given. Within the Madras presidency not very long ago, there were eleven active factories or emporia of cotton goods, which produced to the value of a million sterling. But this sunshine of Hindoo trade has been for many years in a declining state, and can never be expected to revive under the competition of goods produced by British machinery. From the vear 1821. when the first notable importation of English cotton twist into India took place, the speedy decline of its cotton manufactures might be predicted. Since then, the throstle and mule jenny, the two great arms of the Manchester Briareus, have been making frightful havock among Asiatic industry, depriving its myriads of spinners of their only resource,—dexterity at the distaff. Thus mankind, by the avariciously directed arts of peace, may come to prey on one another with as fatal an influence as by the arts of war. Prior to the above

period, however, the muslin and long cloth of Great Britain, had, in no small degree, supplanted the perkals and calicoes of Hindostan in the markets of the world. This fact will appear astonishing, if we compare merely the price of labour in India and England. The *retees* or the weavers' elderly wives, who are the most dexterous of hand-spinners, earn only three farthings a-day in producing the finest yarn, worth at one time from £3 to £4 sterling a pound, which is more than thirty times the price of the raw material; whereas the Manchester spinner with his machine can afford to make his fine yarn for one half the cost of its labour in India. Reckoning the mean price of fine cotton-wool in Great Britain at 2*s.* 6*d.*, and in India at 5*d.*, the cost of our labour and materials united would be considerably less than one half. Thus for example, the fine yarn of 250 hanks to a pound, costs, by Mr. Kennedy's statement, 35*s.* per pound in England, of which 4*s.* are allowed for material and waste, and 31*s.* for labour; and a pound of similarly fine yarn costs in India 84*s.*, of which only 8*d.* can be charged for material and waste, leaving 83*s.* 4*d.* for the cost of spinning, which at the rate of even 2*d.* wages per day, is equivalent to 500 days, or to a period of nearly one year and a half of constant occupation! Such is the marvellous superiority of the iron fingers of Arkwright and Crompton over the limber and dexterous hands of the Hindoos. In this estimate, a spindle, whether moved by hand or power, is supposed to spin half a hank of yarn daily; equal to nearly one quarter of a mile in length.

The Indian yarn of the finest quality, such as exists in the celebrated Dacca muslin, transparent as the

woven wind, is very irregularly twisted, and appears in the microscope like an ill-made hair-rope bristling with loose strands. The fibres obviously belong to ill-cultivated *gossypium herbaceum,* and are mostly riband shaped. The transparency of the web arises from the transparency retained by these riband filaments in their separate state; for if they were twisted more closely they would form a nearly opaque yarn, like the British. The filaments vary in diameter from $\frac{1}{1000}$ to $\frac{1}{1500}$ of an inch, and are therefore much coarser than those of Sea-Island cotton. Some of the yarns in the web consist of six filaments, others of seven, eight, and more; so that they possess little uniformity. A piece of fine British book-muslin, viewed by the same magnifying power, presents a very different aspect. The yarns are regular cords, most equably twisted, without any bristling ends; and consist of cylindric filaments, very faintly translucent. On viewing the fine Indian yarn, it is easy to comprehend how the looseness of its cohesion should require the web to be woven upon some occasions under water, in order to give it support, as the anatomist developes filmy textures while afloat in the same medium.

The cotton when spun is delivered to the winders, who are frequently the younger wives or girls. The winding machine consists of three parallel bars of wood laid flat on the ground, and kept in their places by a cross piece. From the upper surface of the bars pegs stand up, round which the yarn is wound from the bobbins in a horizontal direction. The coarser yarn is used for the chain or warp of the web, the finer for the woof. The former is prepared for the weaver by boiling in hot water, and then plunging it into cold;

but the woof, being usually less coherent, is strengthened by the gluten of cow-dung; for it is first soaked in water mixed with a little of that substance, then wrung out, laid in a covered vessel for some days to become uniform, and lastly dried in the sun.

The next process is the warping. The machine used for this purpose consists of a straight range of bamboo sticks about three feet long, stuck on end in the ground, two feet apart. Young persons are taught to run nimbly with the bobbins in their hands along that range, interlacing the yarn round each stick upon alternate sides, and applying it uniformly by means of a guide composed of a bamboo having a ring fastened to its point. When the warping is finished, additional sticks are inserted between the others to keep the yarns in their position; after which the whole is rolled up with the bamboos, immersed in a tank of water for a short time, and trodden with the feet to ensure its thorough saturation. It is next taken out, dried, remounted by fixing the bamboo sticks once more in the ground, and carefully examined by the weaver to see what threads are broken that he may mend them. The sticks being now withdrawn, the warp is laid along trestles about a yard high, placed at regular distances, and is rubbed over with rice water of a mucilaginous nature, kept till it has become sour. This corresponds to the weaver's dressing in Europe. The chain of yarn must now be carefully arranged, first with the fingers and then with a whisk of slender twigs, in order to place the threads truly parallel, as well as to smooth and clean them. Lastly a mucilage of boiled rice is spread over the warp to stiffen it, and when dry it is

softened by rubbing it with oil. It is now ready for the loom.

This process was deemed so important as to be regulated by ancient statute. "Let a weaver who has received ten patas of cotton thread give them back increased to eleven by the rice water, and the like used in weaving; he who does otherwise shall pay a fine of twelve panas."—(*Institutes of Hindoo Law*, chap. viii. sec. 397, *by Sir William Jones.*)

The *tanty,* or Hindoo weaver, digs first a hole in the earth for his legs, so as to be conveniently seated on the ground. He then drives two strong bamboo stakes into the earth at a distance apart proportional to the breadth of his web, and near enough to a wall or a tree for fixing the stakes to it by slender bamboos The Engraving (*see fig.* 1, *page* 33) represents the primitive oriental loom. It consists merely of two roller beams resting on two pairs of stakes driven into the ground, and two sticks which cross the chain or warp, and which are supported at each end, the one of them by two cords tied to the palm tree, under whose shade the loom is placed, and the other of them by two cords fastened to the foot of the weaver. These enable him to part the alternate yarns, for the purpose of traversing the warp with the woof. A very rude stick or wooden bar serves the weaver for a shuttle, which answers also the purpose of a batten for driving home each woof yarn against its predecessor, so as to give the cloth the proper closeness of texture. The loops beneath the geer, into which he inserts his great toes, serve him for treddles, and with his long shuttle he both draws the weft through the warp, and closes it up. With such

awkward mechanism as this, are woven those muslins of aerial fineness, transparent and delicate as the gossamer web. The reed is indeed like our own, and is the only thing made with the appearance of mechanical skill.

The destruction of the Mahometan dynasty in Hindostan gave a deadly blow to the manufactures of Dacca, the beautiful fabrics of which were bought principally for the court dresses of the emperor and his omrahs. The *perkals*, so called from a Tamul word signifying superfine, were made in the Carnatic of a silky cotton grown in the plain of Arcot. The district of Condover furnishes the showy handkerchiefs of Masulipatam. Chintzes are produced chiefly in the Calcutta and Benares districts, and in the Masulipatam district of the Circars.

From the division of labour between Mahometan and Hindoo workpeople, we have already shown that the cotton trade of India has not continued stationary since the institution of castes, but received certain modifications along with the Arabian dynasty. Mr. Richards indeed stated in the parliamentary discussion of 1814, upon the renewal of the East India Company's charter, that the distinction of castes, which assigns to the son of a Hindoo the trade of his father, is now maintained chiefly by the pressure of fiscal exactions, and the abject poverty of the people. In Calcutta and Bombay the Hindoo population have emancipated themselves very much from their ancient trammels, and have displayed equal energy and intelligence in commercial transactions. The time is probably not far distant when the benefits of knowledge and the

blessings of religion will be largely imparted to that gentle race, and enable them to take a more important share in the arts of civilized life. Hitherto the cotton trade has done no more for their dignity and comfort than the manufactures did for the slaves of the Roman grandees. Both laboured for hard task-masters in a huckster-like way, and received the scantiest livelihood in return. No motive was presented to their minds to improve their respective processes, and to multiply their productive powers; for the fruit of any such improvements would not have been reaped by them. What a contrast in this point of view is afforded by the arts of Great Britain and those of India! None of the oriental rajahs, however favoured with opulence and tranquillity, ever appear to have proposed the introduction of better implements, or the association of scattered workpeople into a manufactory. However reputable the profession of the Tanty in the scale of castes, it seems never to have been lucrative enough to procure for him or his descendants sufficient capital for the commercial part of his business.

While the East India Company made their remittances to Europe in cotton goods, they were obliged to advance, through their residents at the different stations, not only the cotton wool, but the funds requisite to support the workman and his family during the progress of the manufacture. Under this officer, as chief, a corps of European servants was placed, who watched over and directed the native clerks and *peons*, or immediate superintendents of the weavers; the resident sent forth his proposals for certain quantities of goods to the native merchants, who treated in their

turn with the workpeople. As soon as the terms were agreed upon, the resident advanced the funds to the contractors, who distributed them at his discretion, and became responsible for the delivery of the manufactures at the Company's stores, according to stipulation. The Company's resident never interfered with the contractors in their details, unless complaints were made of fraud, delay, or the interference of contractors acting in other interests; in this case peons were dispatched to intimidate, and if necessary to coerce, the weaver. When the weavers had no engagement for the Company, the resident had the privilege of employing them on his own account; he became hereby a person of great importance to the people, and was regarded by them as the chief source of their subsistence, and the main-spring of their industry; hence, although the native brokers who acted as contractors for the Portuguese and other traders did offer a higher price for the goods than the British resident had fixed, the weavers, however strongly tempted to evade his orders or to smuggle away their cloth, never durst openly dispute his commands.

They were taught to consider the commercial resident as a man of authority, and not as a mere merchant; he dwelt in a palace, and was surrounded by all the pomp and circumstance of high station, the moral effect of which is well known to all who have been in India. Correct, too, and honourable as he himself may have been, the details of his duties mainly devolved on sircars and other subordinate employés spread over the district, with much real and more assumed power, and more or less corrupt from the

inadequacy of their salaries in comparison with their means of extortion and tyranny. Some light is thrown on the compulsory tendency of the Company's commercial system by the 8th paragraph of the Board's letter, dated 27th April, 1827, which is as follows: "It will therefore be your duty to explain these matters fully to the peons and rearers of cocoons employed under your factory, *so as to prepare their minds to submit without murmuring to the prices you may deem it necessary under these orders to determine on granting them for the silk and cocoons produced during the several bunds of the year, impressing it at the same time upon them, as a matter of absolute necessity, that they will seek in vain to elude the operation of the system now about to be established, by carrying their cocoons away from their own factory in order to deliver them into a neighbouring factory for the sake of obtaining increased prices, because by so doing they will inevitably meet with disappointment.*"*

Such unlimited influence over a simple people in a remote district no doubt led to frequent acts of injustice. Various laws and regulations were enacted to protect the weavers against oppression, but it is believed with little effect, for the sovereign power which ought to have administered impartial laws was, in fact, the avaricious and needy trader, whose interest it was to be unjust. Now that the India Company has ceased to be traders, they will have no motive to harass the Tantys through the medium of resident contractors, but will leave them at full liberty to bring their indus-

* Mr. Brucken—Appendix to Report on E. I. C. Affairs, p. 521.

try to the best market. In such circumstances the Indian artisan will find his condition vastly improved; he will be persuaded to employ his dexterity under more liberal auspices, and will be furnished with better implements to sustain the competition against European rivalry. A style of goods may thus be produced surpassing in beauty anything ever manufactured for the court of the Grand Mogul. It is not probable that the Hindoo will submit to the irksome confinement of a factory, but with a better cotton yarn and better loom he may be able to fabricate his peculiar light muslins at so cheap a rate as to make head in some measure against the overwhelming resources of Europe. The late attempt to erect a cotton factory at Calcutta seems to have been injudicious, and failed; a second company have indeed resumed the scheme, but they can hope for little more success; they had, some time since, nearly 700 persons employed in their spinning-mill at the rate of 7*s.* each in the month; but they found these native workmen incapable of sticking to their task more than a few hours at a time, and they require, therefore, two or more relays of hands in a day. Such individuals can never become proficient spinners, nor even at the low rate of wages can they furnish yarn fit to cope in the market with the production of Lancashire; it is only by giving every encouragement to their exquisitely fine faculties and endowments that they can be expected to become profitable servants to an enterprizing manufacturer. Instead of being under the necessity, as at present, of taking down their loom every evening and erecting it every morning, or stopping their labours every rainy day, they should be provided with covered galleries

open at the sides as warping and weaving shops, in which the work could go on uninterruptedly upon the plan of alternate labour, to which they have been long familiar; they should also be provided with the means of better cotton-husbandry by the introduction of a better cotton-seed, a better system of agriculture, and a better gin for cleaning the wool. Thus seconded in a kindly spirit, the Hindoo artisan might once more delight the luxurious with webs of incomparable elegance, at such a price as would ensure for them an extensive and ready sale. Yarn continues to be spun and muslins to be manufactured at Dacca, to which European ingenuity can afford no parallel; such, indeed, as has led a competent judge to say it is beyond his conception how this yarn, greatly finer than the highest number made in England, can be spun by the distaff and spindle, or woven afterwards by ANY machinery.

It is in spinning the more tenacious warp-yarn that machinery has the greatest advantage over the hand, and accordingly it was that description called twist which first made its way from this country into India. In 1815 the small quantity of eight pounds was sent out on trial, and in the same year the importation of British white and printed cotton goods into India amounted to nearly 800,000 yards, the whole of which was probably purchased by our countrymen; but in 1830 the quantity of British cloth imported into India had increased to 45,000,000 yards, indicating a prodigious extension of sale all over the Peninsula, even among the natives, to the exclusion of their own fabrics, which could not be afforded at so moderate a price. In the preceding year, 1829, no less than 3,185,639